An Agile Ethos for Rapid Capabilities Development

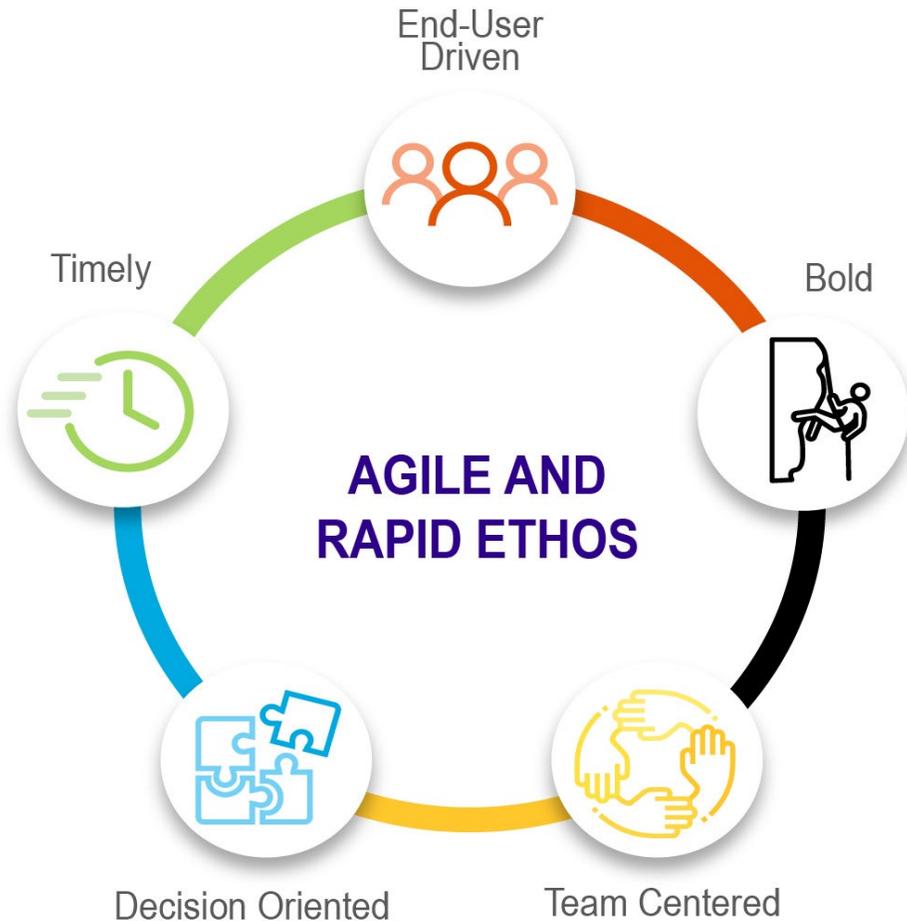**Geoff Reber, Principal Engineer**
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November 2024

The Agile Acquisition and Rapid Deployment Ethos is Built on Enduring Tenets that have Proven Successful

AGILE AND RAPID ETHOS

End-User Driven
Bold
Team Centered
Decision Oriented
Timely

- **End-user Driven**: Knowing the end-user's trade space by regularly engaging them from the beginning

- **Bold**: Getting comfortable being uncomfortable and taking informed risks in the context of program priorities

- **Team-Centered**: Trusting peers, implementing short decision chains, and adapting roles when needed

- **Decision-Oriented**: Converging rapidly to a minimum viable product that meets the end user's need

- **Timely**: Delivering acceptable products at speed

Be End-User Driven
to Understand Needed Capability and Intended Use

- **End-users rely on the space system to meet mission objectives**

- **A clear understanding of the system's operational use is of utmost importance**
  - **To translate objectives quickly into solutions**
  - **To make effective cost, schedule, and technical trades**
  - **To manage emerging issues**

Image credit: The Aerospace Corporation

Support to JPSS ground systems at McMurdo, Antarctica – "on-the-ice" evaluation of future upgrades

Understanding end use enables prioritization, rapid decisions, and minimum (useful) product definition, and descopes

Be End-User Driven to Understand Needed Capability and Intended Use

- **For effective end-user engagements....**
  - **Value - and regularly solicit - input from the end users**
  - **Understand the minimum viable product (MVP) required to achieve the end user's needed capability**
  - **Establish operationally-driven priorities that allow the team to make trades**
  - **Consider what can be done with existing capabilities to achieve timely, incremental solutions**
  - **As much as possible, develop flexible, scalable, interoperable, and maintainable solutions that allow the end users to adapt the system to changing needs**

Don't let user feedback drive requirements creep, but instead focus on building effective relationships

Be Bold in Making Decisions and Taking Risks for Best Impact

- **Decision-making can be difficult in the best of times, let alone when information is lacking because of limited resources**

- **Often a quick-turn product is better than a higher-fidelity result that is late to need**

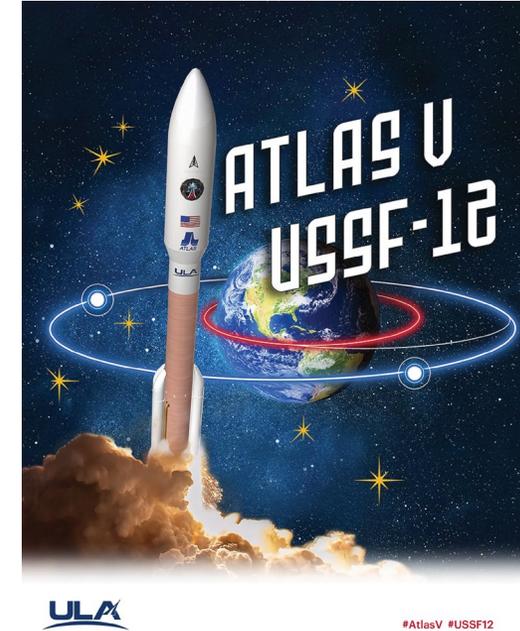- **Agile teams must get comfortable being uncomfortable**

Image credit: United Launch Alliance

Quick analysis bounded the launch risk and allowed the Space Force made a "go for launch" decision followed by a clean flight, despite a loss of redundancy on the ground.

A culture that enables bold decisions and understands the balance of risk and speed acts with the agility needed to rapidly deliver capability
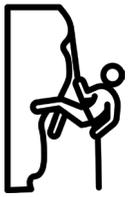
Be Bold
in Making Decisions and Taking Risks for Best Impact

- **Build an agile team culture that can act boldly:**
  - **Across the team and with stakeholders, practice making decisions even when complete information is unavailable**
  - **Avoid "analysis paralysis;" unless it is known that relevant high-quality information is coming soon, a hard decision isn't made any easier by waiting**
  - **Do not euphemize risk; prepare for failure**
  - **Focus on "big rocks" that most impact design, development, and performance across the lifecycle**
    - **Interfaces, critical requirements, do no harm, test like you fly**
    - **Surviving launch, communicating, maintaining power-positive conditions**

Make the hard decisions quickly

Be Team-Centered by Trusting Peers and Backstopping Team Members

- **Agile program offices are typically made up of small teams with short leadership chains**

- **By their nature, small teams are resource limited in time and funding, and cannot chase every issue to resolution**

- **Trust is key to speed, performance, and an effective culture for rapid decisions**

Image credit: NASA

A multi-agency team that restored CloudSat to science functionality despite major anomalies

Success or failure is highly dependent on team composition, and trust and talent mix is the essential ingredient

Be Team-Centered by Trusting Peers and Backstopping Team Members

- **Cultivate an effective agile team to rapidly deliver capability:**
  - **Trust in the team, including all partners and contractors**
    - **Even if responsibilities don't significantly overlap, over time capabilities and knowledge will**
    - **Hold members accountable but support those that need additional help to succeed**
  - **Bring external experts for candid peer reviews to prevent blind spots and groupthink**
  - **Ensure that the team structure does not devolve into a construct in which many must agree to move forward but it takes only one to veto progress or decisions**
  - **Collaborative teams leverage collaborative environments**
  - **Dedicate someone to keep work plans current**

Small, agile teams require trust and empowerment

Be Decision-Oriented
to Align the Acquisition to the End-User's Need

- **Space systems are highly complex**

- **Rapid teams cannot wait for all the information needed, so they must focus on understanding the end-users needs and employing strong system engineering practices**

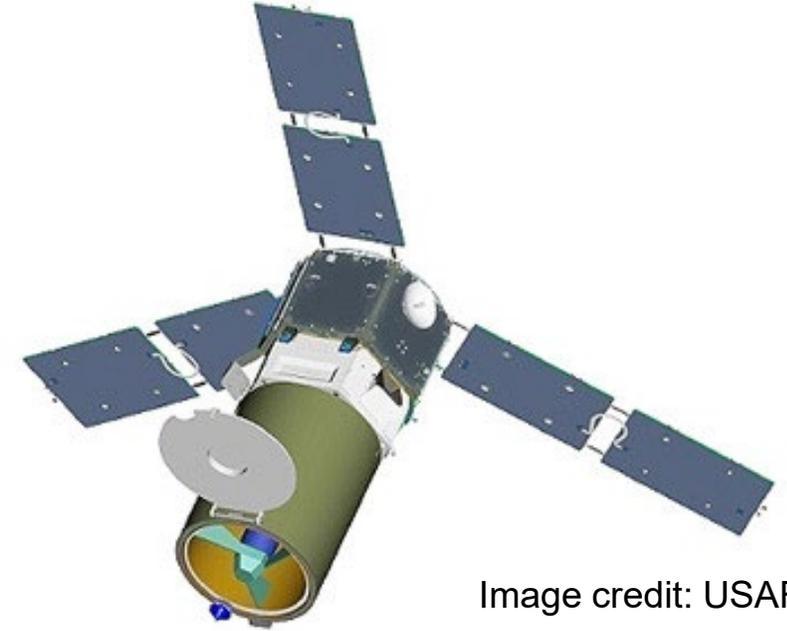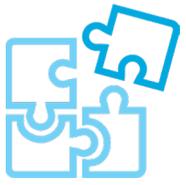- **The simpler and more robust a design, the more likely it is to succeed.**

Image credit: USAF

ORS-1 launched in 30 months by following strict schedule, cost, performance hierarchy of decision-making

The agile team's ability to make effective decisions is built on the team culture, competencies, and a strong understanding of mission priorities

Be Decision-Oriented
to Align the Acquisition to the End-User's Need

- **To achieve a decision-oriented mindset:**
  - **Establish a true minimum viable product (MVP) with descoping options, and rigorously prioritize objectives**
  - **Consciously defer lower-priority objectives to devote resources to the MVP**
  - **"Go slow to go fast" – take time in early development to establish a solid understanding of the design's performance within the end-user capability space**
  - **Reserve one-third to one-half of schedule for testing, rigorously defend that time, and ensure funded schedule margin**
  - **Design for simplicity and robustness, rather than efficiency, by allocating and using margin**

The simpler and more robust a design, the more likely it is to succeed

Be Timely
to Manage the Only Immutable Resource

- **Agile programs recognize time as a fundamental threat**

- **The longer a program takes, the more external change will have an impact**

- **Momentum is as important as speed**

- **Optimal solutions are inevitably schedule and cost intensive**

- **Every requirement, every analysis, and every test drives schedule and cost into the program**

Image credit: Firefly Aerospace

Inception to space operations in 14 months, culminating in a "call-up to launch" phase of less than 60 hours

Timely decisions drive the momentum inherent in successful programs that rapidly deliver end-user capability

Be Timely
to Manage the Only Immutable Resource

- **Practical considerations to include:**
  - **Make timely decisions using the information available now; do not hold options open longer than needed, hoping for a perfect design**
  - **Prioritize risk reduction efforts that have the most impact to the desired outcome**
  - **Perform work that has the highest ratio of technical risk reduced to programmatic risk incurred**
  - **Leverage simple, robust solutions (e.g., margin, proven designs, code reuse, common EEE parts)**
  - **Ensure the team is balancing the volume of schedule drivers with achieving an effective outcome for the end-user within the priorities of the program**

A late program delivers 0% reliability

Applying the Ethos

- **The most critical success factor is the *team***

- **Successful, agile teams:**
  - *Operate through ambiguity*
  - *Recognize progress does not always require precision*
  - *Understand and manage risk within program priorities*
  - *Understand their system element in the context of the whole system*
  - *Understand how their system will provide operational effects*
  - *Promote collaboration to find options and solutions.*

- **Key to this is effective, open, collaborative relationships among all stakeholders**

- **Successful teams are enabled by supportive infrastructures and stakeholder alignment**

End-User Driven

Timely

Bold

AGILE AND RAPID ETHOS

Decision Oriented

Team Centered