

Establishing In-Space Assembly Technical Collaboration Environments through Functional Capability Analyses

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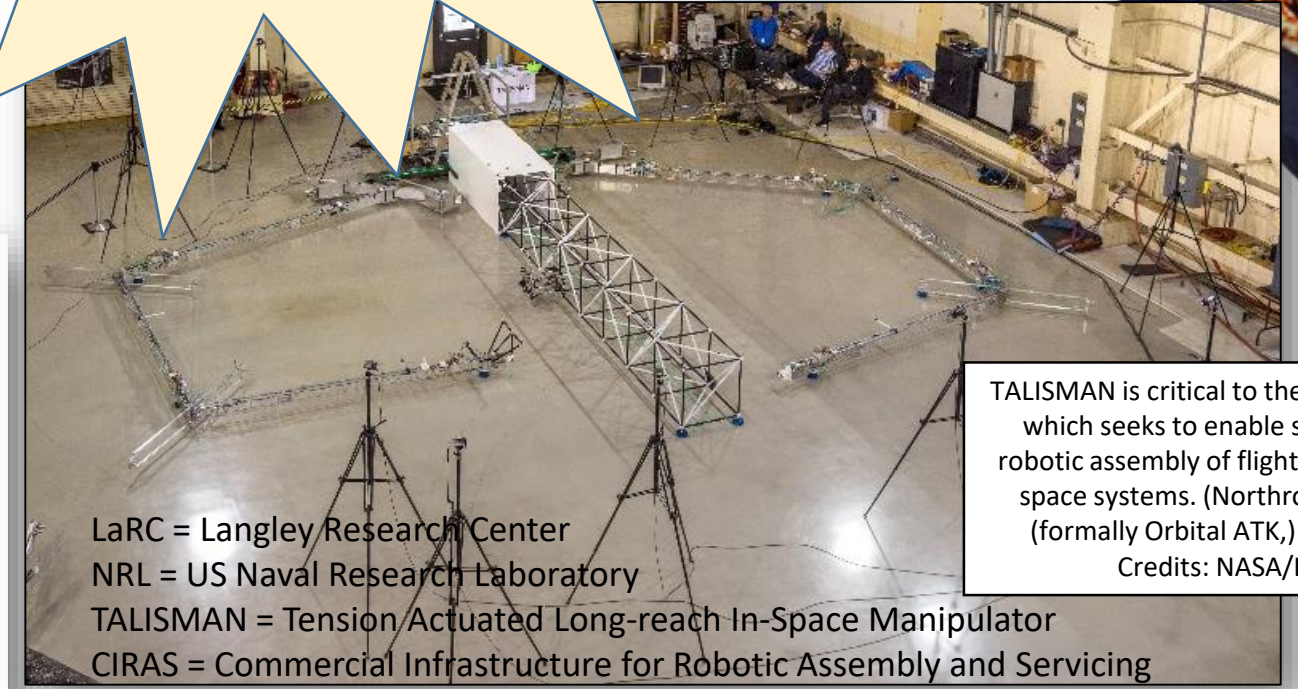
Science and Technology (S&T) Partnership Forum

The US Air Force (USAF), NASA, and National Reconnaissance Office (NRO) are aggressively collaborating to find enterprise synergistic S&T solutions to benefit the Nation.

- Goals**
- Leverage synergies
 - Influence agency portfolios
- Objectives**
- Facilitate synergistic collaborations
 - Strategize technical solutions
 - Maintain awareness of S&T investments
 - Identify impediments and formulate solutions

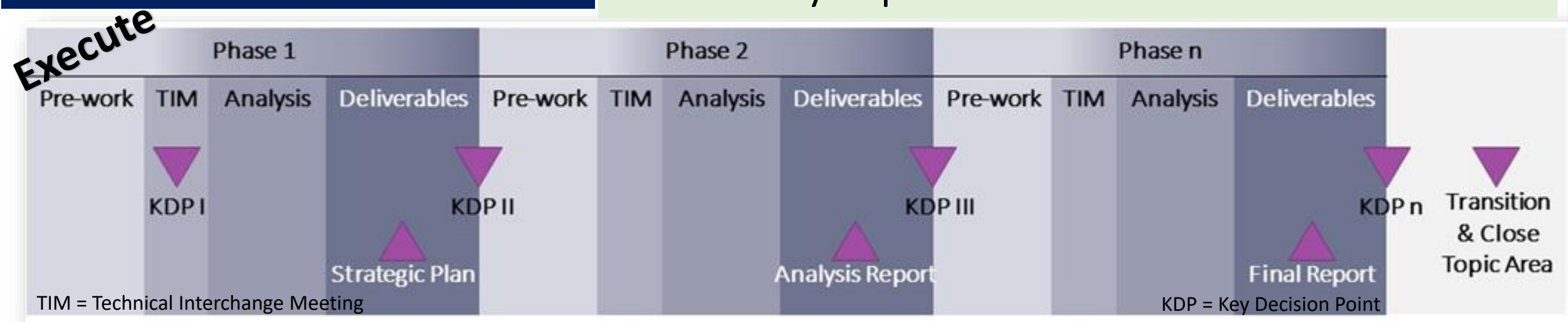
Technology
Topic Area

Autonomous and
semi-autonomous in-
space assembly

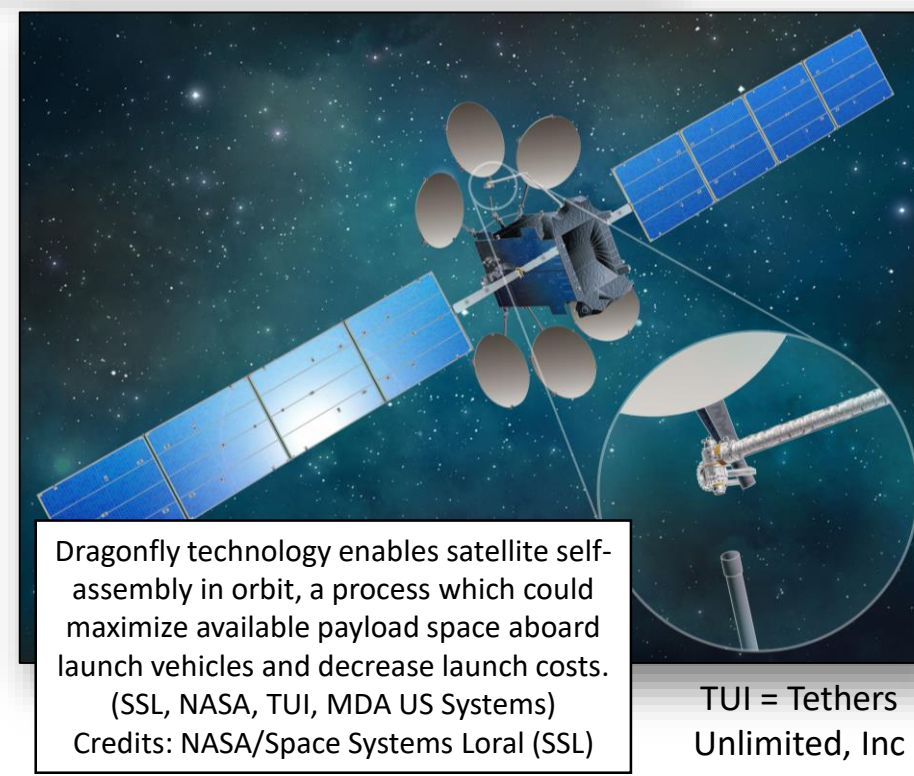
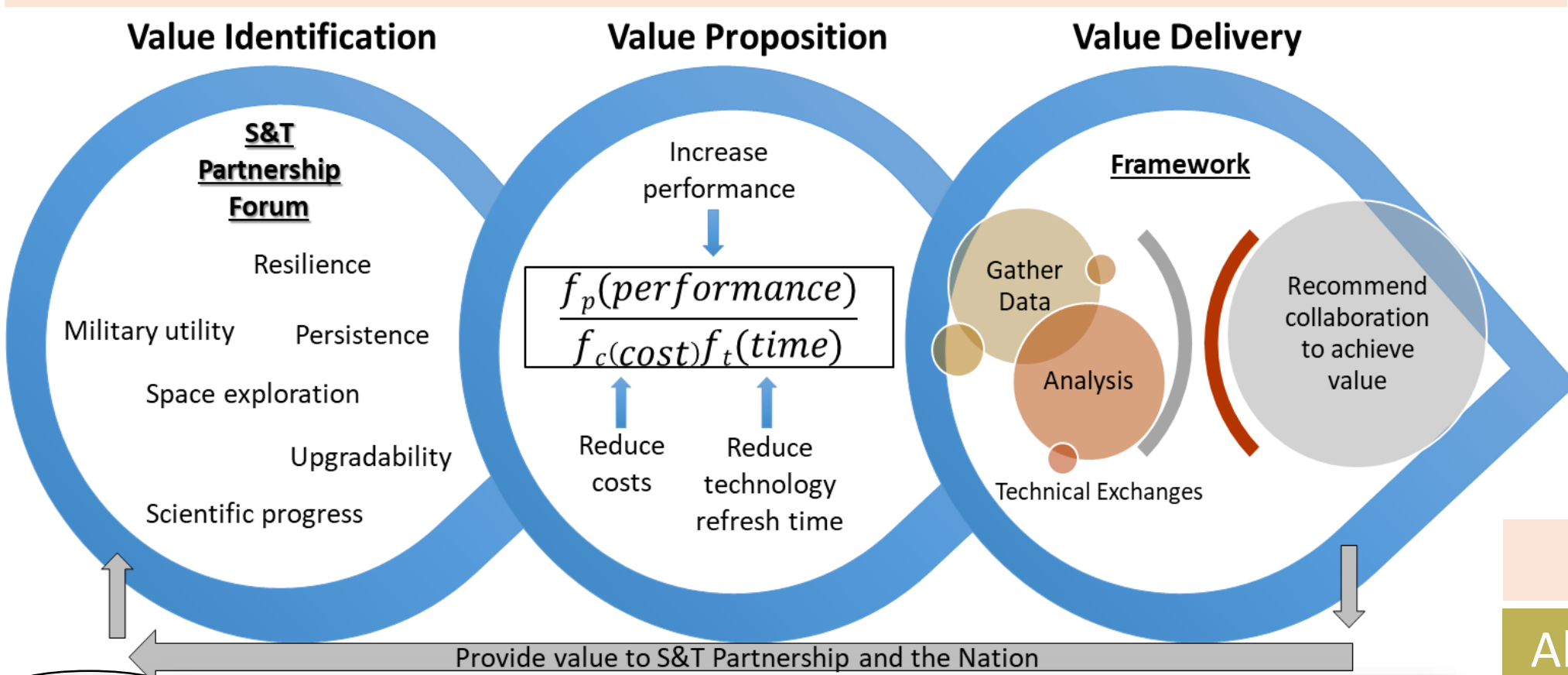


TALISMAN is critical to the CIRAS project, which seeks to enable space-based, robotic assembly of flight hardware and space systems. (Northrop Grumman (formerly Orbital ATK), NASA, NRL)
Credits: NASA/LaRC

LaRC = Langley Research Center
NRL = US Naval Research Laboratory
TALISMAN = Tension Actuated Long-reach In-Space Manipulator
CIRAS = Commercial Infrastructure for Robotic Assembly and Servicing



Value Proposition



Dragonfly technology enables satellite self-assembly in orbit, a process which could maximize available payload space aboard launch vehicles and decrease launch costs. (SSL, NASA, TUI, MDA US Systems)
Credits: NASA/Space Systems Loral (SSL)

TUI = Tethers Unlimited, Inc

Benefits of In-Space Assembly

Bring about new capabilities enabled by spacecraft dimensions, masses, or configurations that cannot otherwise be launched from Earth

Reduce Cost

Improve Performance

Limit Risk

Extensible
Incremental
Modularity
Reusable

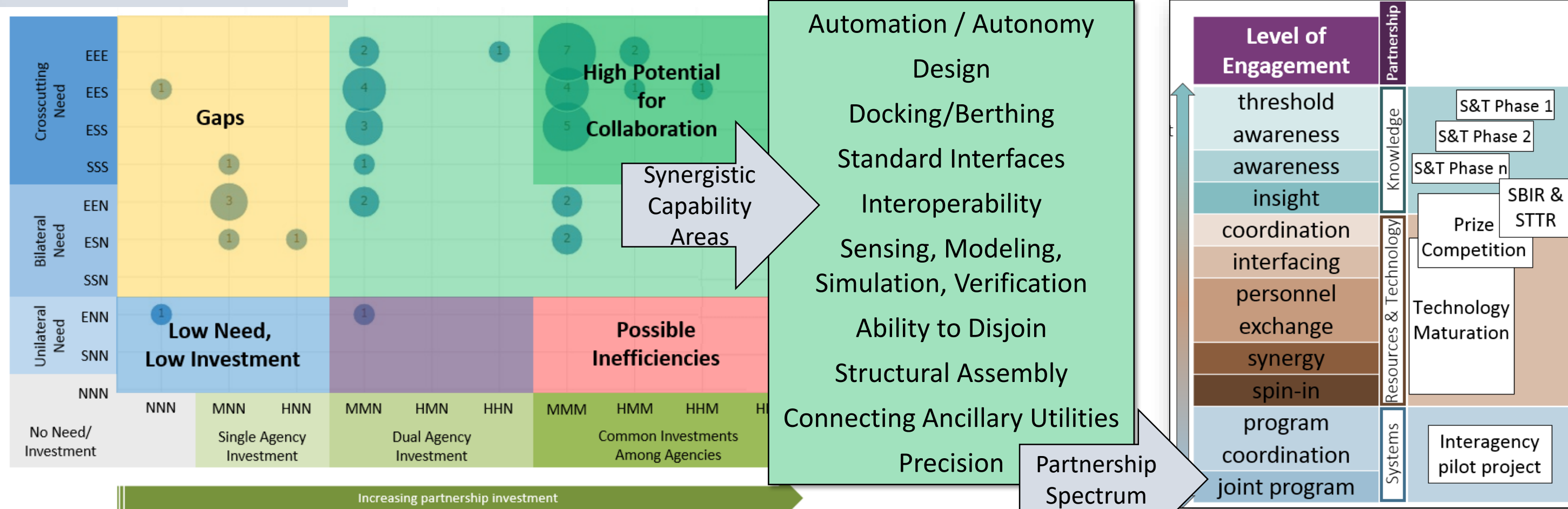
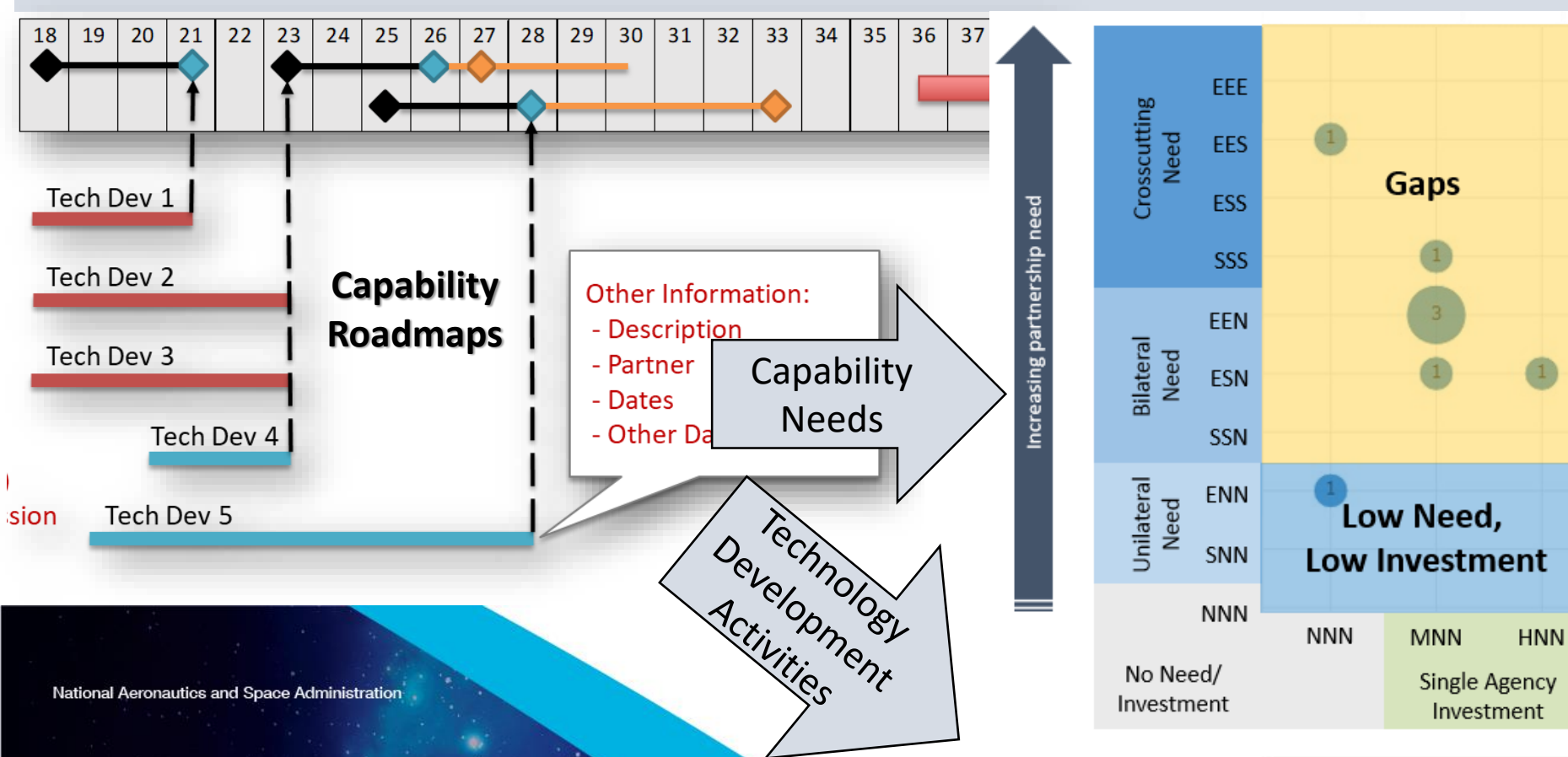
A New Paradigm for Spacecraft Development and Operation

Allow large, persistent space assets to be assembled and routinely upgraded in space

Transform space operations capabilities with economic and performance benefits for both U.S. Govt and commercial space endeavors

Development and maturation of capabilities require a public-private partnership whereby Govt supports initial infrastructure and risk reduction

Analysis and Results



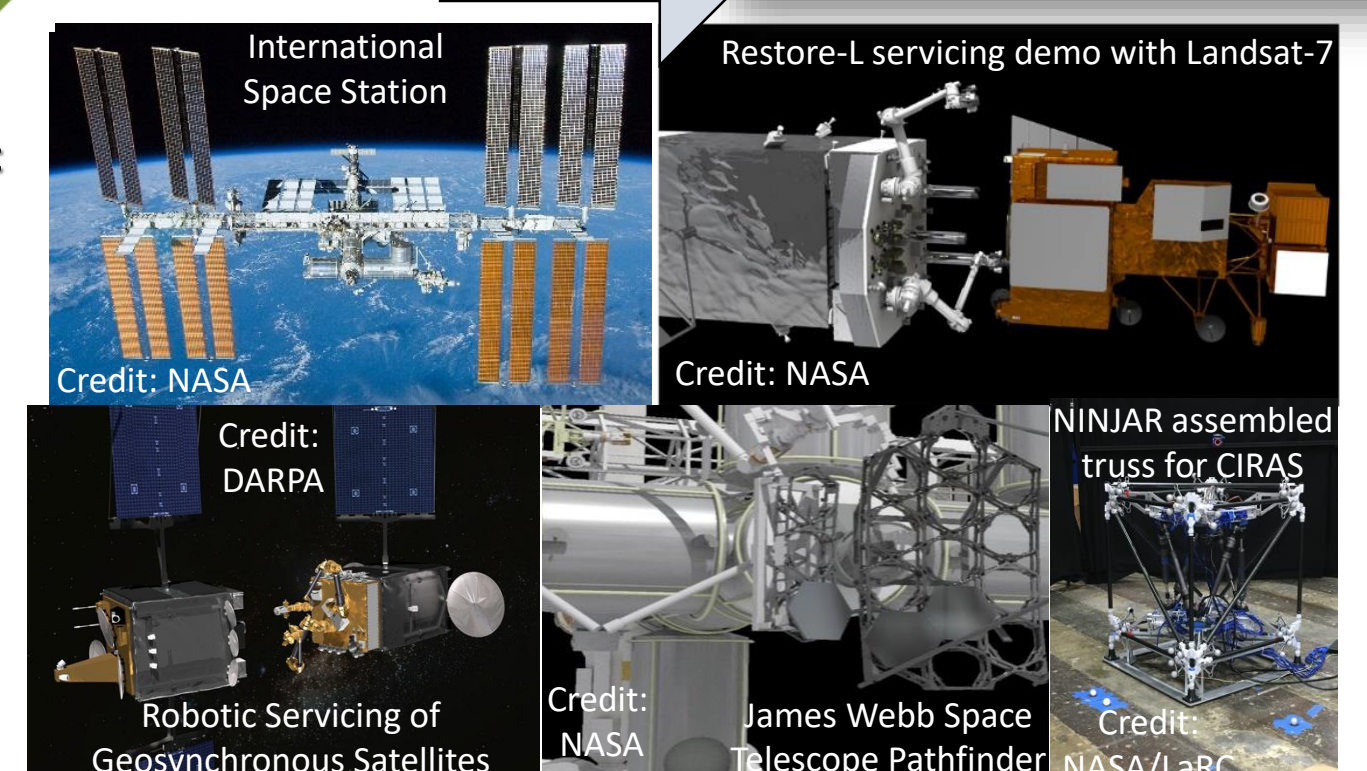
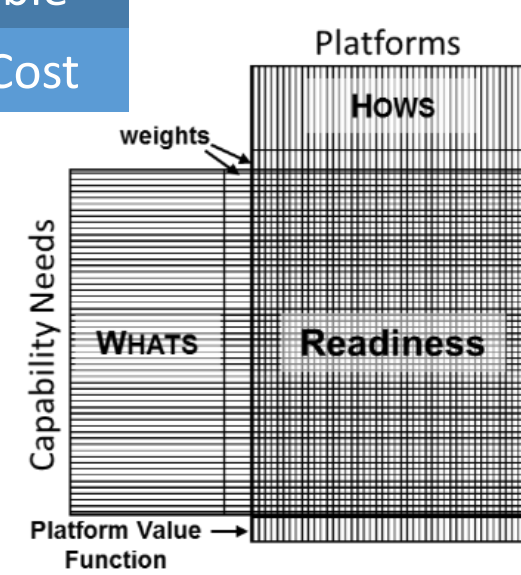
Stakeholder Goals

- Supports near-term demo
- Affordable
- Industry Transition
- Lower Cost

Design Drivers

- Stability
- Scalability
- Assembly
- Interfaces
- Upgradeability

Demonstration Platform Assessment



AIAA SPACE 2018, Orlando, FL, Sept 17-19, 2018: 1. Phillip A. Williams, Erica M. Rodgers, et al., "Space Science and Technology Partnership Forum: Value Proposition, Strategic Framework, and Capability Needs for In-Space Assembly". 2. Dale C. Arney, Erica M. Rodgers, et al., "Space Science and Technology Partnership Forum: In-Space Assembly Data Collection and Analysis". 3. Doris Hamill, Sharon Jefferies, et al., "Space Science and Technology Partnership Forum: Analysis for a Joint Demonstration of High Priority, In-Space Assembly Technology".