MIT Haystack Unmanned Aircraft System (UAS) Testing Facility

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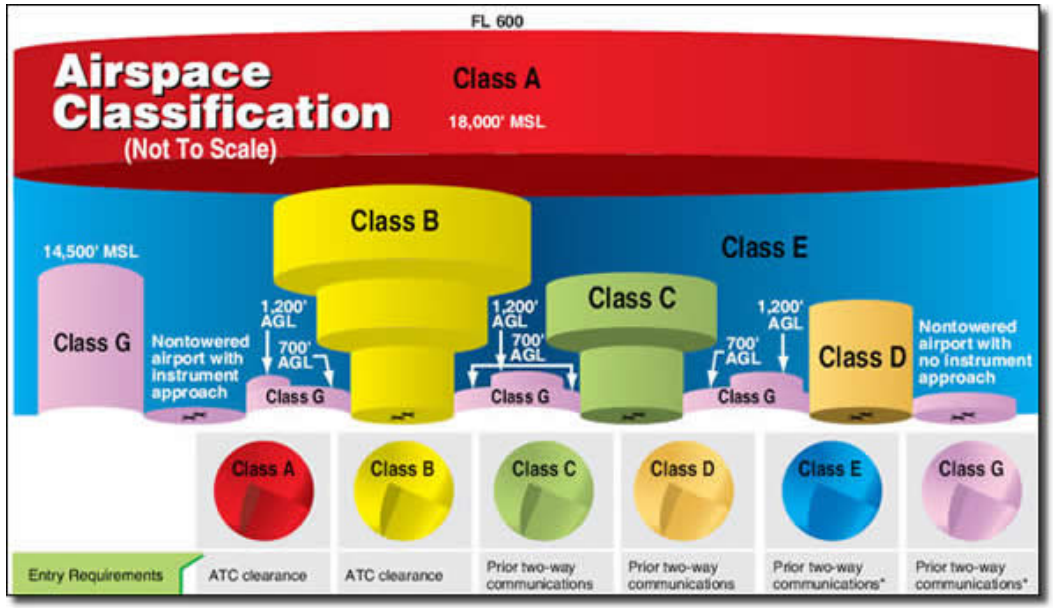
Definitions: UAV vs. UAS

- UAV: Unmanned Aircraft/Aerial Vehicle
- UAV: vehicle only
- UAS: Unmanned Aircraft/Aerial System
- UAS: system includes vehicle and ground control station and any other components

Science applications of UASes for NEROC

- Aerial inspection of large technical facilities (i.e., radome, antennas)
- Antenna array pattern testing for geospace radar
- Arctic electro-magnetic induction (EMI) ice thickness measurements
- GIS (Geographic Information System) mapping to generate ortho-mosaics and digital surface maps: broad application
- Plus many other applications for NEROC radio science and related fields

Federal Aviation Administration and National Airspace



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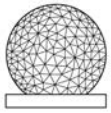
Expertise and testing facility are necessary

- FAA 333 exemptions (old regulations)
  - Manned aircraft pilot's license was required
- Part 107: August 29, 2016 (new regulations)
  - Remote pilot license required
  - 400 feet maximum height
  - Less than 55 pounds
  - Visual line of sight
  - Knowledge of regulations, weather, other expertise necessary
- Safety
  - Best practices for safety management systems (40 hour course)
  - Li-ion batteries need special handling
  - Vehicle handling practices



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Boston area airspace

- A lot going on!
- Airspace regulations around airports and heavily populated areas

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Haystack: current capabilities

- Class G airspace in proximity to research institutions
- Netted enclosure for unlicensed operators, unregistered vehicles, and untested platforms
- 1,300 acres, including existing 5-acre test field
- Expertise and trained personnel

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Autonomous mission testing

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Haystack: forthcoming capabilities

- Expanded facilities
  - Enlarged netted enclosure
  - Wireless access and power in the field
- Use of fabrication equipment for rapid prototyping

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GIS mapping software demonstration

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Summary

- Unmanned aerial systems (UAS) will be everywhere:
  - More sophisticated
  - More autonomous
  - Rapidly becoming more useful and research-relevant
- Haystack has UAS expertise and technology for the NEROC community
- Examples: collecting geophysical data in hard-to-reach areas
  - Australia and South Africa: surveying areas for antenna deployment (i.e., MWA)
  - Amazon rain forest: collecting ionospheric measurements in equatorial regions
  - Antarctica and Arctic: monitoring the break-up of icebergs
- Science applications for this technology are expanding