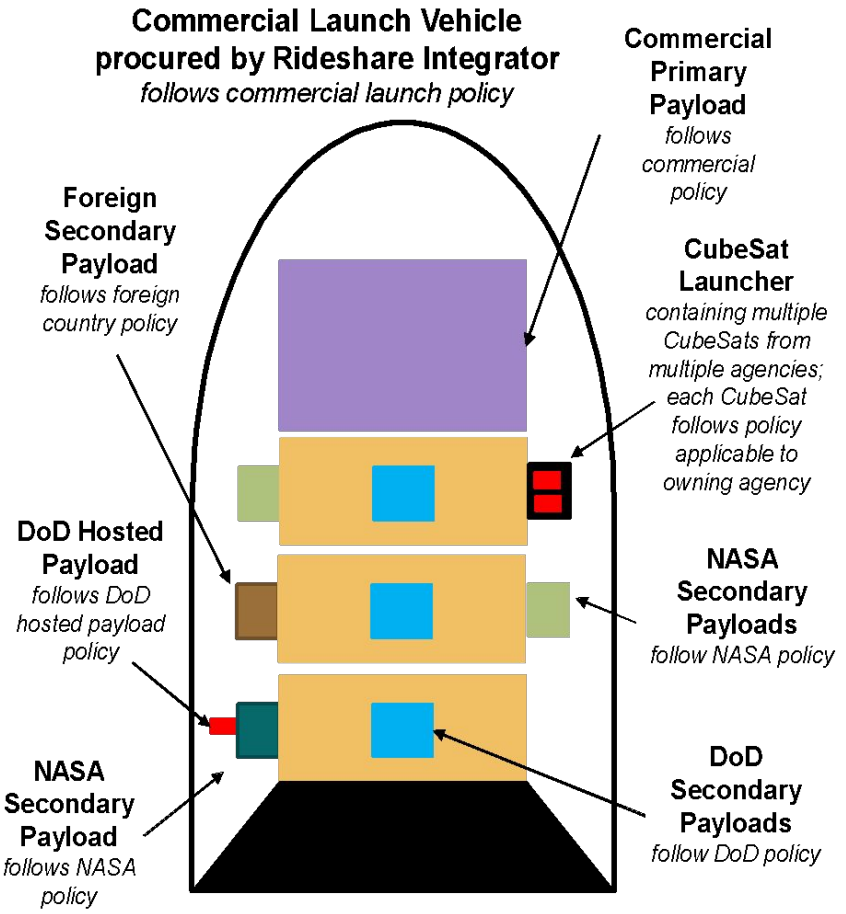
Navigating the Policy Compliance Roadmap for Small Satellites

Barbara Braun and Sam Sims
The Aerospace Corporation
January 12, 2022

FISO telecon

Background

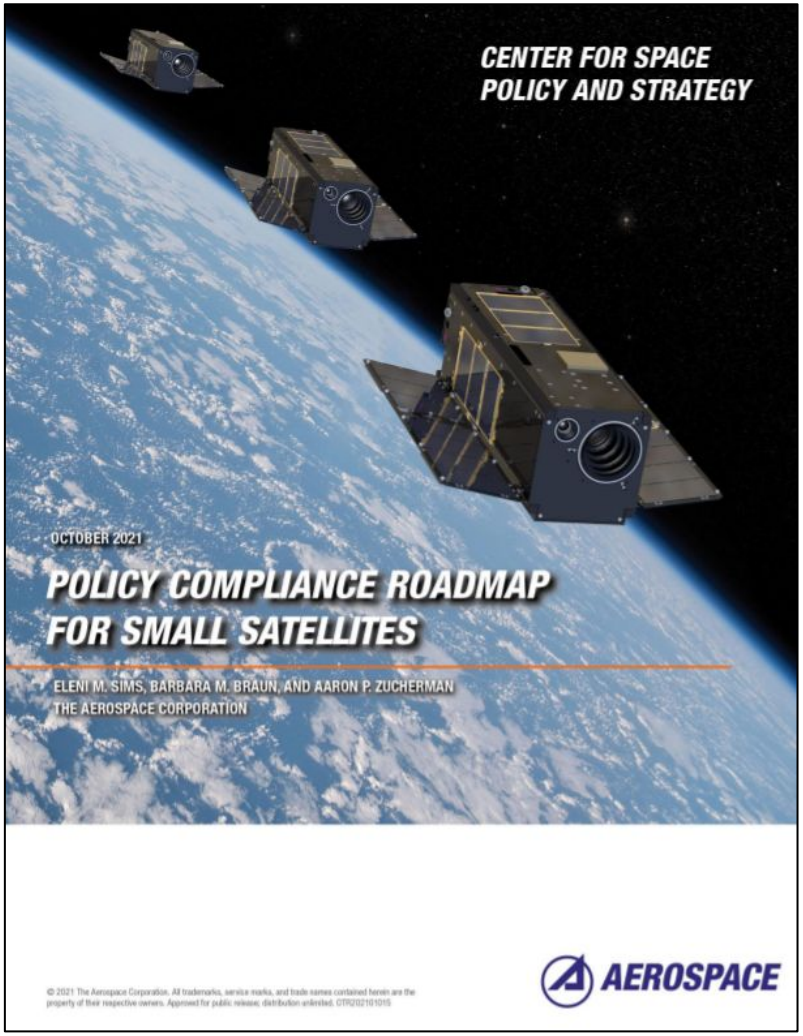
- Launches today rarely consist of one satellite on one launch vehicle all owned by the same agency
- Emerging trends in 21st century space have muddied the policy picture
  - *Increasing use of rideshare*
  - *Proliferation of small satellites,*
  - *Large numbers of new non-traditional entrants (universities, private entities, etc.)*
  - *Hosted payloads*
- Applicable policy / approval authorities are not always clear-cut
- Policy is lagging technology



DoD: Department of Defense
NASA: National Aeronautics and Space Administration

A Policy Roadmap

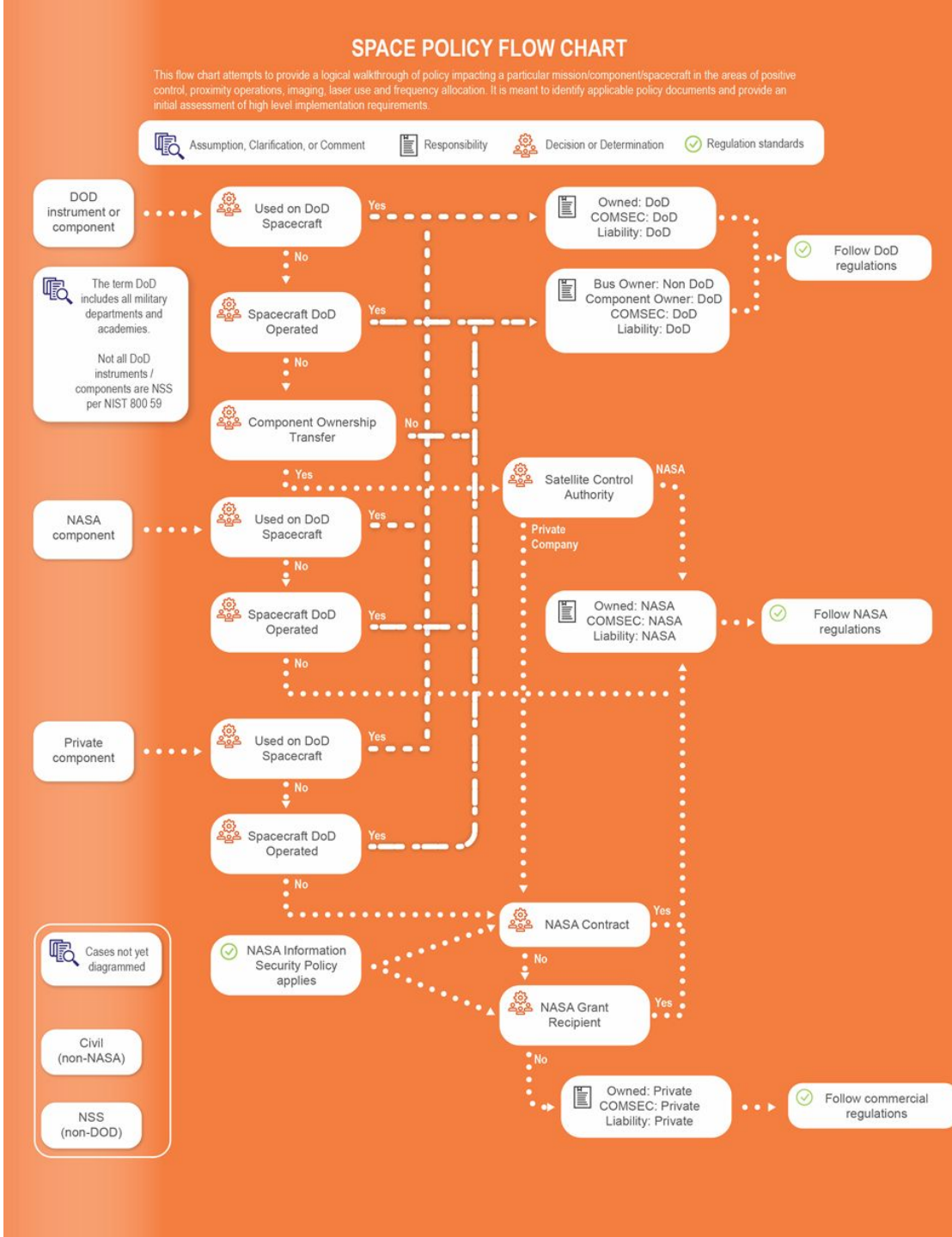
- Aerospace supports multiple agencies who launch rideshare missions
- Teams must guide partners of different agencies through the launch approval process.
- Aerospace has published a “policy roadmap” in an effort to untangle policy requirements for diverse mission owners
- The effort has uncovered policy holes and areas requiring further clarification



https://csps.aerospace.org/papers/policy-compliance-roadmap-small-satellites

Who is Responsible?

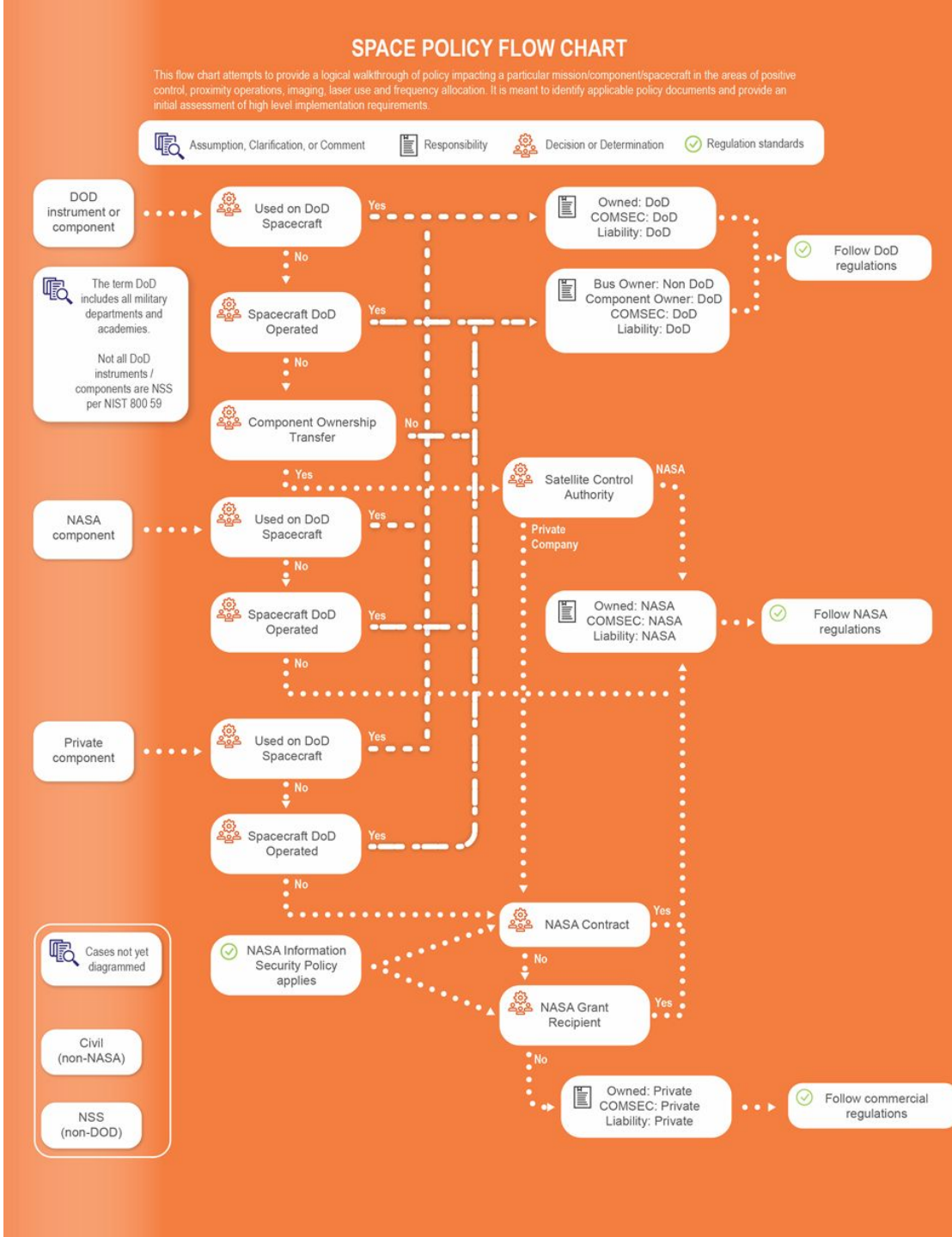
- Generally, DoD owned or operated components / satellites fall under DoD regulations
- However, gray areas exist
  - *Hosted payloads*
  - *Funding / support recipients (i.e., University NanoSat Program)*
  - *Interim policy letter: should not be considered DoD-owned*
  - *DoD missions that are not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



DoD: Department of Defense
NSS: National Security Space
NIST: National Institute of Standards and Technology
COMSEC: Communications Security
NASA: Nationals Aeronautics and Space Administration

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



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

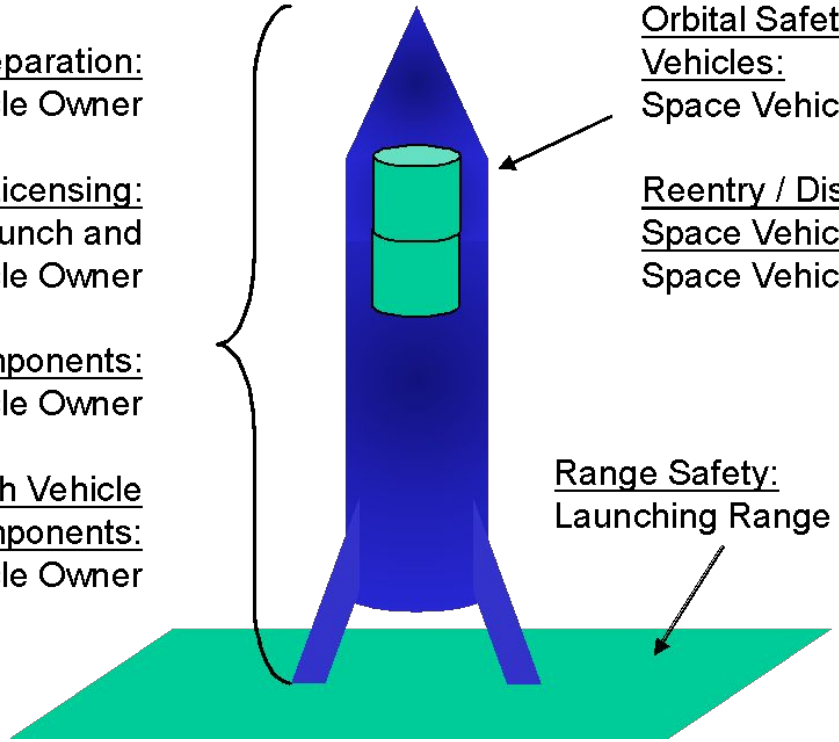
Who is Responsible?

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

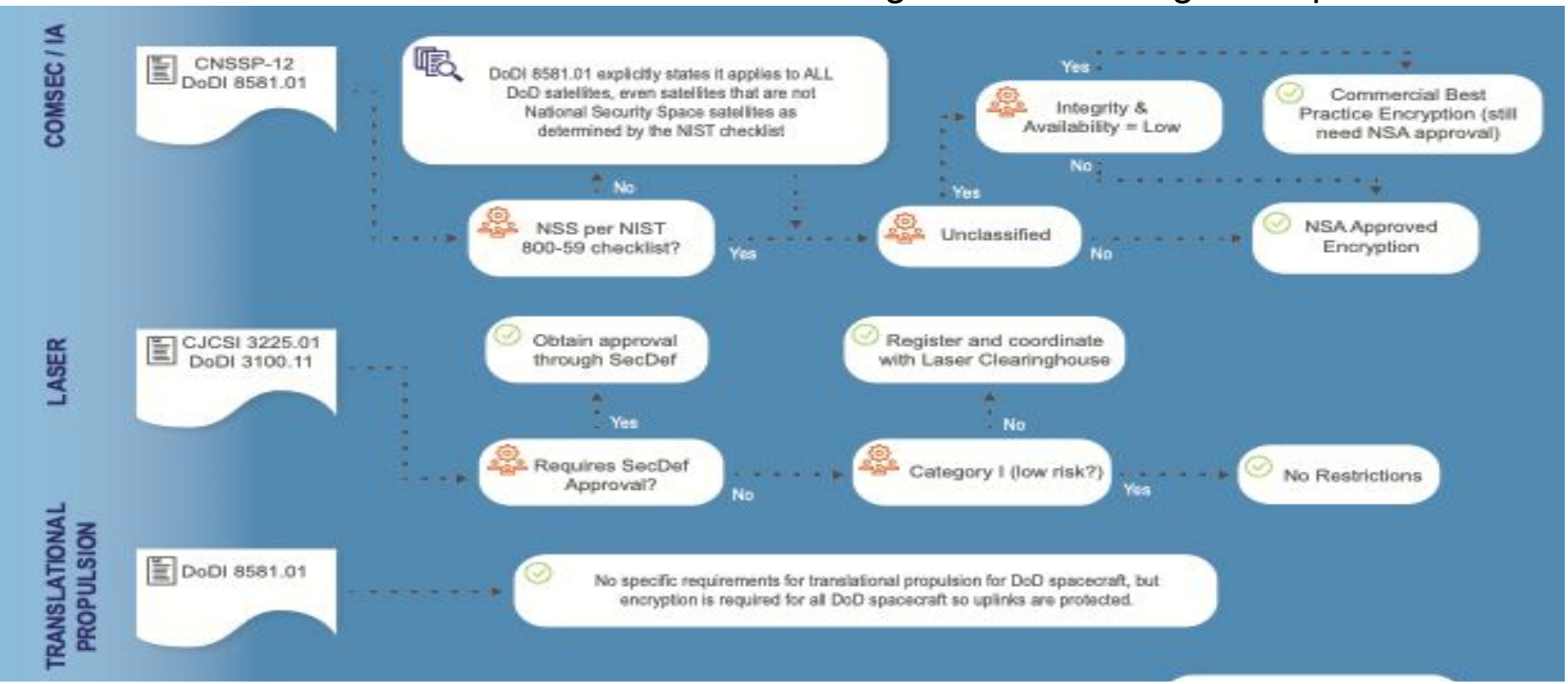
Reentry / Disposal Safety of Launch Vehicle Components:
Launch Vehicle Owner



Exceptions may exist

DoD Satellite Policy

- Encryption and IA requirements for DoD non-NSS missions is unclear
  - *National policy (CNSSP-12) does not require encryption for non-NSS satellites*
  - *DoDI 8581.01 more stringent; requires encryption on all DoD satellites*
- Laser communications must be cleared through Laser Clearinghouse process



DoD: Department of Defense
DoDI: Department of Defense Instruction
NSS: National Security Space
NIST: National Institute of Standards and Technology

COMSEC: Communications Security
IA: Information Assurance
CNSSP: Committee on National Security Systems
NSA: National Security Agency

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*

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

DoD Satellite Policy (cont.)

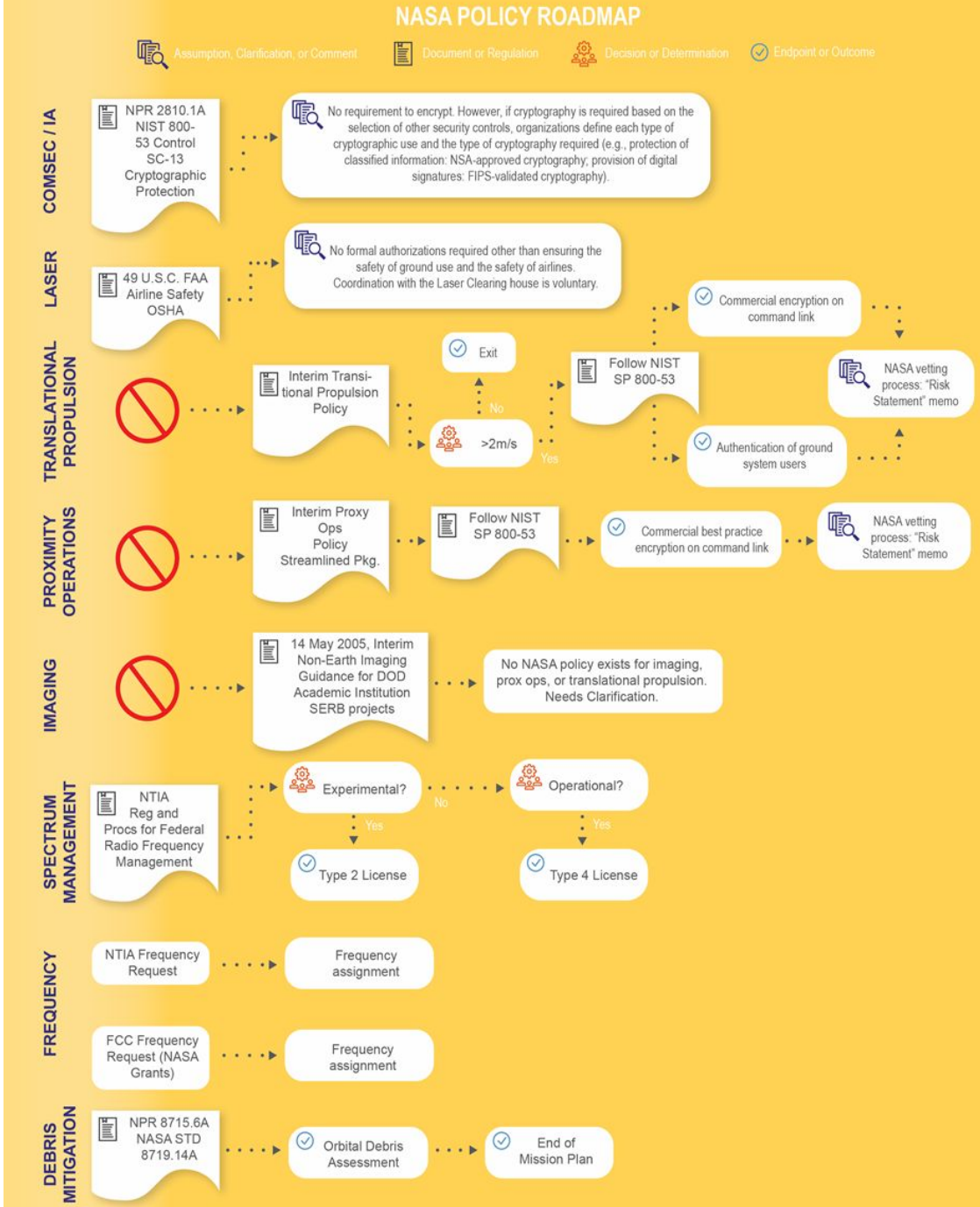
- Debris Mitigation is generally through agency review
  - *Exceptions to national policy must be approved by the Office of the Secretary of Defense*
- DoD and NASA satellites don't go through the NOAA process for sensing (imaging) approval

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

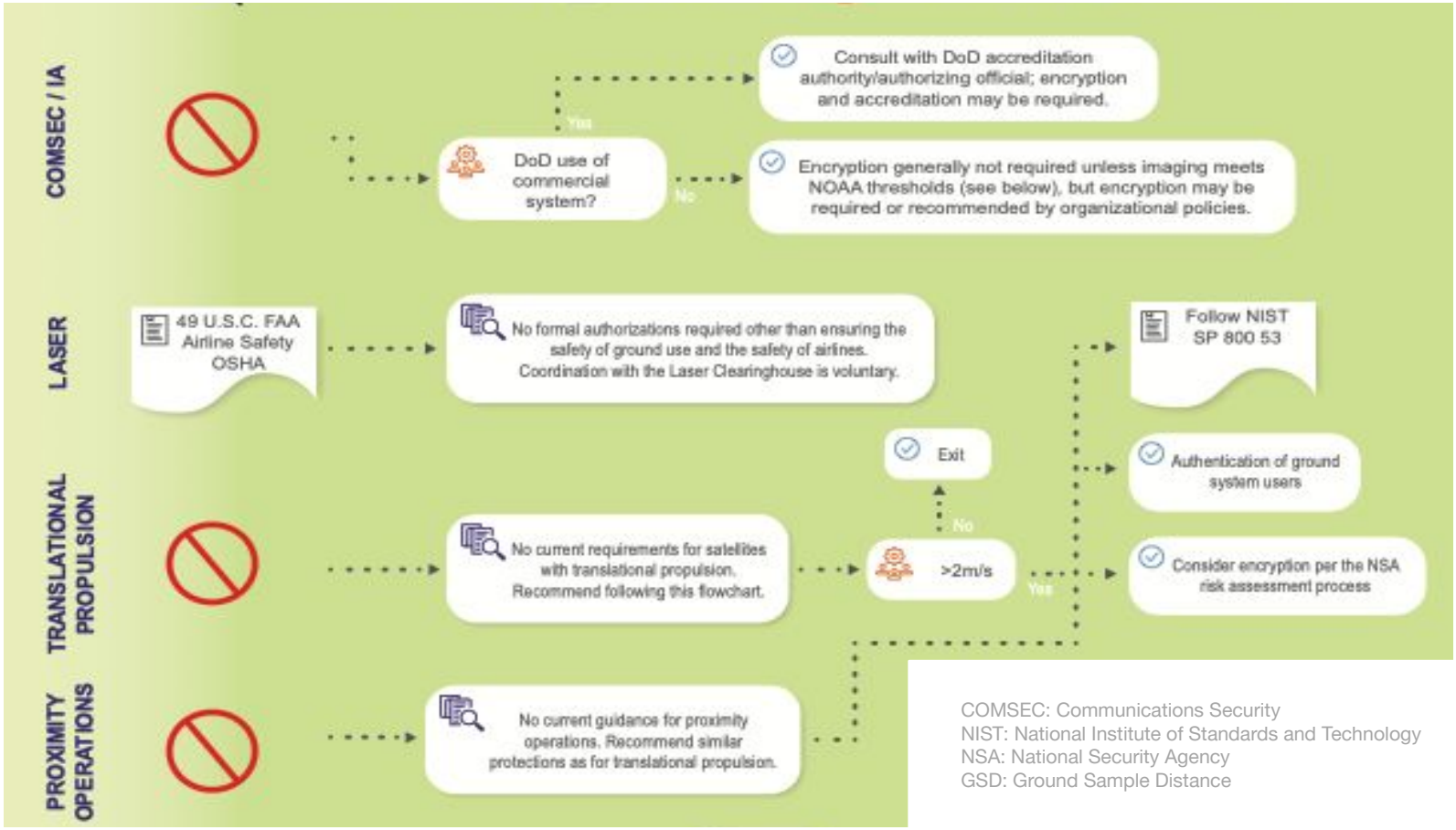
- No specific policy on imaging, proximity operations, protection of translational propulsion
- Frequency approval through NTIA for NASA missions, FCC for NASA grant missions



DoD: Department of Defense
NTIA: National Telecommunication and Information Agency
FCC: Federal Communications Commission
NASA: Nationals Aeronautics and Space Administration
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

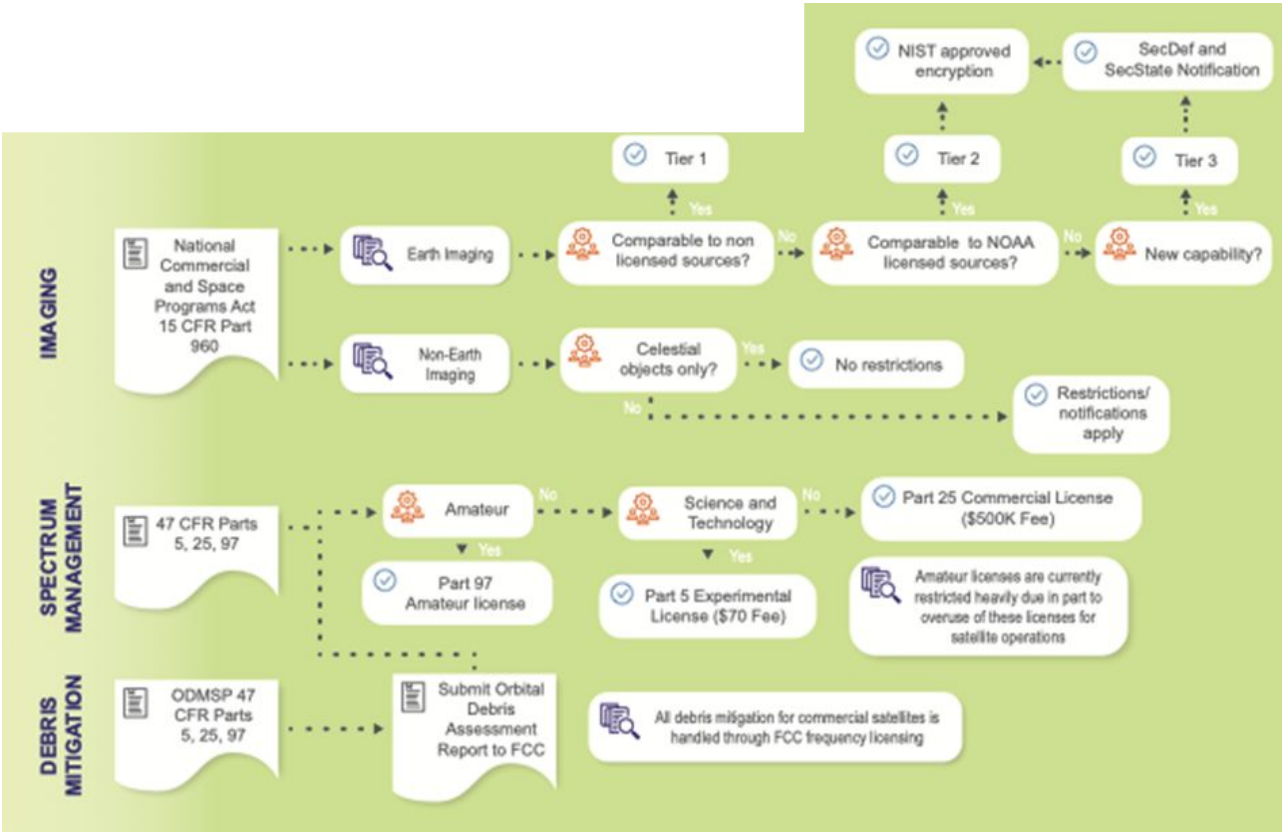
- No current requirement to encrypt uplinks, regardless of satellite capability for propulsion, proximity ops, etc.
- Laser communications governed mainly through FAA and OSHA
  - *Laser Clearinghouse approval optional*



COMSEC: Communications Security
NIST: National Institute of Standards and Technology
NSA: National Security Agency
GSD: Ground Sample Distance

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

DoD: Department of Defense
DoDI: Department of Defense Instruction
FAA: Federal Aviation Administration
ODMSP: Orbital Debris Mitigation Standard Practices
FCC: Federal Communications Commission
NASA: Nationals Aeronautics and Space Administration
STD: Standard
ODAR: Orbital Debris Assessment Report

Summary

- Navigating policy compliance processes can be confusing
- 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