Applied Research & Technology Project Office
Science & Technology Division

Strategy 2006-2010

John C. Stennis Space Center
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EXECUTIVE SUMMARY: In response to a request from the NASA Chief Engineer's Office, Stennis Space Center (SSC) realigned a number of business elements to a Project Office / Engineering Directorate management structure to help the Agency implement the Vision for Space Exploration. As a result, two new organizational units were formed: the Applied Research and Technology Project Office (ARTPO), and the Science and Technology Division (S&TD).

The ARTPO and S&TD personnel skill mix and experience base is diverse and includes expertise from a number of former SSC organizational units: (1) Applied Sciences Directorate; (2) Commercial Technology Development and Transfer Office; (3) Earth System Science Office; and (4) Commercial Remote Sensing Program. Personnel from these former organizational units continue to draw expertise from the remote sensing industry cluster at SSC, other on-site tenant organizations, and a strong network of university and other industry partners.

SSC Center management directed ARTPO and S&TD to develop a strategic plan for the future. The purpose of this plan is to provide a general framework to guide the organization to a new mission that is clearly tied to NASA mission areas, and better aligned to support implementation of the Vision for Space Exploration.

Based on participant data, the Strategic Planning Steering Committee recommends SSC senior management undertake the following four key strategies:

1. Implement strategies to improve collaboration between Headquarters Science Mission Directorate (SMD) and SSC.
2. Establish effective management approaches to provide program stability.
3. Establish clear program objectives and expectations to meet program commitments.
4. Develop a business plan to implement this strategy.

APPROACH: SSC engaged in a strategic planning process in order to capitalize on the broad experiences of personnel, vest staffs in the planning process, and generate a realistic and defensible strategy. All ARTPO and S&TD personnel, and senior management from SSC's Technical Support Contractor, were invited and encouraged to participate.

The approach included:

1. Establishment of a Strategic Planning Steering Committee to coordinate all information flows, analyze data, draft documents, and shepherd the process through to conclusion.
2. Use of a professional facilitator and electronic and anonymous data collection system.
3. Ordered steps that included strengths, weaknesses, opportunities, and threat (SWOT) analysis, development of a vision and mission statement, and the identification of realistic goals, objectives, and actions.

This document captures the results of this approach, and provides a general framework to guide the organization to a new mission that is clearly tied to NASA mission areas, and better aligned to support implementation of the Vision for Space Exploration.

VISION

To be the leader in innovative solutions to enable space exploration, to advance scientific discovery, and to meet societal needs.

MISSION STATEMENT

To provide solutions to NASA's most challenging problems.

VALUES

In recognition of an opportunity to transcend the past and re-define the essential and enduring tenets of the organization, ARTPO and S&TD commit to the following guiding principles: ***Excellence, Innovation, and Teamwork.***

STRENGTHS, WEAKNESSES, OPPORTUNITIES, THREATS ANALYSIS

Through Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis, goals were objectively developed, ratified and overall strategy constructed. The SWOT analysis included an inventory of internal strengths and weaknesses and an analysis of the external opportunities and threats with possible impact on the ARTPO and S&TD organizations. The strategy is based on the following principles derived from the SWOT analysis:

- Build on the organization's strengths.
- Recognize weaknesses and correct where possible.
- Take advantage of opportunities.
- Recognize threats to the organization and take steps to minimize adverse impacts.

Goals were derived through the SWOT analysis and through group feedback on current and future ARTPO and S&TD alignment to NASA Mission Directorates. SWOT results were analyzed and categorized into themes. The Steering Committee identified fifty-nine goals. These goals were refined, through group input, to a final list of seven goals. Based on the list of seven goals, ARTPO and S&TD staff identified corresponding objectives and tactics for achieving each goal.

GOALS

Goal 1: Implement NASA science and technology initiatives.

SSC will focus its technical expertise on addressing priorities of the Applied Sciences Program (ASP) to utilize Earth system science results for decision support. Through collaborative partnerships with public, private and academic interests, ASP identifies practical applications of NASA-sponsored observations from remote sensing systems, and predictions from scientific research and modeling. Efforts are directed to the following priority National Applications: agriculture, air, aviation, carbon management, coastal management, disaster management, ecological forecasting, energy, homeland security, invasive species, public health, and water management. Given the broad array of functional areas, the potential for socioeconomic impact of this program is significant. In the near-term, SSC efforts to implement ASP initiatives will be directed at development of a functional rapid prototyping capability (RPC), and expert execution of contract/grant responsibilities. SSC will also formulate and implement the "coastal management" National Application element.

SSC will also focus its technical expertise on expert implementation of NASA's Innovative Partnerships Program technology initiatives. Effective execution requires thorough understanding of Mission Directorate

technology needs, proactive management of technology partnerships and investments, and efficient identification, assessment, protection, and/or dissemination of NASA funded intellectual property.

As other strategy goals are met, SSC anticipates implementing a new array of NASA science and technology initiatives. Key to the success of this endeavor is SSC's commitment to accountability, responsiveness, and communication with its stakeholders. These elements are essential to program sustainability as well as growth potential.

Objective 1.1: Execute applied science priorities appropriate to our technical expertise.
Objective 1.2: Diligently communicate SSC program accomplishments with our stakeholders.
Objective 1.3: Proactively execute contract/grant management responsibilities.

Goal 1 Tactics:

Objective 1.1: Execute applied science priorities appropriate to our technical expertise.

- Deliver functional Rapid Prototyping Capability that includes input from significant stakeholders
- Maintain Enterprise Architecture, Research Knowledge Base, Components database, and Metis operation for Applied Sciences Program
- Formulate and implement Coastal Management National Application Program element
- Create leveraged technology solutions to address NASA Mission Directorate needs through focused investments and technology partnerships
- Grow system characterization activities and increase funding opportunities by marketing capabilities to other NASA programs, the National Oceanic and Atmospheric Administration (NOAA), United States Geological Survey (USGS), National Geospatial Intelligence Agency (NGA), United States Department of Agriculture (USDA), and other federal agencies as appropriate. Develop presentation materials, white papers, and target existing contacts
- Identify, assess, protect and/or disseminate NASA funded intellectual property
- Annually update list of civil servant and contractor expertise
- Leverage SSC Department of Homeland Security (DHS) knowledge to formulate and implement Homeland Security National Application program element

Objective 1.2: Diligently communicate SSC program accomplishments with our stakeholders.

- Establish liaison officer at NASA HQs to coordinate task management and maintain technical communications with key NASA HQ personnel
- Establish routine program reviews and briefings to exchange information at all management levels
- Communicate ARTPO and S&TD expertise to stakeholders at every opportunity
- Supplement the Weekly Activity Report with in-depth stories that are readable to a variety of audiences
- Increase peer-reviewed publications and presentations at professional conferences
- Publish ARTPO and S&TD annual report

Objective 1.3: Proactively execute contract/grant management responsibilities.

- Provide leadership in administration and placement of assigned grants and contracts
- Assess and reduce the amount of uncosted money on existing grants
- Increase technical oversight of grants and contracts through periodic contact with grantee/awardees
- Participate in solicitation development, proposal evaluation, and selection of ASP competitions

Goal 2: Leverage current program expertise to support exploration systems and other mission directorates.

The fundamental goal of the Vision for Space Exploration is "to advance U.S. scientific, security, and economic interests through a robust space exploration program." The challenge of exploring the solar system will require

concentrated research and development efforts to meet a broad series of mission requirements. The Agency is currently at work on the development of a new generation of spacecraft and launch vehicles that will transport crews and cargo to the lunar surface and ultimately to Mars. Programmatic requirements also dictate the necessity for technology applications to support lunar surface exploration. These requirements provide a unique opportunity for SSC to exploit its capabilities in areas such as geospatial applications and mapping, verification & validation, as well as technology development and maturation.

SSC will also seek to support other mission directorates whose programmatic requirements are consistent with the Center's resident expertise. For the Science Mission Directorate, SSC will actively pursue opportunities in coastal oceanography, maximizing both technical capabilities and the Center's unique geo-location. Similarly, SSC will continue its role in propulsion testing to support the transition from the Space Shuttle Program (Space Operations Mission Directorate) to Constellation Program (Exploration Systems Mission Directorate). In addition, SSC will seek to identify opportunities to continue work in the field of sensor development including the Integrated System Health Management (ISHM) project.

Objective 2.1: Seek opportunities that contribute to Exploration programs.
Objective 2.2: Conduct research and develop technologies that contribute to SSC Exploration and rocket propulsion test programs.

Tactics:

Objective 2.1: Seek opportunities that contribute to Exploration programs.

- Identify Exploration Systems programmatic requirements for lunar mapping
- Engage Stennis Project Integration Office (PIO) in the development of Exploration-related concepts and proposals
- Establish ARTPO/S&TD teams to respond to Exploration solicitations & needs
- Establish bid & and proposal funding pool to develop competitive proposals
- Investigate need for Earth surface collections supporting Mars analog studies

Objective 2.2: Conduct research and develop technologies that contribute to SSC Exploration and rocket propulsion test programs.

- Engage PIO and Rocket Propulsion Test Program Office (RPT) to understand operations and evaluate potential ARTPO and S&TD contributions
- Assess potential technology development requirements to support rocket propulsion testing activities
- Leverage Dual Use, Center Director's Discretionary Fund (CDDF), and other funding sources to establish seed projects
- Exploit visualization capabilities
- Investigate potential non-destructive evaluation concepts that support long duration missions

Goal 3: Exploit technical capabilities to conduct research and technology development with federal Agencies, state/local governments, non-governmental organizations, industry, and academia.

SSC is an excellent example of a "federal city" with numerous on-site federal, state, local, and academic tenant organizations. In addition to lowering infrastructure costs, this type of arrangement offers the potential for research and development, and operational synergy among the resident agencies. SSC tenant agencies are characterized by high-tech capabilities in fields such as remote sensing applications, super computing, oceanography, and meteorology. In fact, SSC is home to the world's largest contingent of oceanographers. It is incumbent upon NASA SSC to implement a "good government" model. This includes actively seeking opportunities to maximize taxpayer investment by minimizing duplication across government programs and focusing resources to more efficiently address common themes, needs and priorities.

SSC will actively pursue collaborative efforts with the U.S. Navy including the Naval Research Laboratory and the Naval Oceanographic Office, and focus on the fields of remote sensing applications, coastal oceanography and high-performance computing. Efforts will be directed to identifying compatible mission requirements with other resident agencies including, but not limited to, the Environmental Protection Agency (EPA), NOAA, and the USGS. Business development activities will focus on the identification of opportunities to further diversify SSC's customer base by serving both regional and national interests.

Objective 3.1: Expand customer base for SSC science and engineering labs.
Objective 3.2: Expand expertise in geospatial and science data management, verification & validation (V&V) of commercial and government remotely sensed data sets, technology transfer, and data simulation.
Objective 3.3: Fully integrate technology development and transfer capabilities with partnership programs.

Tactics

Objective 3.1: Expand customer base for SSC science and engineering labs.

- Establish SSC business development function specifically focused on finding new science and engineering lab customers
- Build project acquisition team to identify potential funding opportunities, establish project objectives and develop proposals
- Develop a marketing program focused on promoting SSC technical capabilities
- Explore partnership opportunities with DoD and commercial entities for utilization of lab space
- Establish liaison to SSC resident agencies whose function is to identify and develop potential partnership opportunities
- Strengthen collaborative relationships with other NASA Centers
- Develop alliance with Mississippi universities to support expanded program scope
- Leverage support from Partners for Stennis and Mississippi Development Authority to encourage new aerospace business development
- Evaluate and reduce overall G&A

Objective 3.2: Expand expertise in geospatial and science data management, verification and validation (V&V) of commercial and government remotely sensed data sets, technology transfer, and data simulation.

- Provide technical training to both civil servant and contractor staff
- Hire scientists and engineers with strong, hands-on information technology / computer science skills
- Attract new employees through established academic partners
- Utilize cooperative education and internship programs to recruit new talent
- Recruit multidisciplinary experts for short research details to exercise Rapid Prototyping Capability (RPC)

Objective 3.3: Fully integrate technology development and transfer capabilities with partnership programs.

- Leverage commercial technology funding to establish new public/private partnerships
- Develop potential SBIR and STTR subtopics related to our partnership programs
- Develop formal outreach mechanisms to disseminate tech development results to federal, state, local, academic and non-governmental organization (NGO) partners

Goal 4: Focus on coastal science and applications development.

The Nation's coastal zone is at risk due to increased population pressures, anthropogenic forcing effects, and natural processes such as subsidence and hurricanes. Nowhere is this more evident than in the Gulf of Mexico. The Gulf of Mexico is the ninth largest body of water in the world, contains seven of the top ten U.S. ports in terms of tonnage or cargo value, four of the top seven fishing ports in the Nation, yields more finfish, shrimp, and shellfish annually than the south and mid-Atlantic, Chesapeake, and New England areas combined, and supports a $20 billion annual tourism industry. The resource productivity and water quality of the Gulf of

Mexico and its watershed is diminished by non-point source pollution largely resulting from pollutant transport along the nearly 2,300 mile long Mississippi River.

NASA SSC is ideally positioned to lead coastal science and applications development given the geographic proximity to the Gulf of Mexico, history of coastal science and ocean applications, and co-location with other tenant organizations whose missions encompass the application of ecosystem and oceanographic knowledge to better understand and mitigate for a broad spectrum of coastal zone challenges.

SSC will focus applications development activities on supporting coastal zone priorities, with particular attention on the Gulf of Mexico. SSC will seek to collaborate with resident agencies including the U.S. Navy, Environmental Protection Agency (EPA) Gulf of Mexico Program, and NOAA, as well as industry and academia to conduct relevant research and development activities. SSC will also actively engage in working groups and panels with responsibility for implementing priorities identified in the U.S. Ocean Action Plan.

Objective 4.1: Leverage resident agency capabilities through sponsored research partnerships.
Objective 4.2: Expand collaborative partnerships that advance our scientific understanding of coastal environments.
Objective 4.3: Expand NASA coastal applications by contributing to the U.S. Ocean Action Plan priorities.

Tactics:

Objective 4.1: Leverage resident agency capabilities through sponsored research partnerships.

- Develop alliances with resident agencies to support National coastal science priorities
- Partner with resident agencies to develop competitive solicitation proposal teams
- Investigate utility of system characterization / atmospheric correction capabilities for coastal applications
- Strengthen partnerships with resident agencies and universities with *in situ* platforms (buoys) that can accommodate sensors to validate remotely sensed coastal data
- Conduct RPC experiments focused on coastal ocean science needs
- Exploit current and develop future innovative in-situ technologies for calibration and validation of ocean color, with buy-in from resident agencies
- Initiate and conduct hurricane preparedness and response decision support activities

Objective 4.2: Expand collaborative partnerships that advance our scientific understanding of coastal environments.

- Develop outreach strategies that focus on the coastal environmental science priorities of resident agencies and organizations
- Work with local/regional partners to contribute to Hurricane Katrina studies, including identification of needs and funding opportunities
- Identify NASA data requirements that could be met with assets from SSC resident agencies
- Establish contacts with NOAA's National Environmental Satellite, Data, and Information Service (NESDIS) to understand NOAA requirements in the coastal zone
- Write peer-reviewed articles of coastal-related collaborative partnerships results
- Formalize relationship to the EPA Gulf of Mexico program and become active in Gulf Alliance activities
- Participate in regional/national working groups focused on hypoxia, wetlands loss, and other coastal issues

Objective 4.3: Expand NASA coastal applications by contributing to the U.S. Ocean Action Plan priorities.

- Provide coastal management project management support for HQ to address Ocean Action Plan
- Maintain involvement in working groups and panels responsible for implementing Ocean Action Plan priorities; identify opportunities to respond to requirements that are consistent with SSC technical capabilities
- Assign subject matter experts to represent NASA in the Gulf of Mexico Alliance

- Assign subject matter experts to track ocean policy, report to staff, management and legislative affairs teams on impacts of ocean policy, and provide yearly recommendations to staff and management teams on program adjustments needed to meet policy priorities

Goal 5: Establish professional program management approaches to ensure responsive, credible implementation and technical excellence in the delivery of innovative and responsive solutions that meet customer needs.

As SSC responds to existing customer needs and seeks to diversify its customer base, it is imperative that the organization maintain a professional approach to program management. One aspect of this approach is to ensure that all personnel receive the requisite training and certification in project management. SSC will continue to focus on technical excellence; an inherent NASA cultural characteristic. SSC is committed to effectively managing programs through responsiveness, accountability and communication with stakeholders.

SSC will aggressively focus resources on responding to customer requirements within the matrix of technical, budgetary, and schedule considerations. Additionally, SSC will actively engage in frequent communication with its customers, provide program status information, discuss challenges, and provide timely responses to inquiries. The strategic plan will serve as a powerful communication tool for stakeholders, SSC personnel and external interests.

Objective 5.1: Improve responsiveness to customer requirements through conscientious program execution.
Objective 5.2: Provide consistent and coherent messages on program strategy, direction and status.
Objective 5.3: Recruit and retain civil servant technical expertise in science, engineering, project management, and business development.
Objective 5.4: Maximize use of Agency training and education resources to enhance civil servant skills.

Tactics:
Objective 5.1: Improve responsiveness to customer requirements through conscientious program execution.
- Establish clear requirements and expectations for all project plans, including development of quantifiable performance metrics, before commencing work
- Regularly meet with NASA HQ program managers to discuss technical issues and progress
- Hold HQs accountable for establishing program priorities, expectations and funding levels

Objective 5.2: Provide consistent and coherent messages on program strategy, direction and status.
- Establish outreach team to communicate Applied Research and Technology strategy
- Identify relevant professional conferences and other outreach forums and develop targeted messages
- Conduct periodic program reviews to continually assess project performance

Objective 5.3: Recruit and retain civil servant technical expertise in science, engineering, project management, and business development.
- Foster a work environment that values technical innovation and outreach
- Engage current personnel in the recruitment and selection of new management and staff
- Provide incentives for current personnel to recruit additional staff
- Interface with Office of Human Capital to identify opportunities for workforce development (including training, internships, and the availability of slots for new hires)
- Establish clear, written criteria for performance awards, honors, and promotions
- Consider "Term" positions to meet short-term, changing needs
- Matrix other personnel to address short-term personnel needs

Objective 5.4: Maximize use of Agency training and education resources to enhance civil servant skills.

- Require ARTPO Project Managers be PMI certified or the equivalent
- Use skills inventory and gap assessment to formulate Individual Development Plans

Goal 6: Leverage Verification and Validation capabilities to contribute to NASA science and technology initiatives.

As available resources within NASA tighten and cause reductions and delays in the launch of new Earth science missions, NASA and other agencies will need to rely on commercial and international data sources. By the year 2010, more than 50 imaging satellites (mostly international) with better than 40-m ground sample distance (GSD) are expected to be operational. A number of these systems produce very high spatial resolution datasets with better than 10-meter GSD. These systems can answer questions that cannot be addressed with coarser resolution systems and serve a niche for a variety of science and application issues. Although it is difficult to estimate the total worldwide investment in these systems, it is easily in the billions of U.S. dollars.

During the past 7 years, SSC has built a cohesive team of federal agencies and academic institutions across the nation to perform comprehensive calibration and validation (cal-val) of commercial and international moderate- and high-spatial-resolution electro-optical image products. Through these efforts, SSC characterized several data sources beneficial to science and operational applications. SSC led the development of the highly successful JACIE (Joint Agency Commercial Imagery Evaluation) team that leverages the capabilities of NASA, USGS, NGA, and key academic institutions to perform cal-val. These cal-val efforts benefit NASA research, other federal agencies, the Department of Defense (DoD), and the commercial sector, and they provide a giant step toward the Global Earth Observation System of Systems (GEOSS) era.

SSC conducted such characterizations for several commercial aerial digital camera products and for commercially available, electro-optical, high-spatial-resolution image products from Space Imaging® (now GeoEye™) IKONOS®, DigitalGlobe® QuickBird®, and ORBIMAGE® (now GeoEye) OrbView®. SSC has also been part of the Department of Energy (DOE) Multispectral Thermal Imager cal-val team for thermal band radiometric calibration. Recently this role has expanded to include the moderate-resolution Indian Space Research Organization (ISRO) RESOURCESAT-1 Advanced Wide Field Sensor (AWiFS) image products (commercially available through GeoEye).

Many of these new systems are candidates for the GEOSS: an international satellite constellation designed to monitor the Earth in a coordinated, comprehensive, and sustained fashion. The GEOSS model intrinsically provides for sharing multi-source remote sensing data products within the 62 member countries, the European Commission, and the 43 participating organizations. The need to characterize these data products is essential because many systems are not typically calibrated in a manner consistent with or required by the science community. The ability and need to develop and launch systems is often driven by factors other than basic or applied science (e.g., disaster management, intelligence gathering) and therefore may not be very well characterized. Understanding the data characteristics and operational aspects of these systems will be a key component to the success of future research.

Objective 6.1: Provide calibration/validation analysis for international initiatives.
Objective 6.2: Seek opportunities supporting NASA research programs.
Objective 6.3: Support calibration/validation requirements of other federal agencies.

Tactics:
Objective 6.1: Provide calibration/validation analysis for international initiatives.
- Identify opportunities for calibration/validation work through participation in international organizations policy groups
- Participate on the Committee on Earth Observation Satellites (CEOS) to establish calibration/validation requirements
- Gain membership on CEOS Working Group for Calibration and Validation (WGCV)

- Support USDA Foreign Agricultural Service (FAS) requirements for characterization of AWiFS image products
- Research and identify new potential customers
- Participate in the American Society of Photogrammetry and Remote Sensing (ASPRS) and International Society for Photogrammetry and Remote Sensing (ISPRS)

Objective 6.2: Seek opportunities supporting NASA research programs.
- Develop white paper on the value of V&V and JACIE Team for NASA research programs
- Brief NASA HQ on V&V capabilities including assessments of moderate resolution systems
- Establish NASA cal-val working group to support NASA science requirements
- Re-establish ties with the North American Carbon program
- Develop partnerships with Naval Research Lab and academia to utilize ocean platforms and ships to support NASA Ocean Biology and Biogeochemistry program calibration/validation requirements

Objective 6.3: Support calibration/validation requirements of other federal agencies.
- Expand JACIE membership to include NOAA and USDA
- Develop tighter integration with USGS EROS Data Center (EDC)
- Work with other federal agencies to develop calibration/validation requirements
- Market capabilities to DoD, National Reconnaissance Office (NRO) and other federal agencies
- Support transition from analog film to digital cameras

Goal 7: Cultivate a positive and healthy work environment.

Program management excellence is closely linked to maintenance of a professional work environment that promotes creativity, openness, trust, teamwork and individual respect. This is cultivated, in part, through clear delineation of authority, and linkage of authority to accountability. As such, the organization will take steps to ensure that each individual understands the scope of their authority, roles and responsibilities, and corresponding performance measures. Staff and management will promote excellence through performance accountability. SSC is committed to an organizational culture that promotes free and open communication, including forums for discussion of dissenting opinions. Additionally, all staff and management are expected to contribute to an environment that promotes mutual respect and tolerance.

Objective 7.1: Link responsibility to authority in all business processes, including tasking, scheduling, and budgeting.
Objective 7.2: Establish clearly defined roles and responsibilities for everyone in the organization.
Objective 7.3: Establish accountability for work performance.
Objective 7.4: Open and continual communication.

Tactics:
Objective 7.1: Link responsibility to authority in all business processes, including tasking, scheduling, and budgeting.
- Establish Task Agreements between ARTPO and S&TD to clearly delineate responsibility and authority
- Utilize Work Breakdown Structure to document specific assignments of responsibility and authority.

Objective 7.2: Establish clearly defined roles and responsibilities for everyone in the organization.
- Establish clear chain of authority for the acceptance and implementation of new requirements
- Establish clearly defined organization structure and individual authorities/responsibilities
- Establish clear technical contacts for each activity or SWR so technical authority is not challenged

Objective 7.3: Establish accountability for work performance.

- Develop performance-based evaluation plans to accurately assess individual performance against WBS assignments
- Develop quantifiable metrics and integrate into individual performance plans
- Establish written responsibilities for management and staff

Objective 7.4: Open and continual communication.

- Re-establish monthly program reviews and status briefings by program/project personnel and contract staffs
- Establish weekly tag-up meetings between ARTPO and S&TD to review weekly priorities and identify potential program risks
- Establish weekly meetings between civil servant management and contractor staff management to review weekly priorities and identify potential program risks

SUMMARY AND OUTSTANDING ISSUES

SSC Center management requested ARTPO and S&TD consider specific elements in the strategic plan. These elements include business implementation approaches and models that are most appropriately analyzed for feasibility in the context of a business development / implementation plan. The purpose of this strategy plan is to provide a general framework to guide the organization to a new mission that is clearly tied to NASA mission areas, and better aligned to support implementation of the Vision for Space Exploration. The subsequent business plan will build upon this general framework to provide realistic business case scenarios with realistic goals and measurable outcomes. The following elements will be important to consider in business case analyses:

1. Intergovernmental Personnel Assignments (IPAs): IPAs are a useful mechanism to address skill gaps and other staffing needs. This alternative provides the means to flex the workforce based on changing requirements, and allows the organization to hire individuals with focused areas of expertise for a limited duration.

2. Leverage the Navy's computational capabilities: The Navy maintains an operational rapid prototyping capability (RPC) similar to the one currently in development at SSC. Potential collaborative projects should be identified and pursued. In addition, the super computing capability should be evaluated in order to identify availability for shared utilization.

3. Research and Development Structure: SSC should consider alternative structures to facilitate research and development across government, industry, and academia.

    a. The "Institute" Concept: Examples include the National Space Science and Technology Center (NSSTC) in Huntsville, Alabama and the Goddard Institute for Space Studies (GISS) in New York City.

        - NSSTC – a partnership between NASA's Marshall Space Flight Center, Alabama universities, federal agencies, and industry that is focused on cutting-edge research in science and engineering, and workforce development.

        - GISS – a partnership between NASA's Goddard Space Flight Center and Columbia University. GISS is a laboratory of the Earth Sun Exploration Division at GSFC (SMD) and a unit of the Columbia University Earth Institute with a focus on the study of global climate change.

4. SSC Partnership with Marshall Space Flight Center (MSFC): SSC and MSFC have a long and positive history of work partnerships. SSC should seek opportunities to work with MSFC to support other NASA mission requirements in the areas of exploration and space operations, and consider collaborative projects with MSFC to include connections to SSC's Rapid Prototyping Capability.