Office of the Chief Technologist Update
for NAC Technology, innovation and Engineering Committee
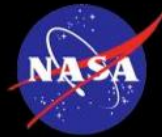
Jim Adams, Deputy Chief Technologist
4/7/15

TECHNOLOGY DRIVES EXPLORATION

#321TechOff

NASA Chief Technologist Priority List

- Space Partnership S&T Forum
  - Coordinate technology investment
  - Address inter-Agency challenges
  - Facilitate inter-Agency collaboration
  - Elevate inter-Agency technology issues to the Space Summit
- Communicating the Role of Technology
  - Perspectives vary inside and outside NASA
  - Promote commercial space **or** build exploration missions **or** develop technology
  - It is not "**or**," it is "**and**"
- ISS Utilization
  - Commercialization
  - Allocating NASA utilization across science, technology and education
  - External engagement through CASIS and NASA programs
- Restoring the Foundation: the vital role of fundamental research
  - Policy to transition from R&D to R2D and, in turn, reinvigorate the innovation pipeline
- The roles of Science, Engineering, Technology and Architecture
  - Supply (Technology) and Demand (Science) perspectives on mission formulation (EMC)
  - Architectural resiliency for multi decade missions (robust and adaptable to change)
  - Restore "Blue Sky" dialogues between Science and Technology
- New Architectures for NASA's missions
  - Small spacecraft, disaggregation, sparse aperture synthesis, robotic assembly/servicing

Asteroid Grand Challenge FY15 Update

- Topcoder Asteroid Data Hunter Challenge improved main belt asteroid detection algorithm by 15%
  - New algorithm was so successful, that an easy to use, one button downloadable multi-platform software application was developed for amateur usage
- Expert and Citizen Assessment of Science and Technology (ECAST) in-person forums of facilitated conversations with informed, but non-expert representative populations, about the Asteroid Initiative and the Journey to Mars, was highly successful with final report due in early May
- Developing Open Innovation Research Program for engaging post-graduate researchers
- Four new Space Act Agreements in work to leverage aligned interests and expand the reach and efficacy of the AGC

- 5 selected research efforts from 1st Annual NRA on 'Economic Research for Space Development' proceeding

- 'Symposium on Economic Research for Space Development' planned for Mid-November at NASA HQ Auditorium to present NRA research results.

- 2015 NRA on 'Economic Research for Space Development' expected to be released in May 2015.

- Supported HEOMD NEXTSTEP BAA selection process

- Supporting ISS LEO Commercialization Working Group

- Co-led, with Office of Policy and Strategy Formulation, external team of economists examining economic indicators and stimulation options for LEO commercialization with final report to be released Fall 2015.

EMERGING SPACE

THE EVOLVING LANDSCAPE OF 21ST CENTURY AMERICAN SPACEFLIGHT

National Aeronautics and Space Administration

Public-Private Partnerships for Space Capability Development

Driving Economic Growth and NASA's Mission

April 2014

NASA TechPort Update and Status

In 2013, NASA created Techport, in March 2015 NASA released a version of the site to the public.

- TechPort serves as the Agency's integrated technology data source, sharing the latest accomplishments and new and exciting technology projects from all of NASA's Mission Directorates, Centers and facilities.

- TechPort makes a wide range of technology information available, so the public can search and find information relevant to their interests and specific needs.

- TechPort provides the capability to search and select NASA technology information by Technology, Project Description, Management Team, Technology Readiness Level (TRL) and many other descriptive attributes.

TechPort Public Beta version Released Public 3/2/2015

NASA Roadmap Update and Status

In 2010, NASA Teams generated 14 Technical Area Roadmaps; in 2014, <u>we began an update to those existing roadmaps</u> to incorporate:

- Advances in technology development

- New Human Exploration, Science and Aeronautics Mission Needs:

  - Human Exploration Mission Classes and Design Reference Missions Derived from Capability Driven Framework and Human Spaceflight Architecture Studies

  - Science Mission Classes and Design Reference Missions Derived from Decadals and Science Plans

  - Aeronautics Content Derived from Thrust Areas and Aeronautics Research and Development Plans

- Increased utility and ease of use by NASA and our external stakeholders

Technology Roadmap Update

Will Consider:
- Updates in Science Decadal Surveys
- Human Exploration Capability Work
- Advancements In Technology

Will Include:
- State of the Art
- Capability Needs
- Performance Goals

Expanded Scope:
Aeronautics Technology
Autonomous Systems
Avionics
Information Technology
Orbital Debris
Radiation
Space Weather

TA 01	LAUNCH PROPULSION SYSTEMS	TA 09	ENTRY, DESCENT, AND LANDING SYSTEMS
TA 02	IN-SPACE PROPULSION TECHNOLOGIES	TA 10	NANOTECHNOLOGY
TA 03	SPACE POWER ENERGY STORAGE	TA 11	MODELING, SIMULATION, INFORMATION TECHNOLOGY, AND PROCESSING
TA 04	ROBOTICS AND AUTONOMOUS SYSTEMS	TA 12	MATERIALS, STRUCTURES, MECHANICAL SYSTEMS, AND MANUFACTURING
TA 05	COMMUNICATIONS AND NAVIGATION	TA 13	GROUND AND LAUNCH SYSTEMS
TA 06	HUMAN HEALTH, LIFE SUPPORT AND HABITATION SYSTEMS	TA 14	THERMAL MANAGEMENT SYSTEMS
TA 07	HUMAN EXPLORATION DESTINATION SYSTEMS	TA 15	AERONAUTICS
TA 08	SCIENCE INSTUMENTS, OBSERVATORIES, AND SENSOR SYSTEMS		

Public Release of the Roadmaps Soon

Back ups

National Aeronautics and
Space Administration

- **Provides the strategy, leadership, and coordination that guides NASA's technology and innovation activities**
  - Develops and implements NASA technology policies, roadmaps, and Strategic Technology Investment Plan (STIP).
  - Coordinates technology needs across the NASA Mission Directorates

- **Documents, Tracks, and Analyzes NASA's technology investments**
  - Develops and Operates the TechPort Database, which provides capability to share information about NASA's technology investments within the Agency and to the public

- **Coordinates with other Government agencies and the emerging commercial space sector to maximize benefit to the Nation**

- **Provides Agency-level leadership and coordination of the use of prizes and competitions to spur innovation**
  - Pilot new approaches to technology innovation and track their success

- **Leads technology transfer and technology commercialization activities across the agency**

Strategic Technology Investment Plan

Technology Roadmaps

NASA Strategic Space Technology Investment Plan

DoD   NRL   FAA

NRO   Space Command   DoE

AFRL   DARPA

Technology partnerships

TechPort

Develop & operate the TechPort database

Tech Transfer, Partnerships and Commercialization Activities

Prizes, Competitions and Grand Challenge

Innovation Office

- **Technology Transfer** - supports an office at each of the field centers, as well as a full intellectual property management tool, the NASA Technology Transfer System (NTTS), and the Spinoff Program Office.

- **Prizes and Challenges** - keeps NASA at the cutting edge of new business practices, while supporting realistic pilots to enable implementation at scale. The function currently drives two major sets of innovation activities within NASA:
  1. Drive the appropriate use of prizes, challenges and crowdsourcing (open innovation) as additional, unique tools within NASA and the aerospace industry
  2. Facilitate, catalyze, and lead the implementation of special technology initiatives and strategic concepts, including Grand Challenges and Launch

- **Emerging Space** - provides economic intelligence on the emerging commercial space ecosystem. Advises NASA HQ on the economics of space development and commercial space

Strategic Integration

- **Roadmaps** – A set of documents that consider a wide range of needed technologies and development pathways for the next 20 years. The roadmaps focus on "applied research" and "development" activities.

- **Strategic Technology Investment Plan** (STIP)– An actionable plan that lays out the strategy for developing the technologies essential to the pursuit of NASA"s mission and achievement of National goals. This plan provides the prioritization and guiding principles of investment for the technologies identified in the roadmaps.

- **Technology Coordination**-Coordinates technology needs across the NASA Mission Directorates and communicates with other Government agencies to identify opportunities for technology collaboration

- **TechPort** – Web-based software system that serves as NASA's integrated authoritative technology data source