

Topic: N171-096

Transparent Sky

Real Time Computation of Precision 3D Models Using Low Size, Weight, and Power (SWAP) Architectures

Transparent Sky, employing embedded hardware onboard small unmanned aircraft (sUAS), performs near real-time reconstruction of 3-dimensional scene models, in minutes, from aerial imagery. With a goal of real-time, frame-by-frame 3D reconstruction of collected imagery. The system expands upon Wide Area Motion Imagery (WAMI) technology providing advanced 3-D reconstruction capabilities. Transparent Sky's capability provides tactical advantage to small units, enabling them to become proactive, providing capability to observing battlespace events from any angle or perspective, study patterns of life, and measure scene object range. The system has low size, weight, power, and cost (SWaP-C), and is designed for simple operation and maintenance. Transparent Sky's seeks strategic partnerships with Department of Defense and Commercial entities interested in exploiting content derived from sUAS, immersive real-time 3-D WAMI surveillance.

Technology Category Alignment:

Fixed Wing Vehicles (includes UAS)

Information Collection/Management

Sensors

Electro-Optical/Infrared (EO/IR)

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<https://www.transparentskey.net/>

SYSCOM: ONR

Contract: N68335-19-C-0188

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-19-C-0188

Department of the Navy SBIR/STTR Transition Program

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WHO

SYSCOM: ONR

Sponsoring Program: ONR Code 30 Expeditionary Maneuver Warfare

Transition Target: USMC small tactical unmanned aerial vehicles

TPOC:

Mr. Martin Kruger

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Other transition opportunities:

- Current Advocacy
- US Marine Corps Warfighting Laboratory
- Precision Integrated Programs LLC (Navy Intelligence, Surveillance, and Reconnaissance (ISR) service operator)

Our SBIR work is only a part of the solution

- Tactical ISR integration needed
- Existing systems need overall image quality improvements
- Practice and con-op development needed to uncover more integration lessons

Possible transition paths include

- Multi-Domain Operations
- SOCOM Program Executive Office Fixed Wing (PEO-FW)
- Navy and Marine Corps Small Tactical Unmanned Aircraft Systems (PMA-263)
- Direct (Retail) sales of solution



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WHAT

Operational Need and Improvement: Embedded in the sensor we quickly construct a 3-dimensional model from aerial imagery. We can survey, take measurements, provide situational awareness, and augment security, instantly.

Specifications Required: The Navy target was to generate accurate 3D models:

1. With bandwidth limitations (4Mbps-10Mbps range)
2. Generated without return to ground (i.e. in flight)
3. With small, low-power hardware

Technology Developed: Sensor system with its embedded software algorithms generates a real-time 3D model of aerial imagery. This system will produce a 3D model in real-time frame-by-frame as imagery is collected, making a live map-in-time display, like a battlefield TiVO of 3D imagery.

- | | |
|---|---|
| 1. Current: Tactical data link: < 10 Mbps | - Planned: As low as 1.5 Mbps |
| 2. Current: During flight: 3D in 3 Minutes | - Planned: 3D Frame-by-Frame |
| 3. Current: Accuracy: Pixel size < 10 cm | - Planned: Variable to pixel size |
| 4. Current: Status: TRL 5 – prototype operational | - Planned: TRL 9 – routinely deployed |
| 5. Current: SWaP: 1.5 kg & 15 W | - Planned: 3.5x higher resolution option at 2.5 kg & 25 W |

Warfighter Value: Measure what you cannot touch. Evaluate a position before you commit. See what is happening around you in 3D to gain better insight into the situation so you can respond more proactively.

WHEN

Contract Number: N68335-19-C-0188 **Ending on:** January 29, 2021

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Prototype '3D in 3 minutes'	Low	Algorithm routinely works	TRL 5	4th QTR FY19
Fielded '3D in 3 minutes'	Low	Fielded WAMICam units updated	TRL 7	1st QTR FY20
User interface fielded for sharing 3D models among operational team	Low	Sharable interface fielded	TRL 7	1st QTR FY20
Life frame-by-frame 3D modeling prototyped	Med	3D model updated after each frame	TRL 5	3rd QTR FY20
Live frame-by-frame 3D modeling	Med	Algorithm demonstrated robust	TRL 6	1st QTR FY21
Operational Test and Evaluation under ISR Services contract	Med	ISR services contractor deploys capability	TRL9	2nd QTR FY21

HOW

Projected Business Model: -

We produce unmanned aerial surveillance (UAS) payloads, capable of executing these algorithms now.

Business model is to build these units for operators, either commercial or government.

Retail sales to multiple customers, including military, civil, and commercial markets.

Company Objectives: -

Make Wide Area Motion Imagery (WAMI) practical and affordable for routine operations that can scale to metropolitan sized areas.

Leverage research and development (R&D) funding to enter commercial sales and scale.

Deliver a 3D persistent wide area surveillance "live map-in-time" as a canvas for overlaying other intelligence collection for improved situational awareness and a common operating picture to help organize operations.

Potential Commercial Applications: -

Near-Term: Urban planning, event monitoring (rallies, sports, riots), law enforcement, perimeter security.

Long-Term: Live metro viewing available to the general public. A "beyond GoogleEarth" capability.

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