Office of the Chief Technologist (OCT)
Community Update

Rick Howard
Deputy Chief Technologist
LEAG Annual Meeting
September 14, 2010

www.nasa.gov/oct
Office of the Chief Technologist Organization

Chief Technologist

Deputy CT

Financial Management

Partnership, Innovation and Commercial Space

Communications & Outreach

Strategic Integration

Cross Agency Support

Early Stage Innovation

Space Technology Research Grants (GRC)
NIAC
SBIR/STTR (ARC)
Centennial Challenges (MSFC)
Center Innovation Fund

Grants / Activities

Game Changing Technology

Game Changing Development (LaRC)
Franklin Small Satellite Subsystem Technology (ARC)

Activities

Crosscutting Capability Demonstration

Tech Demonstration Missions (MSFC)
Edison Small Satellite Missions (ARC)
Flight Opportunities (DFRC)

Projects / Activities
Prove feasibility of novel, early-stage ideas with potential to revolutionize a future NASA mission and/or fulfill national need.

Mature crosscutting capabilities that advance multiple future space missions to flight readiness status.

**Visions of the Future**

- **Does it WORK?**
  - Idea
  - Possible Solution
- **Is it Flight Ready?**
  - Possible Solution

**Early Stage Innovation**

Creative ideas regarding future NASA systems or solutions to national needs.

**Game Changing Technology**

Prove feasibility of novel, early-stage ideas with potential to revolutionize a future NASA mission and/or fulfill national need.

**Crosscutting Capability Demonstration**

Mature crosscutting capabilities that advance multiple future space missions to flight readiness status.

**Infusion Opportunities**

for NASA Mission Directorates, Other Govt. Agencies, and Industry
NASA’s Integrated Technology Programs

- A portfolio of technology investments enabling new approaches to NASA’s current mission set, and allowing the Agency to pursue entirely new missions of science, discovery and exploration.

**Space Technology Program Technology Push**

*Developing technologies with broad applicability…*

- **Academia, Industry and Government Advanced Technologies and System Concepts**
- **Visions of The Future**
- **Early-Stage Innovation**

- **OCT Space Technology Program**
  - Game-Changing Technologies
  - Crosscutting Capability Demos

- **ESMD Enabling Technology Programs**
  - Foundational Areas
  - Transformational R&D
  - Small Scale Demos

- **ESMD Flagship Technology Demonstrations**
  - Disruptive Approaches
  - Requirements Flowdown
  - Large Scale Capability Demonstrations

- **Portfolio Of Operational Capabilities for Exploration**

*...to support mission-specific technology needs*

**ESMD Technology Pull**

**Increasing Technology Readiness**
Roadmapping Background

- OCT documented and received Agency-level concurrence on the “Process to Create and Maintain NASA’s Aero-Space Technology Area Roadmap (A-STAR)” – released version posted with OCT policy documents at www.nasa.gov/OCT
- A-STAR performs a decadal survey:
  - Creating a set of 15 cross-cutting Technology Area (TA) roadmaps and links them to an integrated strategic roadmap to show the overall technology strategy and priorities across all of NASA’s technology investments
    - Responds to the OCT charter to provide “Coordination of technology investments across the Agency, including the mission-focused investments made by the NASA Mission Directorates, and perform strategic technology integration.”
  - Calls for thorough internal and external roadmap content development and review processes
    - Establishes a deliberative panel of internal and external stakeholders to review and advise on technology development priorities for the Space Technology Programs through a transparent and balanced process
- OCT’s Office of Strategic Integration (OCT/SI) was charged with executing the A-STAR process
Agency Goals, Outcomes, and Objectives

MD Goals, Missions, Architectures & Timelines
MD Technology Roadmaps & Prioritizations
Center Technology Focus Areas

Major Step A
Collect MD & Center Inputs to Select Tech Areas

Major Step B
Establish TA Teams

Major Step C
TA Teams Provided Common Approach

Major Step D
Form Starting Point For TA Roadmaps

Major Step E
Draft Roadmaps For Each TA

Major Step F
Internal Review (OCT, NTEC) External Review (NAS/NRC)

Deliverables: Decisional Information
- Reference to Goal/Mission
- Current SOA and Status
- Funding, Plans, Priorities
- Technical Challenges/Gaps
- Prioritization Criteria
- Phased Cost
- Acquisition Strategy

Integrated Roadmap & Prioritization
Final TA Roadmap
External & Internal Review

We are here

15 Technology Areas (TAs)
OCT (NTEC)
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## Technology Areas (TAs)

<table>
<thead>
<tr>
<th>A-STAR TAXONOMY</th>
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<tbody>
<tr>
<td>1. LAUNCH PROPULSION SYSTEMS</td>
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<td>2. IN-SPACE PROPULSION SYSTEMS</td>
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<td>3. SPACE POWER AND ENERGY STORAGE SYSTEMS</td>
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<td>4. ROBOTICS, TELE-ROBOTICS, AND AUTONOMOUS SYSTEMS</td>
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<tr>
<td>5. COMMUNICATION AND NAVIGATION SYSTEMS</td>
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<td>6. HUMAN HEALTH, LIFE SUPPORT AND HABITATION SYSTEMS</td>
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<td>7. HUMAN EXPLORATION DESTINATION SYSTEMS</td>
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<tr>
<td>8. SCIENTIFIC INSTRUMENTS, OBSERVATORIES, AND SENSOR SYSTEMS</td>
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<td>9. ENTRY, DESCENT, AND LANDING SYSTEMS</td>
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<tr>
<td>10. NANOTECHNOLOGY</td>
</tr>
<tr>
<td>11. MODELING, SIMULATION, INFORMATION TECHNOLOGY AND PROCESSING</td>
</tr>
<tr>
<td>12. MATERIALS, STRUCTURAL &amp; MECHANICAL SYSTEMS, AND MANUFACTURING</td>
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<tr>
<td>13. GROUND AND LAUNCH SYSTEMS PROCESSING</td>
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<tr>
<td>14. THERMAL MANAGEMENT SYSTEMS</td>
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<td>15. AERONAUTICS</td>
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# A-STAR Milestones

<table>
<thead>
<tr>
<th>Activity Name</th>
<th>2010</th>
<th>2011</th>
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<tr>
<td>1. Kickoff meeting with TA chairs</td>
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<tr>
<td>2. Breakdown structure and one page (draft) summary roadmap for each TA</td>
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<tr>
<td>3. Draft NASA Roadmap showing current Technology Plans</td>
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<tr>
<td>4. Draft NASA Roadmap showing current Technology Plans to NRC</td>
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<tr>
<td>5. NRC Workshops</td>
<td></td>
<td></td>
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<tr>
<td>6. NRC Interim Report</td>
<td></td>
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<tr>
<td>7. NASA Roadmap</td>
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<td></td>
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<td>8. NASA NTEC/OCT review</td>
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<tr>
<td>9. NASA “Final” Roadmap for NRC review</td>
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<td>10. NRC Review Panel</td>
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<tr>
<td>11. NRC Final Report</td>
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- Jul  Aug  Sept  Oct  Nov  Dec  Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sept  Oct  Nov  Dec
Space Technology Engagement with External Community To Date

- Three Space Technology Programs - SBIR/STTR and Centennial Challenges and Flight Opportunities are proceeding with standard cycle of external engagements as part of FY10 NASA IPP activities.


- Space Technology Industry Day on July 13-14, 2010


- Internal program formulation process is proceeding on pace to allow release of Space Technology solicitations in early fall pending Congressional approval.
Backup
Office of Chief Technologist
Roles/Responsibilities

• OCT established in February 2010

• OCT has six main goals and responsibilities:
  1) Principal NASA advisor and advocate on matters concerning Agency-wide technology policy and programs.
  2) Up and out advocacy for NASA research and technology programs. Communication and integration with other Agency technology efforts.
  3) Direct management of Space Technology Programs.
  4) Coordination of technology investments across the Agency, including the mission-focused investments made by the NASA mission directorates. Perform strategic technology integration.
  5) Change culture towards creativity and innovation at NASA Centers, particularly in regard to workforce development.

• Mission Directorates manage the mission-focused technology programs for directorate missions and future needs
• Beginning in FY 2011, activities associated with the Innovative Partnerships Program are integrated into the Office of the Chief Technologist
• **Space Technology** is a new budget line in the President’s FY11 Budget Request for NASA
  – Consists of 10 technology development and innovation programs that are broadly applicable to the Agency’s aeronautics, science and exploration enterprises
  – Managed by Office of the Chief Technologist (OCT)

• **OCT has chosen to manage these 10 programs through the formation of 3 Divisions**
  – Early Stage Innovation
  – Game Changing Technology
  – Crosscutting Capability Demonstrations

• **Space Technology builds on the success of NASA’s Innovative Partnerships Program (IPP)**
  – In FY11, IPP is integrated into Office of the Chief Technologist and the IPP budget is integrated into the Space Technology Program
### Space Technology Budget

#### Space Technology (Major Elements)

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<thead>
<tr>
<th></th>
<th>FY 2011 PBR</th>
<th>FY 2012</th>
<th>FY 2013</th>
<th>FY 2014</th>
<th>FY 2015</th>
<th>FY11-15 Total</th>
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<td>Partnership Development &amp; Strategic Integration</td>
<td>42.0</td>
<td>46.5</td>
<td>48.2</td>
<td>47.7</td>
<td>55.0</td>
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<td>300.4</td>
<td>305.1</td>
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<td>362.0</td>
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<td><strong>1012.2</strong></td>
<td><strong>1059.7</strong></td>
<td><strong>1063.9</strong></td>
<td><strong>1217.9</strong></td>
<td><strong>4925.9</strong></td>
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#### Space Technology

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<td>48.2</td>
<td>47.7</td>
<td>55.0</td>
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<td>(1) Space Tech Res Grants</td>
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<td>(4) SBIR/STTR</td>
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<td><strong>Game Changing Technology</strong></td>
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<td><strong>329.3</strong></td>
<td><strong>319.1</strong></td>
<td><strong>319.1</strong></td>
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<td><strong>1485.3</strong></td>
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<td>(6) Game Changing Developments</td>
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<td><strong>325.0</strong></td>
<td><strong>325.0</strong></td>
<td><strong>387.0</strong></td>
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<td>(8) Technology Demonstration</td>
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<td>325.0</td>
<td>325.0</td>
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<td>(9) Edison Small Satellite Demo</td>
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<td>(10) Flight Opportunities</td>
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<td>17.0</td>
<td>17.0</td>
<td>85.0</td>
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<tr>
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<td><strong>572.2</strong></td>
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Budget numbers are preliminary and may be changed as the NASA FY 2011 request is updated (to accommodate the Orion ERM).
Early Stage Innovation

The Early-Stage Innovation Division sponsors a wide range of low TRL efforts for advanced space system concept and initial technology development across academia, industry and at the NASA field Centers.

Early-Stage Innovation includes:

• Space Technology Research Grants Program that focuses on innovative research in advanced space technology & graduate fellowships for student research in space technology

• NIAC Program that focuses on innovative aeronautics and space system concepts for future NASA missions.

• Center Innovation Fund Program to stimulate aerospace creativity and innovation at the NASA field Centers

• SBIR/STTR Program to engage small businesses in our Nation’s space enterprise and infuse these products across NASA missions

• Centennial Challenges Prize Program to address key technology needs with new sources of innovation outside the traditional aerospace community.

All Early Stage Innovation selections will be made competitively.
• **The Game Changing Technology Division** focuses on maturing advanced space technologies that may lead to entirely new approaches for the Agency’s future space missions and solutions to significant national needs.

• **Through significant ground-based testing and/or laboratory experimentation, the Game Changing Technology Division matures technologies in preparation for potential system level flight demonstration.** Success is not assured with each investment; however, on the whole and over time, dramatic advances in technology, enabling entirely new NASA missions and potential solutions for a variety of society’s technological challenges are expected.

• **A broad spectrum of space system technologies will be developed ranging from launch vehicle subsystems, spacecraft technologies, in-space capabilities, and surface systems that support robotic and human exploration.**

Game Changing Technology Division includes:

- **Game Changing Development Program** which focuses on innovative ideas enabling new capabilities or radically altering our current approaches to space systems
- **Small Satellite Subsystem Technology Program** which enables small satellites to provide game changing capabilities for the government and commercial sectors

**Greater than 70% of GCT selections will be made competitively**
The Cross-Cutting Capability Demonstrations Division focuses on maturation to flight readiness of cross-cutting capabilities that advance multiple future space missions, including flight test projects where in-space demonstration is needed before the capability can transition to direct mission application.

Matures a small number of technologies that benefit multiple customers to flight readiness status (TRL 6) through Projects that perform relevant environment testing.

Crosscutting Capability Demonstrations Division includes:

- **Technology Demonstration Missions Program** which matures, through flight demonstrations, a small number of Agency crosscutting technologies in partnerships with the Mission Directorates.
- **Edison Small Satellite Missions Program** which develops and operates a series of NASA-focused small satellite demonstration missions in collaboration with academia and small business.
- **Flight Opportunities Program** which provides flight opportunities of reduced-gravity environments, brief periods of weightlessness, and high-altitude atmospheric research.

Greater than 70% of CCD selections will be made competitively.