Smart City Planning with Drone Data - A Case Study

HuviAiR

![HUVIAiR]

Drone generated geo-referenced high resolution 2D and 3D GIS maps are emerging as a must have tool to design, plan and execute smart city projects around the world.

HUVIAiR Technologies created these maps for Hargeisa, the capital of Somaliland, Africa.

Hargeisa

Project Background

Hargeisa, the capital city of Somaliland covers almost 20,000 acres of urban built up area and has a population of 1.6m.

The government of Somaliland is using cutting edge technology to enhance governance and to plan the complete development of the city. Using Drone Data technology, Huviair is helping the Government of Somaliland to achieve the following objectives-

- Zoning the city and further assigning the postal zip code to different areas of the city with the help of geo-referenced drone generated maps.
- Conducting aerial land survey of the city to establish accurate property dimensions. Each property is geo-referenced and the ownership is digitally established.
- Further, a property tax system is developed and the property tax is fixed based on the property size and location
- The geo-referenced land survey outputs are used for planning of road laying, powerlines and piping of drinking water to each home.
- The drone data outputs are also used for creating urban surface water models to design rain water collection and drainage systems.
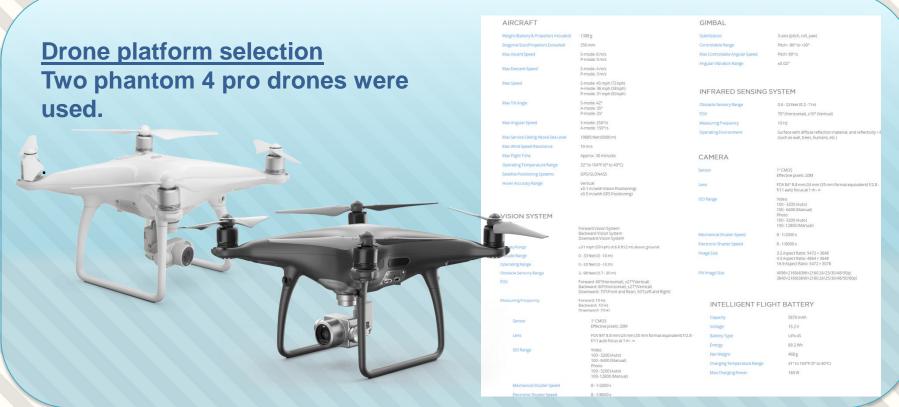
Process

Flight planning

The entire area was subdivided into multiple zones and flight plans were created for each zone.

Drone platform selection
Two phantom 4 pro drones were used.

AIRCRAFT

Weight (Battery & Propellers Included)	1388 g
Diagonal Size (Propellers Excluded)	350 mm
Max Ascent Speed	S-mode: 6 m/s P-mode: 5 m/s
Max Descent Speed	S-mode: 4 m/s P-mode: 3 m/s
Max Speed	S-mode: 45 mph (72 kph) A-mode: 36 mph (58 kph) P-mode: 31 mph (50 kph)
Max Tilt Angle	S-mode: 42° A-mode: 35° P-mode: 25°
Max Angular Speed	S-mode: 250°/s A-mode: 150°/s
Max Service Ceiling Above Sea Level	19685 feet (6000 m)
Max Wind Speed Resistance	10 m/s
Max Flight Time	Approx. 30 minutes
Operating Temperature Range	32° to 104°F (0° to 40°C)
Satellite Positioning Systems	GPS/GLONASS
Hover Accuracy Range	Vertical: ±0.1 m (with Vision Positioning) ±0.5 m (with GPS Positioning)

VISION SYSTEM

	Forward Vision System Backward Vision System Downward Vision System
Velocity Range	≤31 mph (50 kph) at 6.6 ft (2 m) above ground
Altitude Range	0 - 33 feet (0 - 10 m)
Operating Range	0 - 33 feet (0 - 10 m)
Obstacle Sensory Range	2 - 98 feet (0.7 - 30 m)
FOV	Forward: 60°(Horizontal), ±27°(Vertical) Backward: 60°(Horizontal), ±27°(Vertical) Downward: 70°(Front and Rear), 50°(Left and Right)
Measuring Frequency	Forward: 10 Hz Backward: 10 Hz Downward: 20 Hz
Sensor	1" CMOS Effective pixels: 20M
Lens	FOV 84° 8.8 mm/24 mm (35 mm format equivalent) f/2.8 - f/11 auto focus at 1 m - ∞
ISO Range	Video: 100 - 3200 (Auto) 100 - 6400 (Manual) Photo: 100 - 3200 (Auto) 100 - 12800 (Manual)
Mechanical Shutter Speed	8 - 1/2000 s
Electronic Shutter Speed	8 - 1/8000 s

GIMBAL

Stabilization	3-axis (pitch, roll, yaw)
Controllable Range	Pitch: -90° to +30°
Max Controllable Angular Speed	Pitch: 90°/s
Angular Vibration Range	±0.02°

INFRARED SENSING SYSTEM

Obstacle Sensory Range	0.6 - 23 feet (0.2 - 7 m)
FOV	70° (Horizontal), ±10° (Vertical)
Measuring Frequency	10 Hz
Operating Environment	Surface with diffuse reflection material, and reflectivity > 8 (such as wall, trees, humans, etc.)

CAMERA

Sensor	1" CMOS Effective pixels: 20M
Lens	FOV 84° 8.8 mm/24 mm (35 mm format equivalent) f/2.8 - f/11 auto focus at 1 m - ∞
ISO Range	Video: 100 - 3200 (Auto) 100 - 6400 (Manual) Photo: 100 - 3200 (Auto) 100 - 12800 (Manual)
Mechanical Shutter Speed	8 - 1/2000 s
Electronic Shutter Speed	8 - 1/8000 s
Image Size	3:2 Aspect Ratio: 5472 × 3648 4:3 Aspect Ratio: 4864 × 3648 16:9 Aspect Ratio: 5472 × 3078
PIV Image Size	4096×2160(4096×2160 24/25/30/48/50p) 3840×2160(3840×2160 24/25/30/48/50/60p)

INTELLIGENT FLIGHT BATTERY

Capacity	5870 mAh
Voltage	15.2 V
Battery Type	LiPo 4S
Energy	89.2 Wh
Net Weight	468 g
Charging Temperature Range	41° to 104°F (5° to 40°C)
Max Charging Power	160 W

Process

Data capture process

A total of 12 ground control points were marked and established using the Trimble R8 in RTK mode.

Process

Data capture process

<u>After obtaining the required permissions from aviation and local authorities, the 2 drones were flown simultaneously and autonomously across the areas of interest.</u>

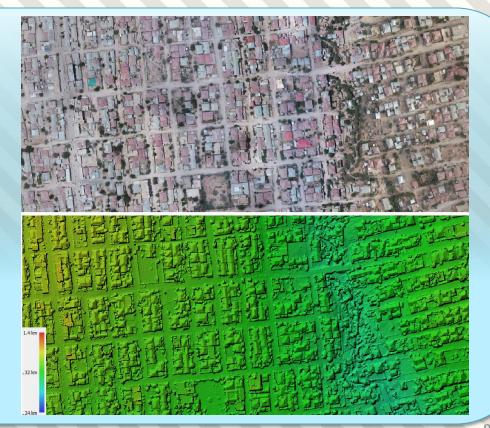Two drone pilots flew the drones and completed the data capture process in 7 days.

Data Processing

Data processing:

A total of 7300 images captured were processed to generate the high resolution geo-referenced orthomosaic and digital surface model.

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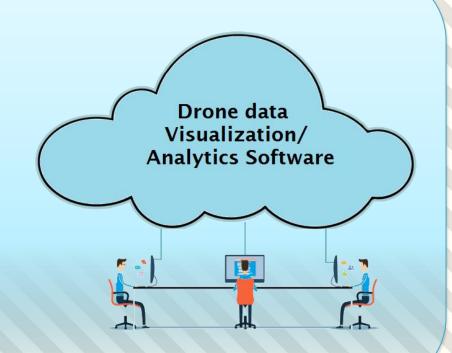
Software

All the outputs were deployed in our browser based software.

This enabled the Government officials to visualize, analyze and manage the outputs generated.

Drone data Visualization/ Analytics Software

Smart City Planning with Drone Data

The HUVIAiR platform was used to label and measure each property.

With this data, a GIS based property tax information system was created.

Further the following outputs were generated-
- Postal code zoning system
- Nomenclature of City roads
- Road network plan, powerlines routing , water piping routing
- Urban surface water models for Drainage systems and Rainwater
 harvesting

Huviair continues to provide inputs and provide solutions to enable the city administration to execute all of the above plans.

About HUVIAiR

HUVIAiR Technologies is a Drone Data Solutions Company.

The HUVIAiR solution delivers drone data based insights for construction, infrastructure, smart cities, renewable energy and natural resource management sectors.

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