



UAV Program

Water Resources Management Division

Definition Of UAV

An Unmanned Aerial Vehicle (UAV) is an aircraft flown with no person on board. It is synonymous with the term Remotely Piloted Aircraft System (RPAS) or the more informal term drone.

Benefits of UAV

UAV technology can greatly benefit environmental management operations for the collection of spatial data on a local and regional scale. Compared to alternative ways of collecting spatial data, using manned aircraft or satellites, UAVs are:

- a *cost effective* means of collecting *high-quality data with survey precision*;
- *not constrained by third-party relations* (e.g., contracting, scheduling, purchasing, etc.) when deployed by in-house staff;
- *easily deployed* for quick response to emerging issues (e.g., flood or pollution events);
- *highly maneuverable* for acquiring data in difficult-to-access areas;
- flown at lower altitudes to *avoid cloud cover effects*; and
- a *secure* means of collecting data, especially when the capacity to collect and process the data can be done in-house.

WRMD UAV's

- DJI Matrice 300 RTK (purchased January 2021)
 - DJI Zenmuse H20T
- DJI Mini 3 Pros (purchased November 2022)
- DJI Phantom 3 Professional (Purchased 2015 - semi retired due to lack of safety features required for advanced operations)

Software

Agisoft Metashape Software - Photo Processing Software

UAV Applications for Environmental Monitoring

- BGA bloom extent mapping;
- River ice mapping and product confirmation (e.g., ice front, leads);
- Flood event emergency response (e.g., map extent and damage to properties);
- Pollution event emergency response (e.g., map extent and investigate cause);
- Turbidity mapping resulting from natural or manmade disturbances;

UAV Applications for Environmental Monitoring cont'd

- Sewage and industrial outfall detection;
- Dam inspection including condition, leakage and movement;
- Create or update digital elevation models used for flood risk mapping;
- Air pollution monitoring;
- Videos for promotional, explanatory, or training material;

UAV Applications for Environmental Monitoring cont'd

- Water grab sample collection;
- Streamflow monitoring using particle tracking velocimetry methods;
- Protected watershed and public water supply surveillance and change detection;
- Wetland mapping, especially near urban development; and
- Water distribution systems leakage detection.

Resources

- The WRMD currently has three certified pilots that are capable of carrying out basic and advanced flight operations.
- Several additional staff have experience aiding with flight operations by serving as visual observers, assisting pilots in conducting safe flights in areas where hazards such as power lines, bystanders, wildlife, and other obstacles exist.

Path Forward

- Initiate or continue collaboration with partner organizations interested in UAV operations, such as the Geological Survey of Newfoundland and Labrador and Environment and Climate Change Canada.
- Develop and document standard operating procedures for creating high-quality UAV products (e.g., 3D surface and terrain models).
- Integrate Post Processed Kinematic (PPK) corrections into production workflow, to create spatial datasets with precise location information.
- Plan for new sensor integration, such as LiDAR and multispectral cameras.
- Maintain pilot certification through Transport Canada's regency requirements program.

UAV Video



UAV Video

- BGA Investigation
 - this footage is of Forest Pond in Victoria just 1.5 hours outside of St. John's
 - Note the Blue Green Algae Bloom, fish kill and where the BGA bloom peters off