AEROTESTRA
UNMANNED AIRCRAFT SYSTEMS

sUAS for Precision Survey and Documentation

Unmanned Systems, Processes and Quality Control
For Unmanned Aerial Mapping

Unmanned Aircraft Types

Fixed Wing Aircraft

- Commonly referred to as airplanes, aeroplanes, or simply planes.
- Utilizes stationary wings (one or more pairs) for flight:
  - Lift is created through forward propulsion forcing air over the wing's surface
  - Uses control surfaces (e.g. ailerons, elevators, rudders) to direct the aircraft and move side-to-side and up and down

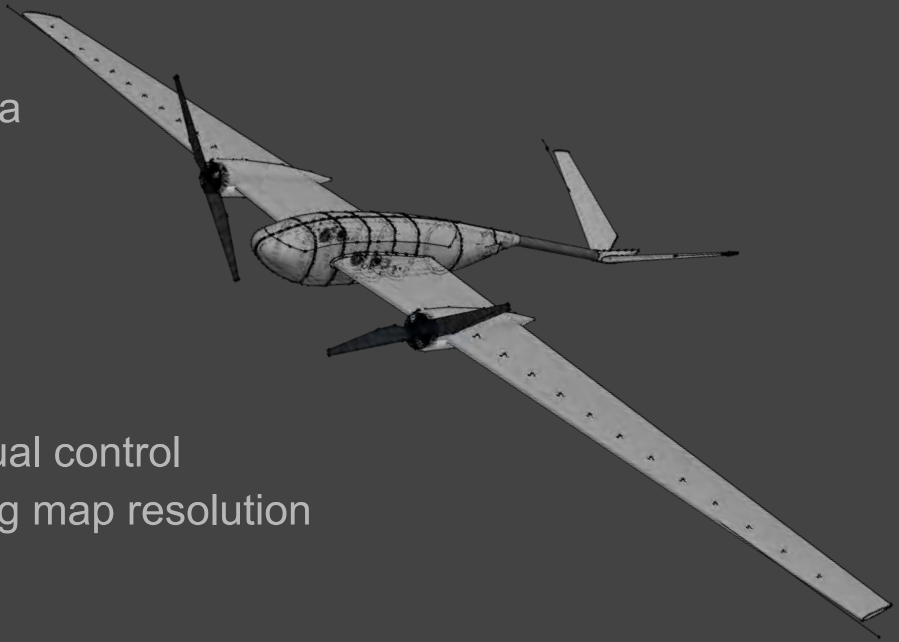
Multi Rotor or VTOL (Vertical Takeoff and Landing)

- Includes multirotors, helicopters, and hybrids which combine the fixed and rotary wing concepts
- Utilizes two or more propellers around a center axis to achieve lift
- Attitude, the aircraft's orientation in space – yaw, pitch, roll, is controlled by the speed of the propellers in relationship to each other

Fixed Wing Aircraft

Advantages:

- \+ Longer flight duration = larger coverage area
- \+ Easier power loss recovery = safer



Disadvantages:

- Requires longer takeoff and landing area
- Requires a more experienced pilot for manual control
- Requires higher minimum altitude, impacting map resolution

Multi Rotor or VTOL

Advantages:

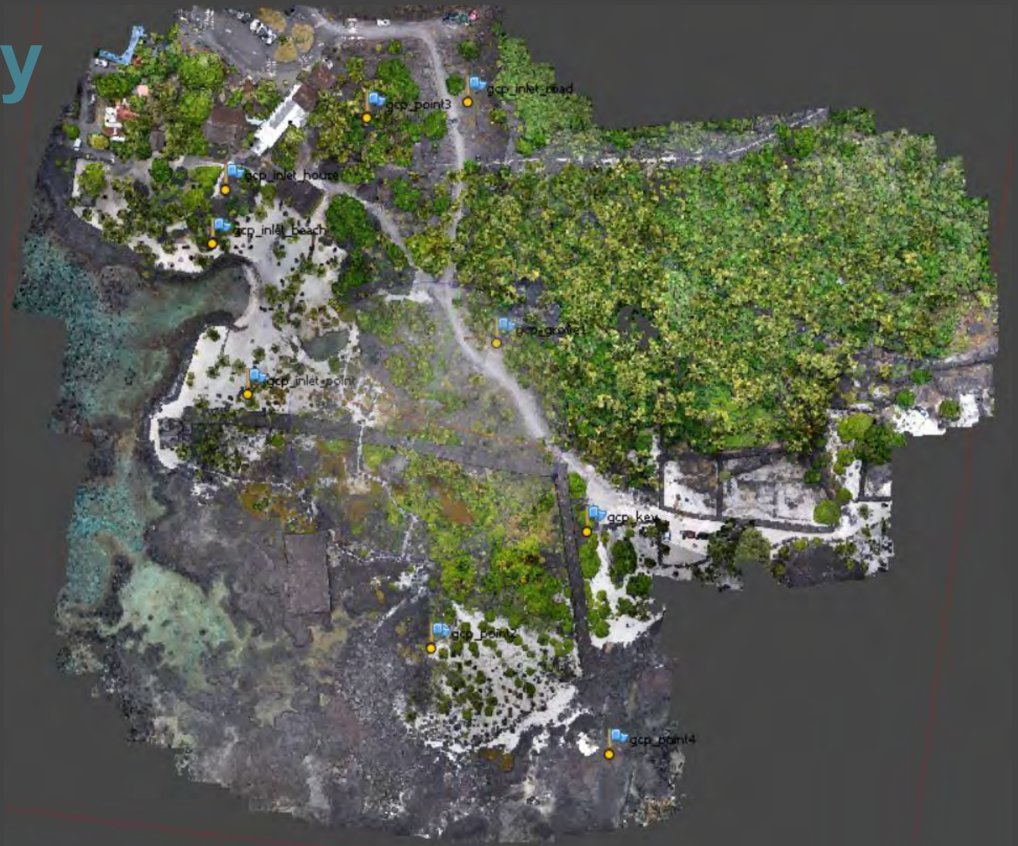
- \+ Can takeoff and land in a small area (10’x10’)
- \+ Manual control requires less experience to pilot
- \+ Altitude and speed can be as low as safety permits

Disadvantages:

- \- Shorter Flight duration (20-30 min.) = smaller coverage area
- \- Power failure can lead to catastrophic aircraft loss

CASE STUDY:

Kona, Hawaii: Pu’uhonua O Hōnaunau National Park Survey



MIssion Details

Flight Time: 15 minute flight, 3x
Altitude: Approx. 150 ft. AGL
Coverage: Approx. 34 acres
Camera images: 575
Image Sensor: ILCE-QX1

Survey Details

Resolution: 1.07cm
Ground Control Points (GCPs): 8
Mean Accuracy: 10cm X,Y / 13cm Z

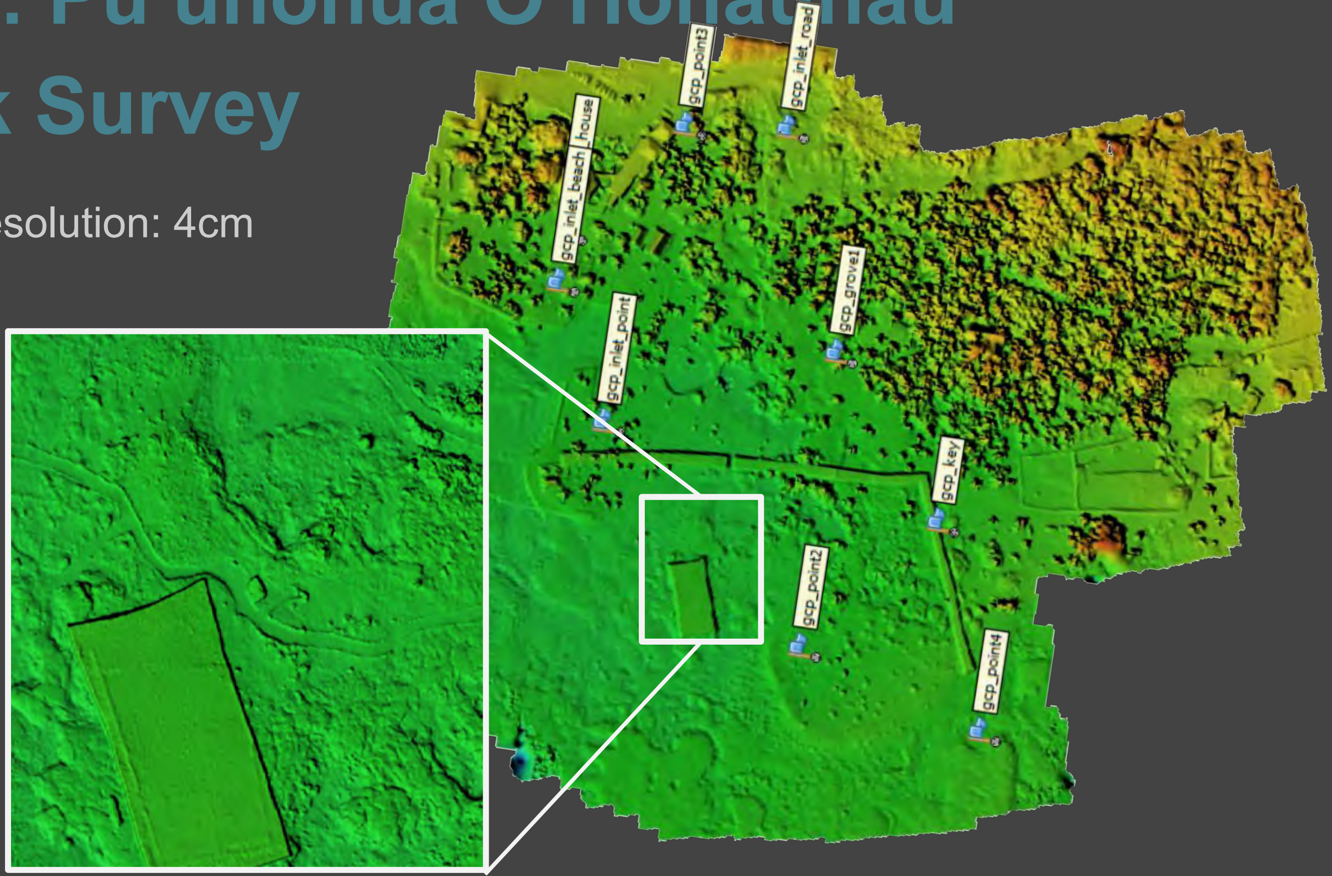
CASE STUDY:

Kona, Hawaii: Pu’uhonua O Hōnaunau National Park Survey

Digital Elevation Model Resolution: 4cm

Use case:

High resolution elevation models can identify previous constructions that have since been covered by vegetation or sediment.



Methods for map data accuracy:

Ground Control Points (GCPs)

Visual targets placed at precise locations throughout a survey area create geographic anchors for map data.

These targets are identified along with their GPS location prior to processing the 3D model.

GCPs can be placed at locations around sensitive or inaccessible areas.

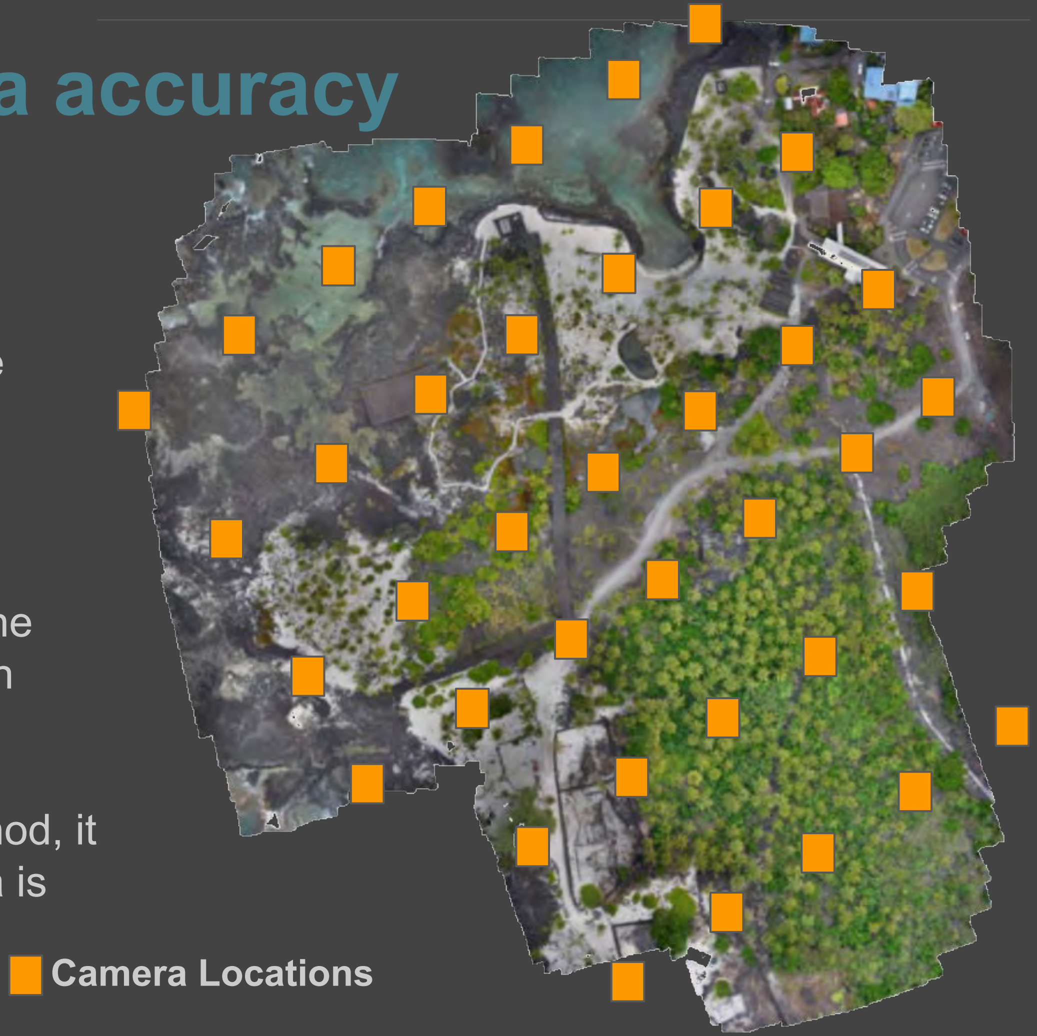
Methods for map data accuracy

Camera Location Data

Camera location data records the precise moment the image is captured. This can provide a high degree of accuracy to the processed model.

Variables, including GPS accuracy and the synchronization of the image capture, can impact the accuracy of the model.

Since no GCPs are required for this method, it can be very useful where the survey area is inaccessible.



CASE STUDY:

Mt. Umunhum Survey

Client: Midpeninsula Regional Open Space District
Project Objective: Provide base level topographic map for restoration project planning phase
Operator: Andrew Chafer, PLS, CFedS, Senior Project Surveyor
UAS: AeroTestra MK09 Aerial Mapping System
Location: Mt. Umunhum, California
Date: February 2015

UAS advantage for this aerial survey:

The summit is closed to the public due to hazardous materials and unsafe partially demolished structures of the former Air Force station. Using the UAV allowed Sandis to capture the necessary topographic data while limiting exposure to hazardous materials or conditions.

CASE STUDY:

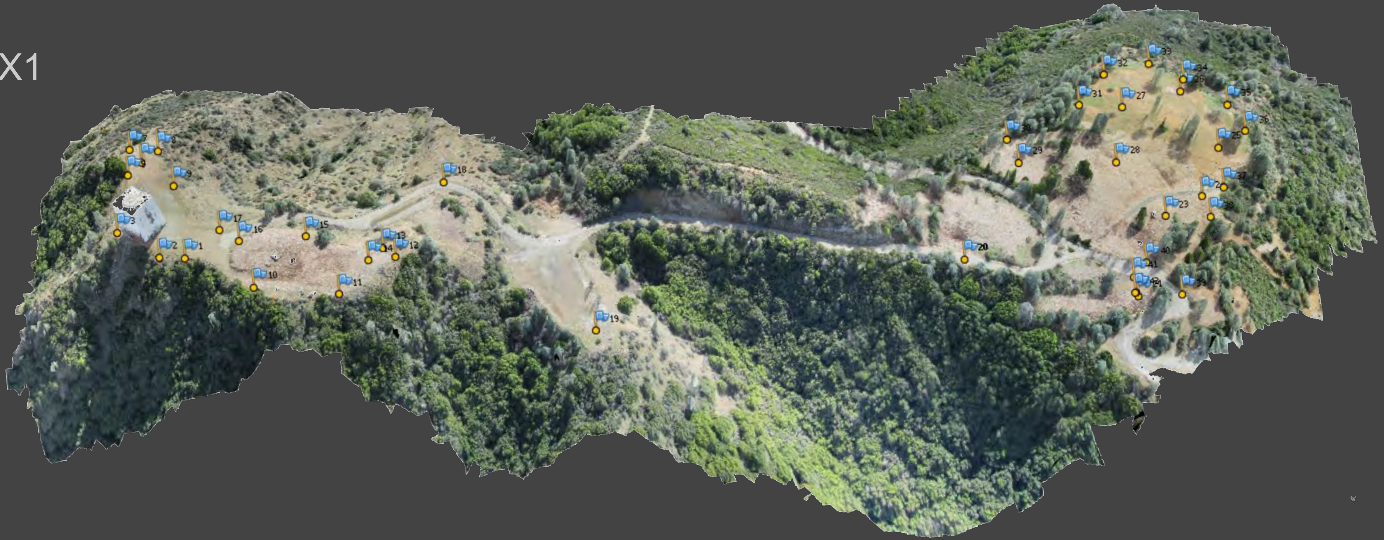
Mt. Umunhum Survey

MIssion Details

Flight Time: 20 minute flights, 2x
Altitude: Approx.387 ft. AGL
Coverage: Approx. 75 acres
Camera imagess: 244
Image Sensor: ILCE-QX1

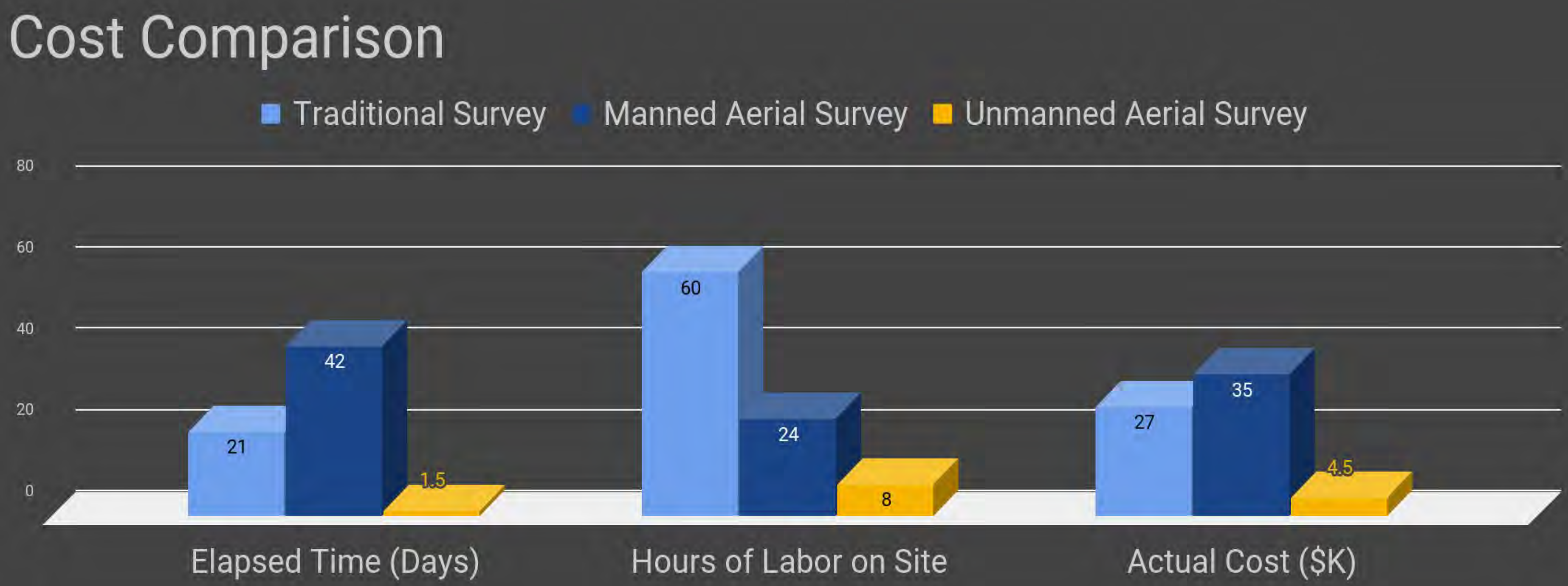
Survey Details

Ground Sample Distance (GSD): 2.97cm
Ground Control Points (GCPs): 45
Mean Accuracy: 2-3 cm X,Y / 5cm Z



CASE STUDY:

Mt. Umunhum Survey



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Contact us:
For general information
info@aerotestra.com

Sean Headrick
sean@aerotestra.com

Website
Aerotestra.com