Navigating the Policy Compliance Roadmap for Small Satellites

Barbara Braun, Aerospace
Capt. David Butzin, SMC/ADS
Ken Reese, SMC/ADS
Sam Sims, Aerospace
David Voss, AFRL/RV
Launches today rarely consist of one satellite on one launch vehicle owned by the same agency.

Emerging trends in 21st century space have muddied the policy picture:
- Increasing use of rideshare
- Proliferation of small satellites,
- Large numbers of new non-traditional entrants (universities, private entities, etc.)
- Hosted payloads

Applicable policy/approval authorities are not always clear-cut.

Policy is lagging technology.
The DoD Space Test Program (STP)

• “…provide spacecraft acquisition, integration, launch, and on-orbit operations for the maximum number of DoD experiments…”

• “…the “front door” for all DoD auxiliary payloads (APLs), and for all non-DoD APLs seeking launch opportunities on DoD missions.”

• “single manager for all DoD payloads on … the ISS [and] manned and unmanned NASA launch vehicles…”

Air Force Research Laboratory Small Satellite Portfolio

• Program objectives include determining how CubeSats can meet Air Force objectives and promoting workforce development

• Objectives will be met through research performed at AFRL and partnerships between AFRL and other government labs, industry and academia
STP builds rideshares with multiple partners, and must guide partners of different agencies through the launch approval process.

STP and AFRL developed a “policy roadmap” in an effort to untangle policy requirements for diverse mission owners.

The effort has uncovered policy holes and areas requiring further clarification.
Who is Responsible?

- Generally, DoD owned or operated components / satellites fall under DoD regulations
- However, gray areas exist
  - Hosted payloads
  - Funding / support recipients (i.e., University NanoSat Program)
    - *Interim policy letter: should not be considered DoD-owned*
  - DoD missions that are not NSS missions (per NIST 800-59)

**Flowchart:**
- **DoD Instrument or Component**
  - Used on DoD Spacecraft
    - Yes
      - Owned: DoD
        - COMSEC: DoD
        - Liability: DoD
    - No
      - Spacecraft DoD Operated
        - Yes
          - Bus Owner: Non-DoD Component Owner: DoD
            - COMSEC: DoD
            - Liability: DoD
        - No
          - Component Ownership Transfer
            - Yes
              - Satellite Control Authority
            - No
  - To NASA and Private Flowchart
Who is Responsible?

- NASA satellites are similar to DoD satellites, but also include NASA grant recipients and commercial companies operating satellites under NASA contracts.
- Private satellites are essentially any satellites that don’t fall under DoD or NASA regulations.

To / From DoD Flowchart:
- **Yes**
  - NASA Component
    - Used on DoD Spacecraft
      - Spacecraft DoD Operated
        - **Yes**
          - Satellite Control Authority
        - **No**
          - Private Company
    - **No**
      - Cases not yet diagrammed
- **No**
  - Private Component
    - Used on DoD Spacecraft
      - Spacecraft DoD Operated
        - **Yes**
          - **NASA Contract**
        - **No**
          - **NASA Grant Recipient**
      - **No**
        - NASA Information Security Policy Applies
          - **Yes**
            - **NASA Grant Recipient**
          - **No**
            - **Cases not yet diagrammed**

**Owned:**
- NASA
  - COMSEC: NASA
  - Liability: NASA
- Private
  - COMSEC: Private
  - Liability: Private

**DoD:** Department of Defense
**NSS:** National Security Space
**COMSEC:** Communications Security
**NASA:** Nationals Aeronautics and Space Administration

Cases not yet diagrammed
Who is Responsible?

Launch Safety through Spacecraft Separation: Launch Vehicle Owner

Launch Certification / Licensing: Based on Type of Launch and Launch Vehicle Owner

Orbital Safety of Launch Vehicle Components: Launch Vehicle Owner

Reentry / Disposal Safety of Launch Vehicle Components: Launch Vehicle Owner

Orbital Safety of Space Vehicles: Space Vehicle Owners

Reentry / Disposal Safety of Space Vehicle: Space Vehicle Owner

Range Safety: Launching Range

• Exceptions may exist
Encryption and IA requirements for DoD non-NSS missions is unclear

- NIST 800-59 has a checklist for distinguishing NSS from non-NSS
- National policy (CNSSP-12) does not require encryption for non-NSS satellites
- DoDI 8581.01 more stringent; requires encryption on all DoD satellites
DoD Satellite Policy (cont.)

- No publicly-available proximity operations guidance
  - Challenging for non-DoD, non-classified missions (e.g., UNP’s Prox-1)
  - Debate continues

- DoD must go through NTIA for frequency allocation
  - Not FCC
  - Government technically cannot use amateur bands

- Policy gap exists for remote sensing approval (imaging) for DoD and NASA satellites

DoD: Department of Defense
DoDI: Department of Defense Instruction
DoDD: Department of Defense Directive
UNP: University Nanosat Program
NTIA: National Telecommunication and Information Agency
FCC: Federal Communications Commission
SERB: Space Experiments Review Board
NASA: Nationals Aeronautics and Space Administration
NASA Satellite Policy

- Possible policy gaps in imaging, proximity operations, protection of translational propulsion, etc.
- Frequency approval through NTIA for NASA missions, FCC for NASA grant missions

DoD: Department of Defense
NTIA: National Telecommunication and Information Agency
FCC: Federal Communications Commission
COMSEC: Communications Security
NPR: NASA Procedural Requirements
NIST: National Institute of Standards and Technology
NSA: National Security Agency
FIPS: Federal Information Processing Standard
STD: Standard
ODAR: Orbital Debris Assessment Report
EOLP: End of Life Plan
Private Satellite Policy

- No current requirement to encrypt uplinks, regardless of satellite capability for propulsion, proximity ops, etc.
  - Leads to concerns about “hostile takeover” of capable satellites
Private Satellite Policy (cont.)

- Imaging approval is through NOAA
  - Streamlining is possible
- Frequency requests through the FCC
  - Also provides debris mitigation approval

FCC: Federal Communications Commission
NASA: Nationals Aeronautics and Space Administration
NSA: National Security Agency
ODAR: Orbital Debris Assessment Report
EOLP: End of Life Plan
NOAA: National Oceanic and Atmospheric Administration
CFR: Code of Federal Regulations
GSD: Ground Sample Distance
SERB: Space Experiments Review Process
STP: Space Test Program
ODMSP and Safety Compliance

- DoD Satellites: Implemented through DoDI 3100.12
- NASA Satellites: Implemented through NASA-STD-8719.14A
- Private Satellites: Implemented through FCC frequency licensing package
  - Generally uses the NASA Orbital Debris Assessment Report (ODAR) form
- Launch vehicles follow the same processes based on who owns the launch mission (FAA licenses commercial launches)
- Demarcation between launch and orbital safety is satellite separation from the launch vehicle
• Policy gaps exist, and not just for small satellites and CubeSats
• The size of the satellite matters less than its capability, reliability, and intended use
• Emerging technologies and rideshares require new thinking on certification authorities and approval chains
  – Individual satellites are from multiple agencies and have many different certification requirements and approval authorities
  – Who is the policy gatekeeper when multiple vehicles from different agencies ride on the same launch?

This is not just a “smallsat” policy roadmap, but an “allsat” policy roadmap