UAS Ground-Based Detect and Avoid Capability

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UAS TEST RANGE
ROME, NEW YORK
Griffiss UAS Focus Area

IFR-equipped UAS operating between Class D airspace and Class A airspace, Extended Operations in Class E airspace
60 NM Service Volume for BLOS testing
15,000 square miles—mostly sparsely populated
GRIFFISS RANGE INSTRUMENTATION PHASE 1 COA
Air Traffic Picture 6/17/16 1222
60 NM SV FAA SBS ADS-B COVERAGE
Six Multilateration Remote Units (RUs) Located at Griffiss ATCT and Oneida County 911 Emergency Services Communications Sites
LSTAR 3D Radar System

- Lightweight Surveillance Target Acquisition Radar
- 3D coverage, 0-30° elevation
- 360° electronic scanning
- 50 km detection range for GA aircraft
- Able to track low, slow, non-cooperating targets
- Filters out birds and ground vehicles
- Standard international data output (ASTERIX)
UAS Test Range LSTAR Coverage

Fort Drum Class D airspace

Griffiss Class D airspace

Syracuse Class C airspace

LSTAR Radar Coverage
GRIFFISS LSTAR 3-D RADAR COVERAGE

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<th>Height (AGL)</th>
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Range Coverage at Selected Altitudes

- 500 ft. AGL
- 2,500 ft. AGL
- 10,000 ft. MSL

Multilateration remote unit (RU) locations, mainly at existing Oneida County 911 sites

ADS-B
Current NY Operational Environment
Multilateral Remote Units (RUs) Located at Griffiss ATCT and Oneida County 911 Emergency Services Communications Sites.

60 NM Service Volume

R-5203
The Path to BLOS Operation
Three Steps to Address The Problem

1. Precision surveillance for flight test
2. LVC-DE and data delivery for collaboration
3. GBDAA proof-of-concept development for BLOS operation in a defined corridor
The Griffiss “Take” on GBDAA

Griffiss, as a FAA-designated UAS test site, operates in the NAS as a public entity.

Our approach to ground-based air traffic surveillance is to be able to gather data independent of FAA air traffic surveillance and data distribution.
Why Do This in Three Steps?

• Developing precision surveillance capability for flight test activity, with data collection, retention, and analysis to make the safety case for UAS integration

• Developing a Live Virtual Constructive – Distributed Environment (LVC-DE) and data delivery capability for collaboration with other national test facilities

• Developing a capability for GBDAA RDT&E to build a safety case for BLOS operation in a defined corridor
The NY UAS Test Site Approach

• If the goal is to develop a proof-of-concept “GBDAA for BVLOS” capability

• A COTS approach to instrumenting a UAS test range is a necessary first step
Four Reasons This is Important

• A precision UAS test range facility in the NAS linked to an LVC-DE environment is a valuable research asset.

• Ground-based multi-sensor surveillance fusion is a problem which has been solved—we can build on that.

• UAS terminal and airport surface operations (including auto taxi) have not received enough attention in recent UAS standards development activities.

• A proof of concept GBDAA system is required to achieve an integrated ABDAA and GBDAA solution.
Five Sensor Categories

Primary Surveillance Radar – 2D echolocation
Primary Surveillance Radar – 3D echolocation
Secondary Surveillance Radar – 1030/1090 MHz
MLAT / WAM – 1030/1090 MHz synchronized TDOA
Mode S / ADS-B – aircraft-derived position & velocity
Four Elements of Multi-Sensor Fusion

- Networked Primary radar +
- Transponder response TDOA +
- Accurate reference time +
- Known ground receiver locations (MLAT/WAM)
So Where Does This Lead?

• The FAA has deployed a system architecture to prevent runway incursions at major airports
  o ASDE-X (Airport Surface Detection Equipment Model X), and a successor system,
  o ASSC (Airport Surface Surveillance Capability)
• Both systems are based on multi-sensor fusion
• Griffiss has adapted this architecture for both surface and terminal area surveillance coverage
COTS Approach to Proof-of-Concept GBDAA

Integrating additional sensors into the Griffiss system, in combination with an LVC-DE and data delivery capability, will enable a flexible approach to future UAS GBDAA development.
BACKUP SLIDES
LSTAR TRACKING ABILITY – NASC TIGERSHARK
Remote Units interrogate on 1030 MHz and receive transponder replies on 1090 MHz.

Target Processor measures TDOA and triangulates accurate aircraft position.
Multi-Sensor Fusion in the Terminal Area

The Griffiss approach to multi-sensor fusion in the terminal area is made by FAA deployment of

- ASDE-X (Airport Surface Detection Equipment Model X), and
- ASSC (Airport Surface Surveillance Capability)

at major airports to prevent runway incursions.