Project U-SAFE

Drones will be everywhere very soon. Central New York's plan will make it safe for everyone.

CENTRAL NEW YORK REGIONAL ECONOMIC DEVELOPMENT COUNCIL | UPSTATE REVITALIZATION INITIATIVE

Definitions

- **U-SAFE** : UAS Secure Autonomous Flight Environment
- **UTM**: UAS Traffic Management
- **NUSTAR**: National UAS Standardized Test and Rating

U-SAFE Award

- Dec 11, 2015
- Signature Initiative in Central New York's URI Submission
- $250 million program over 5 years to help solve the challenges of safely integrating UAS into the NAS

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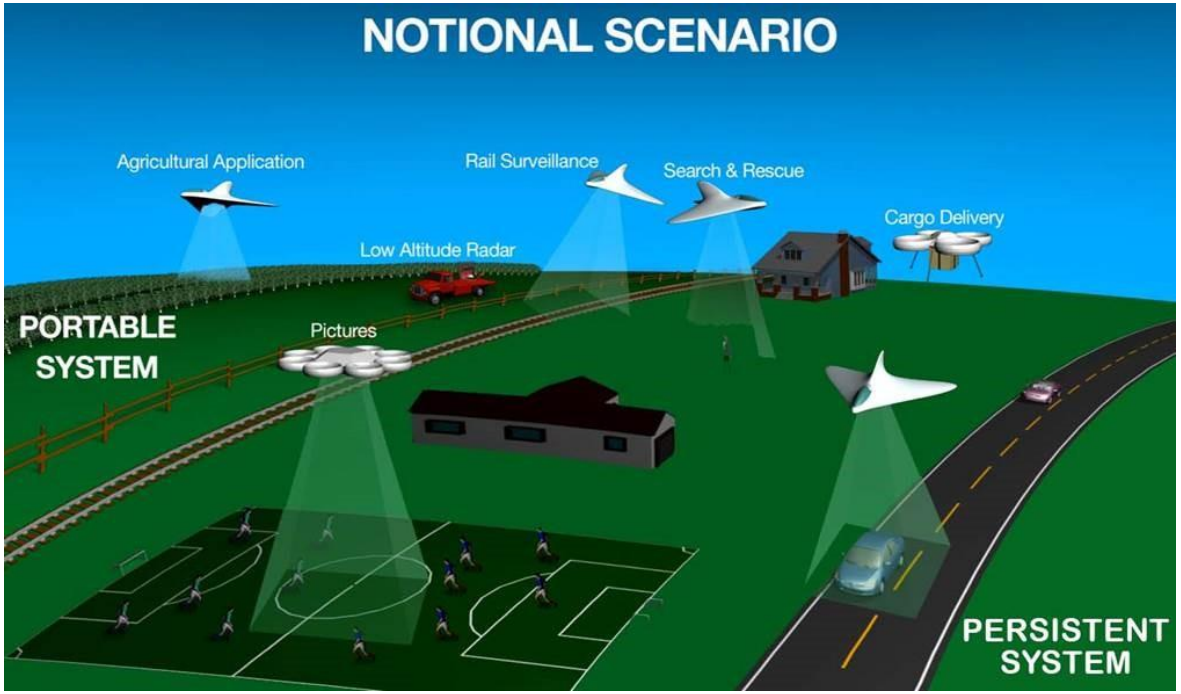

- 50 mile “Validated” UTM (UAS Traffic Management) corridor
- BVLOS Commercial UAS Operations (Low altitude 500 ft, small UAS <55lbs)
- Critical Infrastructure Protection Applications
- NUSTAR (National UAS Standardized Testing and Rating) facility

U-SAFE Phase 1 (today)

UTM

- Engineering Analysis and Siting for 50 mile corridor
- U-SAFE UTM Architecture
- Mobile UTM
- Initial Corridor Operational Sept 2017
- Critical Infrastructure Protection Capability

NUSTAR

- Interim NUSTAR Capabilities
- NUSTAR Advisory committee
- RFI released

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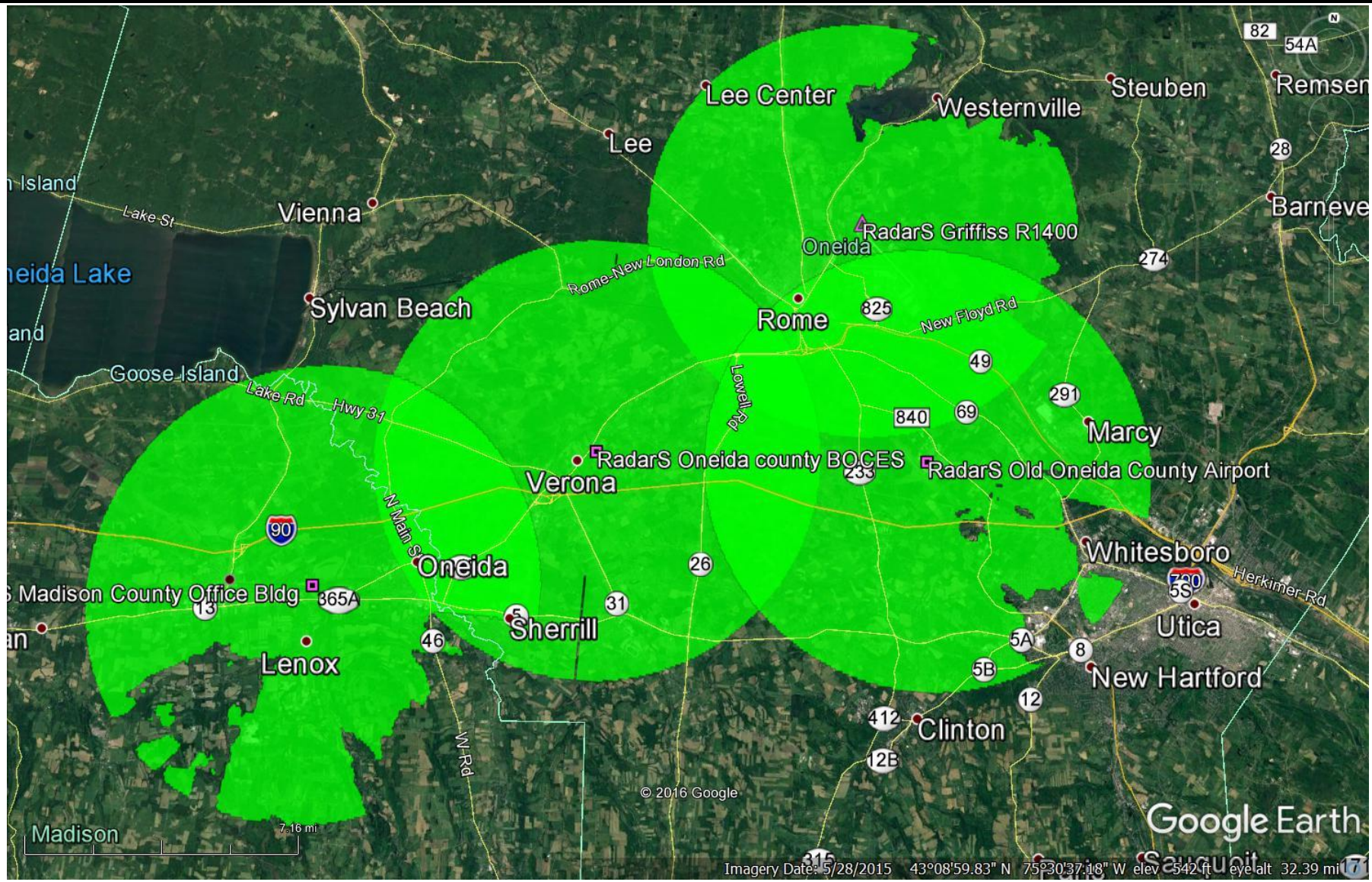
Phase 1 Low Altitude Radar Coverage



Mobile Skylight

- Mobile Drone Security and UAS Integration
- Sensors
  - R1400 radar
  - S1200 direction finding
  - EO/IR camera
  - ADS-B
  - Weather station
- Communications
  - VHF radio for FAA comms
  - Dual-band mesh network
    - 2.4 & 5.8GHz
    - FCC Part 15 compliant
  - Ka Band SATCOM
  - 4 SIM Cellular modem
  - Local TV Tuner
  - ICOM VHF Aircraft radio

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Mobile UTM - Command Center

External Features

- 35’ masts with interchangeable sensor configurations
- FAA compliant & scene lighting
- 8kw Generator & shore power
- Spitzlift for equipment
- Auto-leveling (7 degree offset)
- Safety roof rack
- 360-degree security camera
- 4-wheel drive diesel
- Retractable Awning

Internal Features

- 3 air situation displays
- 360-degree fixed view security cameras and displays with DVR
- Streaming HDTV
- LED red & white lighting
- Desktop

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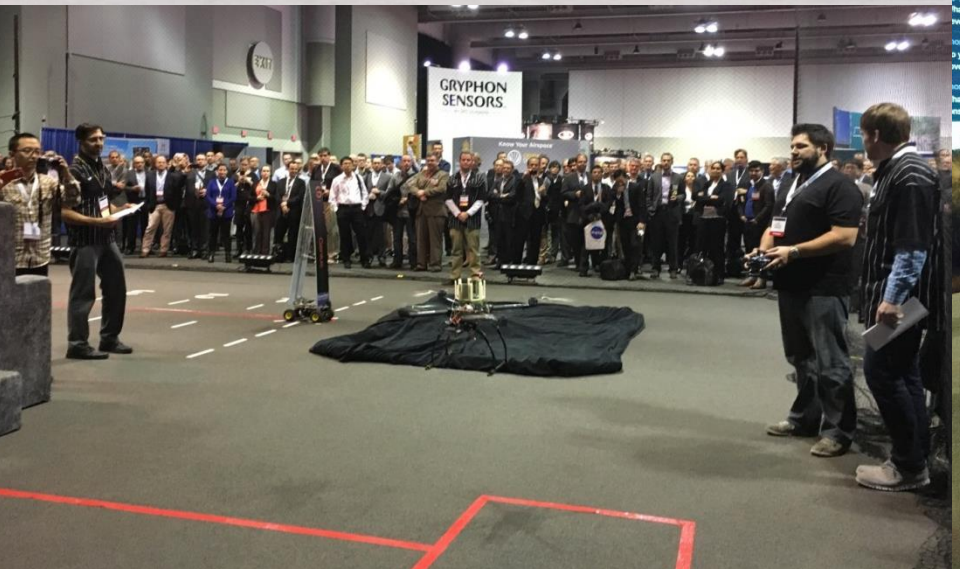
UTM 2016 Convention



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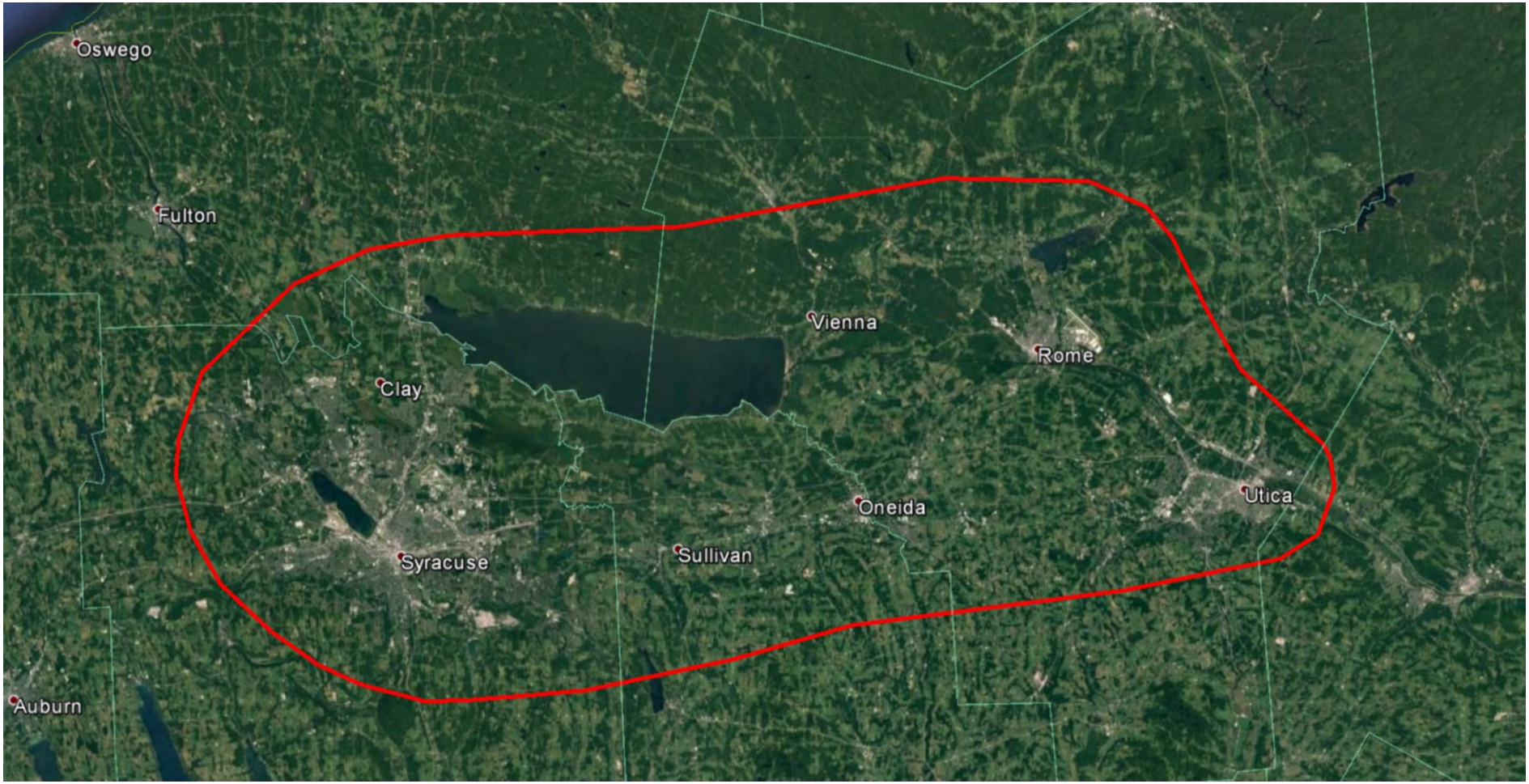
Phase 2



- Initial "BVLOS" operations begin at Griffiss Test Site in Phase 1 (Sept 2017)
- Fully instrumented 50 mile corridor between Syracuse and Griffiss for BVLOS operations (August 2018)
- 7 U-SAFE BVLOS UTM Use Cases Validated

NUSTAR

NUSTAR Market Demand

- Currently, standards are lacking for UAS airworthiness and certification
- Need for Cyber security performance benchmark testing of UAS
- <55 lbs. in weight – UTM commercial class
- BVLOS UTM flight operations
- FAA Micro UAS ARC
  - Operations over people

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NUSTAR GOALS

- Create standardized tests and scenarios that vehicles can be tested against
- Identify key performance parameters of all UAS and their standardized measurement strategy
- Develop standardized performance reporting methods to assist prospective buyers and insurance agencies

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NUSTAR GOALS (cont)

- Identify key performance metrics that could be used to assess the overall safety of the UAS and operations

- Compare the performance of individual UAS against the minimum requirement (e.g., detect and avoid detection time, cyber protection, stopping distance, etc.)

Example Performance Testing

- **Wind**
  - Performance/function under varying conditions
  - Performance with and without payloads (where applicable)
- **Environmental**
  - Thermal
  - Ice/Rain/Fog/Dust/Sand/etc
- **EMI/EMC**
  - Susceptibility to ambient EMI (unintentional and other)
  - Spectrum occupancy and compliance
- **Physical/structural**
  - Drop/crash testing
- **Propulsion**
  - Propulsion/control testing

- **Cybersecurity/C2 requirements**
  - Controller reliability
  - Software/system reliability testing
  - OTA update security
  - Penetration vulnerability assessment
- **Autonomy**
  - Navigation/guidance systems testing
  - GPS systems
  - UTM compliance
  - BVLOS performance
- **Failure Mode and Effects Analysis (FMEA)**
- **Battery Life**
- **Noise**

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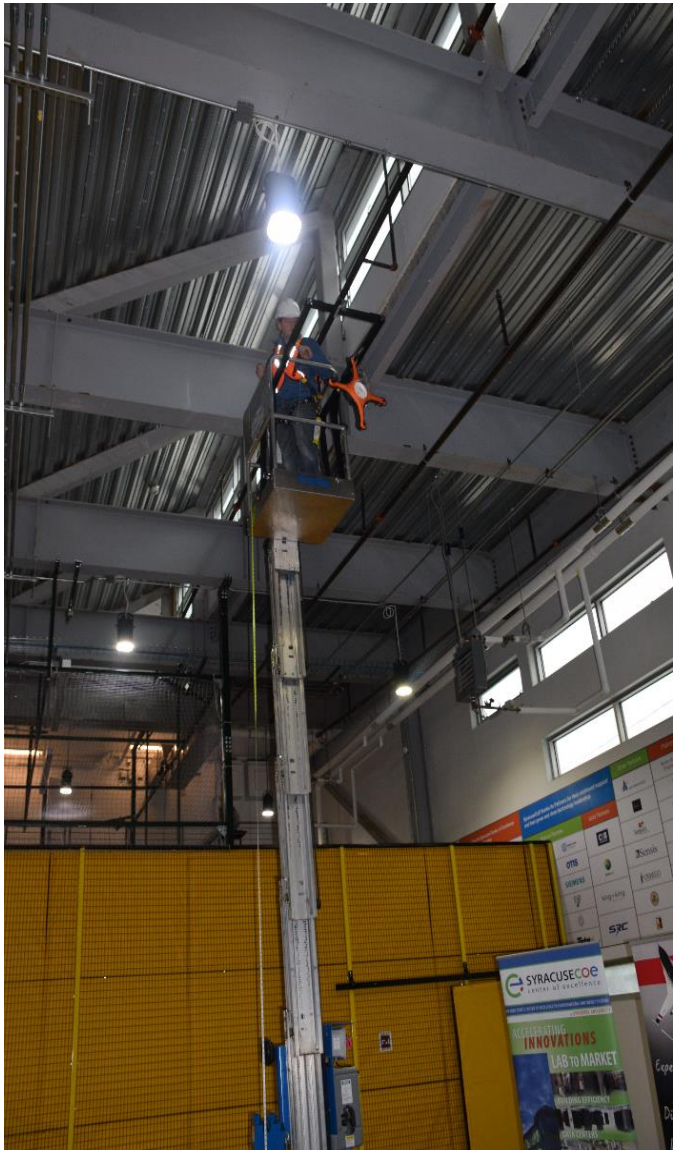
Interim NUSTAR Capability: Impact Test



Courtesy of
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Additional Capabilities: Forensics

- Learning from automobile and traditional aviation
- Forensics will be an important area
- Recreate incidences and accidents
  - Improving systems
  - Data and analysis for insurance, legal, and regulatory bodies
  - Policy decisions
- Create data-bank for anonymous incident reporting and analysis: learning

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NUSTAR Summary

- Test scenarios and variety of use cases
- Clear performance metrics and rating
- NUSTAR 1-5: 1- VLOS, 5-Autonomous to door step
- Considers subsystems as well as entire vehicle operation
    - Operational test conditions
    - Sub-system level performance: engine/propulsion, networking, battery, sensor systems, software systems, cyber-security, GPS denied operations, etc.
- Need to serve multiple stakeholders
  - Consumers, Manufactures, Insurance, Legal, Regulatory bodies
- Tentative Schedule:
  - Interim NUSTAR capability and Advisory committee: 2017
  - Standards and Testing development: 2017-2018
  - Construction: 2018 - 2019
  - Facility complete: August 2019

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NUSTAR Call for Action

- Funding is committed from the State for Project U-SAFE re: URI award
- National Advisory Committee working on development of this “National Asset”
- Public Private Partnership Opportunities

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