



Southeast GeoReadiness Center

Utilization of a Small Unmanned Aerial System by Naval Facilities Engineering Command Southeast

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Program Objectives



- **Alternative to conventional ortho rectified aerial photo acquisition.**
- **Acceleration of acquisition schedule.**
- **Minimal risks.**
- **Rapid deployment.**
- **Can be deployed to remote areas.**
- **Easy to operate.**
- **Cost saving.**

SE GRC UAS Fleet



- **Purchased in 2012.**
- **2 systems ready to deploy.**
- **3rd system can be built with spare parts.**
- **6 pilots trained.**
- **Requires 2 pilots to operate.**
- **Average 1 training mission per month, with multiple flights.**

Gatewing X100 UAS



Gatewing X100 UAS



Gatewing X100 UAS



Sample Imagery



3 in 1:600

Sample Imagery



X100 1:600

Sample Imagery



3 in 1:480

Sample Imagery



X100 1:480

Sample Imagery



3 in 1:240

Sample Imagery



X100 1:240

Sample Imagery



3 in 1:120

Sample Imagery



X100 1:120

Cloud Shadows



Low Cloud Ceiling



Light Rain



Blurs



Crooked Line



Crooked Line



Quickfield



Gateway - Quickfield DEMO MODE

Define scan area

Altitude m GSD cm

Overlap %

Scan area: 0.88 x 0.93 = 0.82 km²

Estimated flight duration: - minutes

Fix takeoff location

Found location:

Fix landing location

Found location:

Heading °

Flight map

An aerial photograph showing a flight path planned for a drone. The path is marked with yellow lines and arrows, forming a series of overlapping rectangular loops. Four specific flight areas are highlighted in yellow and labeled: Flight 1 (a large rectangular area on the right), Flight 2 (a large rectangular area on the left), Flight 4 (a smaller rectangular area at the bottom), and Flight 5 (a smaller rectangular area at the top). The map also shows a road network and some buildings.

(c) 2011 by Gateway, version 1.30.0

Mission Planning



Photoscan



Gateway Demo SSCP_125P0112.apr - Agisoft Photoscan

File Edit View Workflow Tools Photo Help

Ground Control

Markers	X/East	Y/North	Z/Altitude	Error (m)
✓ GCP1	-81.634795	29.143054	27.589180	0.000000
✓ GCP2	-81.634821	29.144588	27.337320	0.000000
✓ GCP3	-81.633809	29.145530	30.434740	0.000000
✓ GCP4	-81.631110	29.143235	35.318352	0.000000
✓ GCP5	-81.631140	29.144907	34.605845	0.000000
Total Error				0.000000

Photos

Photos	X/East	Y/North	Z/Altitude	E
RO010338.JPG	-81.628625	29.146712	183.621047	8
RO010360.JPG	-81.628586	29.146384	182.844816	8
RO010361.JPG	-81.628538	29.146081	182.481139	8
RO010362.JPG	-81.628536	29.145757	182.072018	8
RO010363.JPG	-81.628525	29.145434	181.698101	8
RO010364.JPG	-81.628518	29.145140	181.275770	8
RO010365.JPG	-81.628507	29.144826	181.475801	8
RO010366.JPG	-81.628499	29.144519	181.653586	7
RO010367.JPG	-81.628498	29.144203	181.853808	7
RO010368.JPG	-81.628500	29.143917	181.798178	8
RO010369.JPG	-81.628505	29.143586	181.181821	8
RO010370.JPG	-81.628511	29.143293	181.477338	1
RO010371.JPG	-81.628518	29.142949	181.785281	1
RO010372.JPG	-81.628520	29.142631	184.087136	1
RO010373.JPG	-81.628522	29.142318	184.292668	8
RO010374.JPG	-81.628526	29.141995	184.523836	1
RO010375.JPG	-81.628528	29.141712	184.728462	8
RO010376.JPG	-81.628985	29.142226	186.176415	14
RO010377.JPG	-81.628972	29.142492	186.354601	14
RO010378.JPG	-81.628983	29.142853	185.911711	14

Ground Control Points



Ground Control Points



Gateway_Demo_GCP_12SEP2012.psz -- Agisoft PhotoScan

File Edit View Workflow Tools Photo Help

Ground Control

Markers	X/East	Y/North	Z/Altitude	Error
<input checked="" type="checkbox"/> GCP1	-81.634795	29.143054	27.589180	0.000
<input checked="" type="checkbox"/> GCP2	-81.634621	29.144588	27.337320	0.000
<input checked="" type="checkbox"/> GCP3	-81.633809	29.145510	30.434740	0.000
<input checked="" type="checkbox"/> GCP4	-81.631110	29.143235	35.318352	0.000
<input checked="" type="checkbox"/> GCP5	-81.631140	29.144907	34.605845	0.000
Total Error				0.000%

Model R0010453.JPG

An aerial photograph showing a dirt road or path. A blue marker labeled "GCP5" is placed on the road. The surrounding area is a mix of dirt and green vegetation.

Photos

Photos	X/East	Y/North	Z/Altitude
<input checked="" type="checkbox"/> R0010359.JPG	-81.628625	29.145712	183.621047
<input checked="" type="checkbox"/> R0010360.JPG	-81.628586	29.146384	182.849816
<input checked="" type="checkbox"/> R0010361.JPG	-81.628559	29.145081	182.481159
<input checked="" type="checkbox"/> R0010362.JPG	-81.628536	29.145757	182.072018
<input checked="" type="checkbox"/> R0010363.JPG	-81.628525	29.145434	183.098103
<input checked="" type="checkbox"/> R0010364.JPG	-81.628518	29.145149	183.275779
<input checked="" type="checkbox"/> R0010365.JPG	-81.628507	29.144826	183.475801
<input checked="" type="checkbox"/> R0010366.JPG	-81.628499	29.144519	183.650585
<input checked="" type="checkbox"/> R0010367.JPG	-81.628498	29.144203	183.850603
<input checked="" type="checkbox"/> R0010368.JPG	-81.628500	29.143917	183.798178
<input checked="" type="checkbox"/> R0010369.JPG	-81.628505	29.143586	183.131321
<input checked="" type="checkbox"/> R0010370.JPG	-81.628511	29.143265	183.477358
<input checked="" type="checkbox"/> R0010371.JPG	-81.628518	29.142949	183.785283
<input checked="" type="checkbox"/> R0010372.JPG	-81.628520	29.142631	184.087536
<input checked="" type="checkbox"/> R0010373.JPG	-81.628522	29.142318	184.292668
<input checked="" type="checkbox"/> R0010374.JPG	-81.628526	29.141995	184.523456

Photo: R0010453.JPG R0010457.JPG

Imagery Mosaics



Color Balance



Seam line



Lesson Learned



- **Not a 100% solution for all mapping requirements.**
- **Mission planning is critical.**
- **Technical support is difficult in the field.**
- **Landing technique does not accommodate challenging terrain without consuming expendable bodies.**
- **Small LCD screen.**
- **Limited radio range may mean multiple launch/recovery locations for a mission.**
- **Limited coverage per flight means multiple flights per mission.**
- **Flights cover 1km² – 5km² depending on resolution, height.**
- **However, realistic coverage is < 5km².**

Questions?



Thank you!