MEMO: The Returnable Satellite — Why Reusable Spacecraft Belong in Space Resilience Policy

Policy brief on satellite reusability, space resilience, and supply-chain security

September 14, 2026

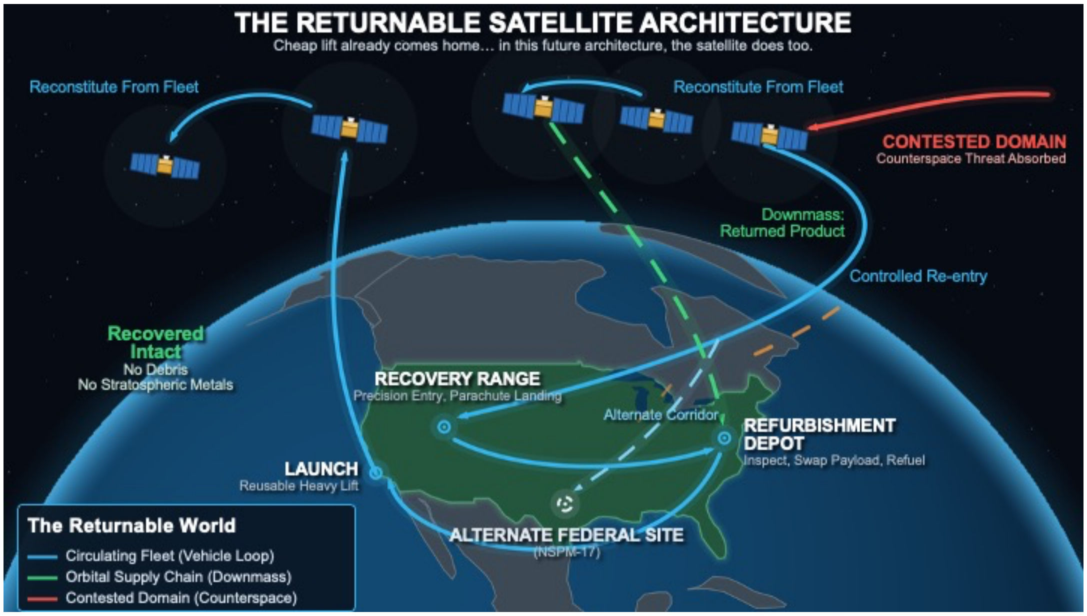

Figure 1. The returnable satellite architecture: a closed loop of launch, on-orbit operation, controlled re-entry, and ground-based recovery and refurbishment.

Bottom Line

Reusable rockets have drastically slashed the cost to reach orbit, but despite this capability nearly every U.S. satellite is still built to be used once and then abandoned. The U.S. should now focus on developing recoverable and reusable satellites to enhance American space resilience doctrine, reduce orbital debris, and increase defense-supply chain security. Particularly as our adversaries, like China, are already moving in that direction. *Six recommendations for Congress and the Department of War (DoW) are outlined below*, several of which align with the White House's new National Space Transportation Policy (NSPM-17, signed August 20, 2026).

Background

Satellites remain single-use: once lost, degraded, or obsolete, they cannot be brought home, repaired, or upgraded—only replaced with an entirely new build. That mismatch is increasingly costly. Threats to satellites are growing: anti-satellite weapons, jamming, cyberattacks); orbital debris is accumulating faster than it decays in certain high-use altitude bands; and the industrial base that builds satellite components (chips, radiation-hardened electronics, rare-earth materials) is thin and remains badly strained following COVID-19. China has moved ahead in this specific area, flying a reusable spaceplane (Shenlong) and recovering a satellite (Shijian-19) that officials say is rated for more than ten flights.

Key Findings

- Current DoD/Space Force resilience doctrine names six attributes (disaggregation, distribution, diversification, proliferation, protection, deception)—but not reuse! The existing doctrine assumes satellites are disposable, unnecessarily limiting America's potential space resilience.
- A recoverable satellite creates a "forensic feedback loop": a degraded or hacked satellite can be brought home and physically examined and upgraded with countermeasures (rather than just inferring from telemetry). This is something adversaries with reusable platforms can already do.
- Traditional (disposable) satellites must reserve up to a fifth of their propellant just for end-of-life deorbiting; a returnable satellite refuels on the ground, freeing that propellant for more aggressive maneuvering.
- A circulating fleet of reused satellites draws less on the strained supply chain per mission than a constant stream of new builds, converting one-off procurement spikes into steadier, more predictable industrial demand.
- Because a reusable satellite is refurbished rather than rebuilt after its first flight, its lifetime cost per mission can fall below a disposable satellite's (providing refurbishment costs stay well below the cost of a new build; it is the aim of current development efforts to demonstrate this).

- Reuse pays off most where something physical must come home—expensive or scarce hardware, products, or the platform itself. Missions that only deliver data or energy (e.g., communications, power beaming) don't require bringing physical material back to Earth ("downmass"), so recovery there only buys the option to upgrade the payload.
- Reusable satellites and on-orbit servicing are complementary: servicing extends the life of the highest-value assets already in orbit, while recoverable design extends the same efficiency to the servicing vehicles and to lower-cost satellites across the fleet.

Commercial Opportunity: The Downmass Bottleneck

The market case reinforces the resilience case. The global space economy is projected to grow from roughly $630 billion in 2023 to $1.8 trillion by 2035, with more than 11,000 active satellites already on orbit. *Downmass is currently the narrowest link in that supply chain* and is already a monetizable commercial market: microgravity *pharmaceutical manufacturing and materials research depend on reliably and affordably returning physical product from orbit*, and *today's downmass capacity is limited*. A circular orbital economy needs a short list of things brought home reliably: manufactured product, failed or degraded hardware for analysis, superseded payloads for refurbishment, high-value long-lead components, and—the piece still missing—the orbital platform itself.

Recoverable and reusable systems are already emerging across multiple countries and mission classes:

Program / Vehicle	Organization (Country)	Status
Delphi	Lux Aeterna (U.S.)	Demo launch planned 2027
W-series	Varda Space (U.S.)	Multiple recoveries flown
Starfall	SpaceX (U.S.)	First demo flight, June 2026
X-37B	U.S. Space Force / Boeing	Eight missions flown
Dream Chaser	Sierra Space (U.S.)	Pre-flight testing
Shenlong	China (CNSA)	Multiple multi-month missions
Shijian-19	China (CAST/CNSA)	Recovered Oct. 2024; rated for 10+ reuses
Pushpak (RLV-TD)	India (ISRO)	Three landing tests, 2023–2024
Nyx	The Exploration Company (EU)	Partial re-entry demonstrated 2025

Policy Recommendations

Six recommendations follow, several framed as implementing NSPM-17 rather than requiring new authority:

- **Formally name "reuse" as a space resilience attribute in DoW/Space Force doctrine**; have HASC/SASC require a DoW report (e.g., via the NDAA) on where reuse fits current force-design guidance and acquisition analyses.
- **Fund space mobility, logistics, and reconstitution as a core (not discretionary) Space Force mission area**.
- Use existing mechanisms (APFIT, Prototype OTA, SBIR/STRATFI/TACFI) to **help return-enabling technology—thermal protection, precision re-entry guidance—cross from demonstration into fielded capability**.
- **Direct the FAA to replace one-off, per-flight re-entry licensing with faster, repeatable type-approvals** for vehicles with flight heritage, and give designated recovery ranges standing authorization.
- **Name "recovery and reuse" within the Contested Logistics Critical Technology Area** and target industrial-base investment at documented single points of failure (compute, propulsion, radiation-hardened electronics).
- **Have U.S. and international debris/sustainability standards** (FCC rules, NASA-STD-8719.14, ISO 24113, UN COPUOS guidelines) **explicitly rank controlled recovery above uncontrolled disposal**.

Who's Affected

Primary stakeholders include: America's commercial space industry, who must remain competitive internationally, including launch providers and an emerging "return" sector of companies building recoverable or reusable spacecraft; the Department of War, Space Force and NASA—each of which benefit from access to downmass and greater resilience; the FAA, which has regulatory and licensing authority over re-entry and debris; international standards bodies (UN COPUOS, ISO, IADC) and downstream commercial sectors—in-space manufacturing, space data centers, space-based solar power—are also implicated.

Source: Based on Brian Taylor and Michael Nayak, "The Returnable Satellite: Atmospheric Re-entry and Reuse as Foundational Infrastructure for Space Resilience and Supply-Chain Endurance" (forthcoming).