Technical Capability Assessment

Update with NASA Industry Forum
March 10, 2015

Lesa Roe
NASA Deputy Associate Administrator
Agenda

• Background and Agency Actions
• Technical Capabilities Assessment Purpose
• Technical Capabilities Assessment Process
• Status and Next Steps
Completing the Puzzle

NEW AGENCY OPERATING MODEL

Program/Project Planning
Mission Integration
Tech Capability Assessment
Competition Model
Contract Assessment
Business Services Assessment

IMPERATIVE: Establish a more efficient operating model that maintains critical capabilities AND meets current and future mission needs
Establish a more efficient operating model that maintains critical capabilities AND meets current and future mission needs

- NASA has a highly complex technical mission.
  - There are significant goal changes on a periodic basis.
  - Technical capabilities are vital to performing the mission.

- NASA has developed, maintains, and partners for technical capabilities.
  - There are many diverse capabilities across the Agency with many customers and partners.

- Budget environment is challenging.
  - We must make informed changes in the way we operate, what we maintain, and where we invest.

- TCAT is developing a method to:
  - Strategically address the technical capabilities required to support Agency goals;
  - Enable decision makers to make informed decisions on investing/divesting strategically within the budget while strengthening innovation in critical areas needed to advance our mission.
We want to make decisions about our capabilities and solutions based on future & current mission needs.
Capability Groups (What are we assessing?)

**Institutional Capabilities**
- HR
- Legal
- Facilities Management
- IT
- Etc.

**Technical Capabilities**
- TC1
- TC2
- TC3
- Etc.

**Program/Project Management Capabilities**
- Project Management
- Systems Engineering
- Safety & Mission Assurance

**Portfolio**

**Assets**
- Workforce (Competencies)
- Equipment
- Facilities

**Institutional Capabilities**
- Workforce (Competencies)
- Equipment
- Facilities

**Technical Capabilities**
- Workforce (Competencies)
- Equipment
- Facilities

**Program/Project Management Capabilities**
- Workforce (Competencies)
- Equipment
- Facilities
What does NASA Langley Research Center do in support of Space Solutions?

Solution: Arrival Transportation

- Recovery
- Landing
- Descent
- Entry

NASA Langley

Capabilities

- Structures and Mechanisms
- Aerodynamics
- Flight Dynamics
- GN&C

What skills does NASA Langley use?
Linking Solutions to Technical Capabilities

Solutions

Centers

Technical Capabilities

Assets

Workforce (Competencies)

Equipment

Facilities

Basic Research

Space

Aero
Solutions

- Solutions are the systems, subsystems and activities that result from the decomposition of Agency objectives, while being independent of budget, organization, and programs. These are grouped in levels known as “Tiers.”

- Solutions refer to both current and future portfolio content.

**Space Solution Example:**

<table>
<thead>
<tr>
<th>Arrival Transportation</th>
<th>Tier 1</th>
<th>Tier 2</th>
<th>Tier 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry, Descent &amp; Landing</td>
<td>Entry</td>
<td>1</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Descent</td>
<td>9</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>Landing</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Aerobraking</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Aerocapture</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Recovery</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>Rendezvous Dock</td>
<td>Acquisition &amp; Rendezvous</td>
<td>13</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>Docking</td>
<td>13</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>Berthing</td>
<td>13</td>
<td>47</td>
</tr>
</tbody>
</table>

**Numbers of Solutions:**

<table>
<thead>
<tr>
<th></th>
<th>Tier 1</th>
<th>Tier 2</th>
<th>Tier 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research</td>
<td>1</td>
<td>9</td>
<td>43</td>
</tr>
<tr>
<td>Space</td>
<td>9</td>
<td>26</td>
<td>97</td>
</tr>
<tr>
<td>Aero</td>
<td>3</td>
<td>12</td>
<td>31</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13</strong></td>
<td><strong>47</strong></td>
<td><strong>171</strong></td>
</tr>
<tr>
<td>Tier 1 and 2 Solutions List</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-----------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>General Space</strong></td>
<td><strong>Human Sustainment (Space)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System Architecture</td>
<td>Launch &amp; EDL</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ascent Transportation</strong></td>
<td>In-space</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle</td>
<td>Extraterrestrial Instruments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ground Support</td>
<td>Sensor Systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propulsion</td>
<td>Experiment Apparatus</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>In-space Transportation</strong></td>
<td>Spacecraft (Bus)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle</td>
<td>Instrument Platform</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-space Servicing</td>
<td>Habitation Platform</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propulsion</td>
<td>In-space Servicing</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Arrival Transportation</strong></td>
<td><strong>Specialized Systems</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entry, Descent &amp; Landing</td>
<td>Long Term Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rendezvous &amp; Dock</td>
<td>Communications</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Extraterrestrial Surface Systems</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surface Transportation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off-surface Transportation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power &amp; Energy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-situ Sample and/or Resource Access &amp; Utilization</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Infrastructure Platform Bus</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In-situ Servicing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communications &amp; Navigation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Science &amp; Exploratory Technology</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earth</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Astrophysics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heliophysics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planetary Science</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Space Environments Characterization &amp; Effects</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Life Science</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Science</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Research</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information Systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Air Vehicles</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systems Architecture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle Platform</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Propulsion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ground Support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aviation Safety</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Air Traffic Management</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strategic Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tactical Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unmanned Aerial Systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ATM Human Systems Integration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Air Traffic Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Human Sustainment (Aero)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Crew &amp; Passengers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ground Crew</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. Making decisions; transparency of data, analysis, and decisions is critical across the Agency, and with stakeholders.
2. Approach must be integrated with other initiatives: Improving how we operate (business model) as we right-size our capabilities.
As we formulate missions and we move to strategically address workforce and infrastructure, there are four key areas we need to address….

- Building a strong foundation to support Agency near and far term goals
- Advancing capabilities to meet long-term needs
- Optimizing deployment of capabilities across all Centers
- Stop doing work we no longer need to do

These 4 bullets are the essence of capability leadership.
When do we determine something to be an Agency Technical Capability:

- Based on technical nature, complexity, and criticality for the Agency,
- Where a short-term programmatic approach is not sufficient,
- Where greater coordination and alignment is needed,
- and/or where an integrated advancement approach is required to address future Agency objectives.
Current NASA Capability Areas

**Discipline Areas:**
1. Aerosciences
2. Avionics
3. Electrical Power
4. Flight Mechanics
5. Guidance Navigation & Control (GNC)
6. Human Factors
7. Life Support/Active Thermal
8. Loads and Dynamics
9. Materials
10. Mechanical Systems
11. Non-Destructive Evaluation (NDE)
12. Passive Thermal
13. Propulsion
14. Software
15. Structures
16. Systems Engineering (recently filled)
17. Space Environments (not yet filled)
18. Cryogenics (not yet filled)
19. Instruments and Sensors (not yet filled)

**Research Areas:**
1. Life Sciences
2. Earth Science
3. Heliophysics (on hold pending Earth Science approach)
4. Planetary (on hold pending Earth Science approach)
5. Astrophysics (on hold pending Earth Science approach)

**Technical Service Areas:**
1. Aircraft Operations
2. Environmental Test Facilities (tiger team in work)
3. Mission Operations (tiger team in work)
• Advises Agency and ensures *proper alignment* across Missions and Centers.
• Establishes *plans/roadmaps* to provide technical guidance to the Agency.
• Determine *gap areas* for advancement and strategic investment.
• Advises on capability *sizing and strategic hiring*, including contracting, across all Centers.
• Determines *investments and divestments* within capability scope, including advising Centers on assets.
• Solicits *innovative ideas* from outside the capability area.
• Establishes *standards and specifications* within capability scope.
Accomplishments to Date

1. Held All Hands at all ten NASA Centers to brief NASA Actions and Technical Capability Assessment plans for transparency to our workforce. Had sessions with all SES/ST/SL as part of the Virtual Executive Summit. Established an internal employee web site for transparency of process and decisions.

2. Briefed Authorization and Appropriations Congressional Committee staff and Congressional Member staff on NASA Technical Capability Assessment.

3. Reviewed and incorporated lessons learned from previous Agency decisions on capabilities, specifically meeting with Arc Jet teams at JSC and Ames.

4. Provided Agency direction on next steps for institutionalizing technical capability leadership.

Technical Assessments Schedule for 2015

Assessments/Decisions that are underway:
  • Entry, Descent, and Landing
  • Rendezvous and Capture
  • Extraterrestrial Surface Systems
  • Ascent Transportation – Vehicle
  • Aerosciences
  • Materials
  • Propulsion
  • Human Factors

February:
  • Software
  • Structures
  • Avionics
  • Electrical Power

March:
  • Guidance Navigation & Control (GNC)
  • Flight Mechanics
  • Life Support
  • Active Thermal
  • Mechanical Systems

April:
  • Non-Destructive Evaluation (NDE)
  • Passive Thermal
  • Loads and Dynamics

All Technical Assessment result in decisions in the Annual Agency Program Management Council
Technical Assessments/State of the Capability

**Background:**
- Scope
- Decomposition
- Definitions
- Team composition

**Baseline:**
- Center Characterization
- Mission Needs
- Workforce demographics
- Facilities and assets
- Technical challenges/State of the Discipline
- Gaps/overlap analysis
- Recommendations

**Expanded:**
- Changes from baseline
- Capability quality
- Facility utilization
- External availability
- Make/Buy decisions
- Partnerships/collaborations
- Emerging innovations
- Updated recommendations
Annual Path for Integrating Capability Leadership

- **September**: Agency Program Management Council (APMC)
- **October**: Agency Strategy Implementation Planning (A-SIP)
- **January**: Strategic Planning Guidance (SPG)

↑
Investment/divestment priorities and integrated issues from capability leadership teams