In 2010 NASA established the Office of the Chief Technologist (with several functions)

- Investment in low-TRL projects to strengthen the foundation of our knowledge and capability base, and to stimulate creative ideas and solutions to the variety of challenges of space system design and operation, exploration, and scientific research
- Bridge the gap between idea formulation and mission infusion to deliver improvements to our future missions – mature technologies and concepts and prove their feasibility through significant modeling, analysis, laboratory experimentation, ground-based testing, and in-space demonstrations
- Establish partnership to utilize expertise within NASA, academia, research labs, industry, and entrepreneurial community
What are the Space Technology Programs?

- **NASA Innovative and Advanced Concepts (NIAC)** – “Study innovative, technically credible, advanced concepts that could one day ‘Change the Possible’ in aerospace”
- **Space Technology Research Grants and Fellowships** – Graduate student research fellowships and grants to academia, NASA field centers and not-for-profit R&D laboratories
- **Center Innovation Fund (CIF)** – stimulate innovation within the NASA Centers support emerging technologies and creative initiatives - NASA scientists and engineers lead projects, partnerships with other agencies, academia and private industry are encouraged.
- **Centennial Challenges** – Prize Competitions
- **Small Business Innovative Research (SBIR)/Small Business Technology Transfer (STTR)**
- **Small Spacecraft Technology Program** - Accelerate the development of small spacecraft capabilities for NASA, commercial, and other space sector users.
- **Flight Opportunities** - Create multiple paths through which innovative technologies may be matured from concept to flight by facilitating low-cost access to suborbital environments
- **Game Changing Development (GCD)** – Develop technologies that produce “dramatic” impacts for NASA’s Space Exploration and Science Missions; a balanced approach of guided technology development efforts and competitively selected efforts
- **Technology Demonstration Missions (TDM)** - Seeks to mature laboratory-proven technologies to flight-ready status; system-level technology solutions are given the opportunity to operate in the actual space environment
Guidance for Space Technology Programs

NASA Technology Investments

Space Technology Grand Challenges
Expand Human Presence in Space

- Economical Space Access
- Space Health and Medicine
- Telepresence in Space
- Space Colonization

Manage In-Space Resources

- Affordable Abundant Power
- Space Station
- Space Debris Hazard Mitigation
- Near-Earth Object Detection and Mitigation

Enable Transformational Space Exploration and Scientific Discovery

- Efficient In-Space Transportation
- High-Mass Planetary Surface Access
- All Access Mobility
- Surviving Extreme Space Environments
- New Tools of Discovery

STI+TASS TECHNOLOGY AREA BREAKOUT STRUCTURE

- Launch Propulsion Systems
- In-Space Propulsion Technologies
- Space Power & Energy Systems
- Transporter/Tele-operated & Autonomous Systems
- Communication & Navigation
- Human Health, Life Support & Habitats
- Human Exploration Development Systems
- Science Instrumentation, Engineering & Space Systems
- Space, Mission, & Launch Systems
- Robotics, Simulation, Reconfigurable Systems
- Materials, Structures, Mechanisms, Systems & Smart Materials
- Robotics & Launch System Propulsion
- Terrestrial Environment Systems

NASA Mission Directorates
• “Past” success stories - developing hardware used at the ISS
  – e.g. Cameras for a robotic arm, plant research units to support experiments, wireless instrumentation...

• Test new technologies for continued and future ISS operations
  – Advanced Sensors for -- improved noise-level monitoring, advanced autonomous rendezvous and docking, improved ECLS functions, enhanced communications and networking
  – New techniques for biomedical and biotechnology research
  – Improving access for small payloads to the ISS

• Test and demonstrate new technologies to support improved crew operations and/or monitoring
  – New technologies for -- crew health monitoring, in-space diagnostic techniques, food packaging, improved communication between crew members, enhanced EVA, improved human-robotic systems
  – Radiation protection and hazard mitigation techniques
• Utilize the ISS as a platform for new technology demonstration for future NASA mission needs (exploration, science, etc)
  – TDM -- Materials International Space Station Experiment-X (MISSE-X)
    • An external ISS platform for space environmental studies designed to advance the tech readiness of materials and devices critical for future space exploration.
  – TDM -- Human Exploration Telerobotics (HET)
    • ISS demos to test and assess how advanced, remotely operated robots can improve exploration before, during and after the crew. ISS is used to obtain baseline data for reducing cost and mitigating risk of future deep-space missions
  – GCD -- Station Explorer for X-Ray Timing and Navigation Technology (SEXTANT)
    • Demonstrate feasibility & viability of X-Ray Navigation and X-Ray Communication Technologies; Integrate all components and demonstrate performance on the ISS.
  – SBIR/STTR -- concepts for demonstrating additive manufacturing, space communications, deployable space systems
  – SBIR/STTR -- expand utilization of the ISS by creating partnerships between OCT/SMD/HEOMD to bring new technology demonstration opportunities/needs to the ISS
The needs of future exploration missions are a core element of the SBIR/STTR solicitation:

- In-space power generation and energy storage,
- In-space propulsion
- Cryogenic Propellant Transfer and Storage
- Life Support and Habitation
- Radiation Protection
- In-Situ Resource Utilization
- Communication, Guidance, Navigation, and Control
- Entry Descent and Landing
- Planetary Robotic Systems, Human-Robotic Systems Technologies, Telerobotics
- Planetary Compositional Analysis
- Extreme Environment Technologies
- Sample Return Techniques