Office of the Chief Technologist
Space Technology Programs; Early Stage

The Small Business Innovation Research and the Small Technology Transfer Research Programs **(SBIR/STTR)**

Presentation to the NASA Advisory Council (NAC), Technology & Innovation Committee

April 26, 2011

Program Executive – Carl G Ray

SBIR/STTR Program Descriptions

Small Business Innovation Research (SBIR)

Set-aside program for small business concerns to engage in federal R&D with potential for commercialization.

2.50%

- **Participation: Departments with more than $100,000,000 in Extramural R&D**

Small Business Technology Transfer (STTR)

Set-aside program to facilitate cooperative R&D between small business and U.S. research institutions with potential for commercialization.

0.30%

- **Participation: Departments with more than $1B in Extramural R&D**

SBIR/STTR Congressional Legislative Purpose

- A legislated federal research and development (R&D) set-aside for small high-technology firms
- A way for government to use the innovation and efficiency of small high-technology firms and research institutions to meet federal R&D needs
- An opportunity for small, high-technology companies and research institutions to participate in government R&D programs
- A way to promote U.S. economic development through private sector commercial application of government funded R&D
- Congressional Objectives
    - Stimulate technological innovation
    - Use small business to meet federal R&D needs
    - Foster and encourage participation by minorities and disadvantaged persons in technological innovation
    - Increase private-sector commercialization innovations derived from federal R&D

SBIR/STTR: 3-Phase Program

- **Phase 1**
  - Feasibility study
  - $150K Contract Award **($125K current plans for NASA FY2011 Solicitation)**
  - 6 months duration (SBIR)
  - 12 months duration (STTR)
- **Phase 2**
  - Technology Development
  - 2-Year Contract Award
  - $1Mil (SBIR/STTR) **($750K current NASA Solicitation)**
  - **$250K Phase-2E/Phase 3 Bridge Option (New FY2011 program Feature)**
- **Phase 3**
  - Technology Infusion/Commercialization Stage
  - Use of non-SBIR Funding Agreements
  - Ability to award sole-source contracts without - Further need for Justification Other than Full and Open competition; (NO-JOFOC) based on specific SBIR authority – NASA and NASA primes.

NASA SBIR/STTR Programs

Proposed Budget Authority ($ millions)	FY11	FY12	FY13	FY14	FY15
SBIR/STTR Programs	138.1	173.3	173.3	173.3	173.3
SBIR Awards	*124.0*	*154.7*	*154.7*	*154.7*	*154.7*
STTR Awards	*14.1*	*18.6*	*18.6*	*18.6*	*18.6*

SBIR

Research and technology topics are for the SBIR program are identified annually by Mission Directorates and Center Programs. OCT and Mission Directorates identify high priority research and technology needs for current programs and projects and future mission needed technology investments

STTR

Research and technology topics for the STTR Program are aligned with needs associated with the research interest and core competencies across NASA Centers again for current and future missions

Both programs support a broad range of technologies defined by a list of topics and subtopics that vary in content within each annual solicitation.

SBIR/STTR FY2011 Program Implementation Objectives

Key Objectives:

- Maintain alignment with new organizational structures and OCT guidance
- Sustain improvements in support of reducing Waste, Fraud and Abuse in program
- Increase utilization rate of SBIR/STTR Technologies into MD Programs and foster infusion capability through OCT follow-on development resources
- Maintain Program quality, while minimizing impact of new program challenges
  - *Maintain viable program administration requirements and cost*
- Efficiently track quality projects beyond SBIR/STTR program

SBIR/STTR FY2011 Program Implementation Strategies

Key Strategies:

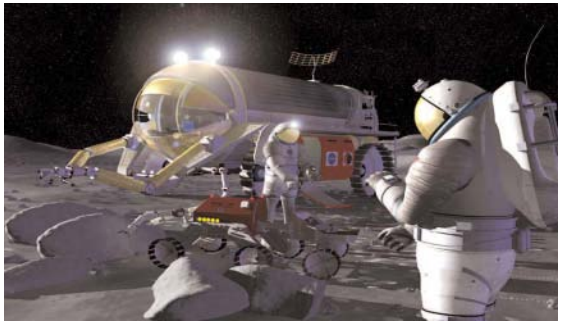
- More top level coordination with MD and agency functional organizations
- Increase administrative support at centers for stronger emphasis on program quality and integrity
- Broader participation in topic/Subtopic allocation and award distribution strategies
- Better control over Topic and subtopic Quality
- Increase funding opportunities for Phase 1 and 2 awards
  - More leveraged use of other OCT assets and increased opportunities for technology maturity (ie. Demo Flight Opportunities)
  - Provide better /monitoring / processes / tools for technology infusion

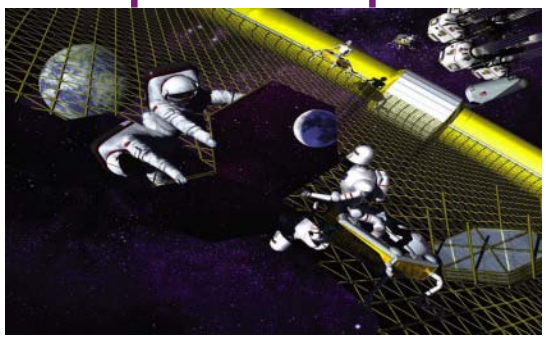
NASA OCT - Early Stage - SBIR/STTR

- Now as an integral part of Space Technology Program, the SBIR and STTR Programs are continuing to build on their rich history and investment opportunities for innovative ideas from small companies across the Nation.

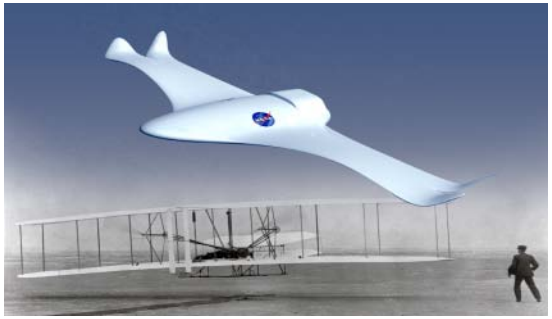
- The OCT and the Center Chief Technologists are working to improve the synergy between the SBIR/STTR programs and the Mission Directorates on the agency technology portfolio and investment needs through topic development, selection and reporting processes .

Human Exploration and Space Operations

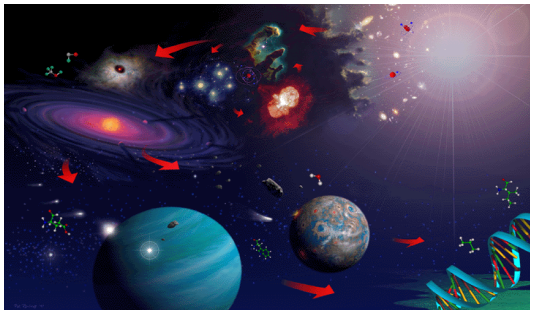




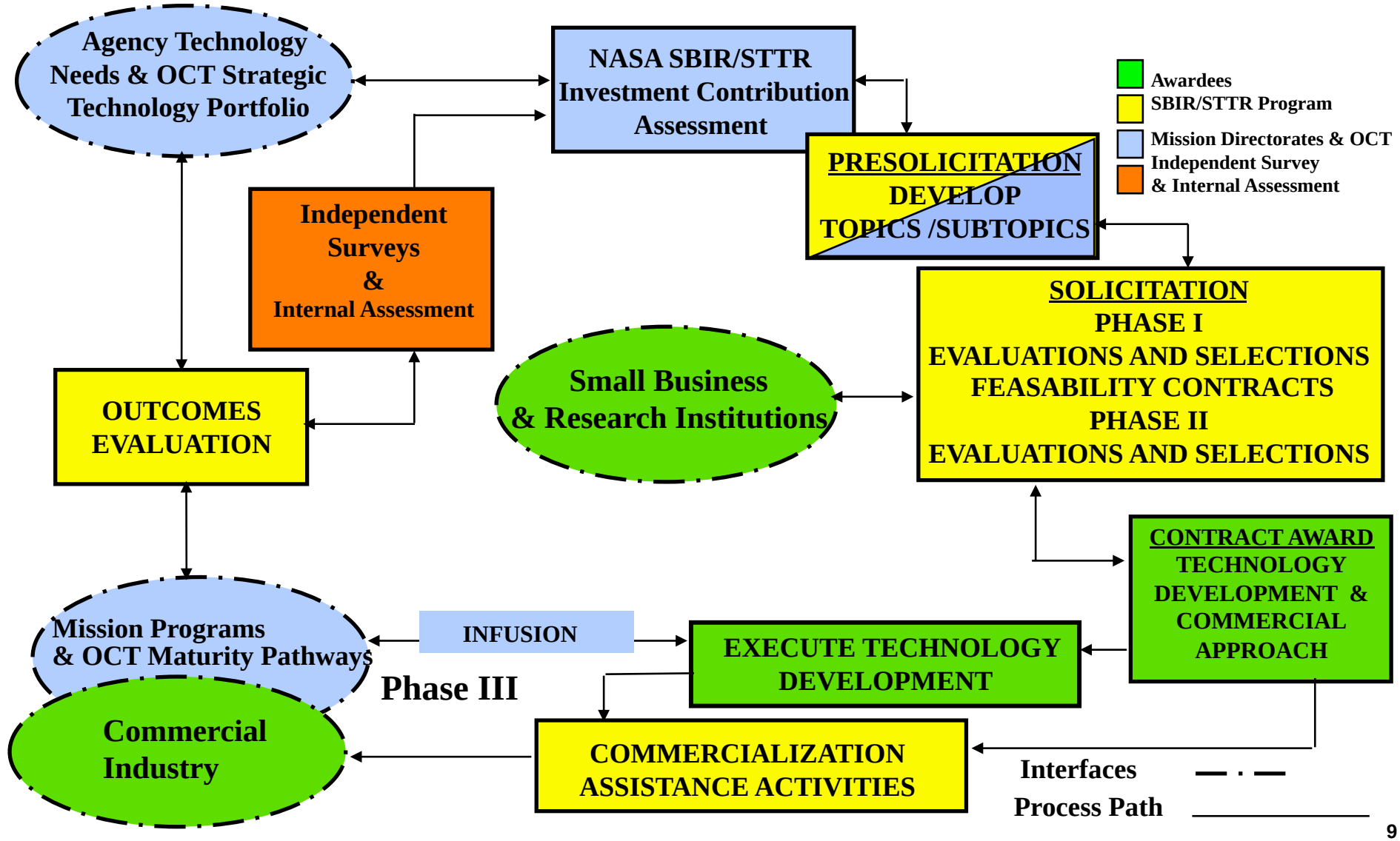
Aeronautics



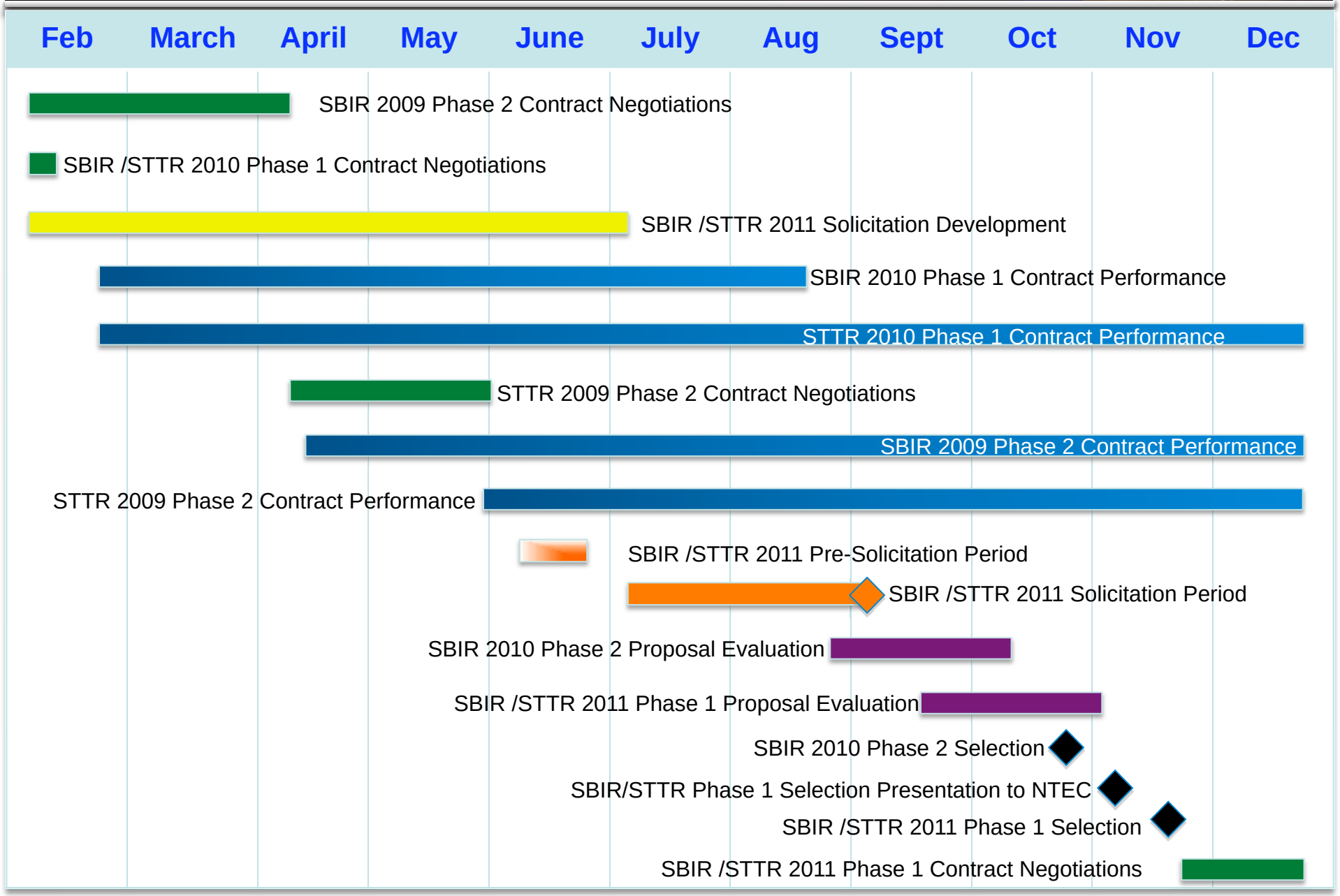
Science



NASA SBIR/STTR Strategic Implementation
TECHNOLOGY DEVELOPMENT & INFUSION PROCESS FLOW



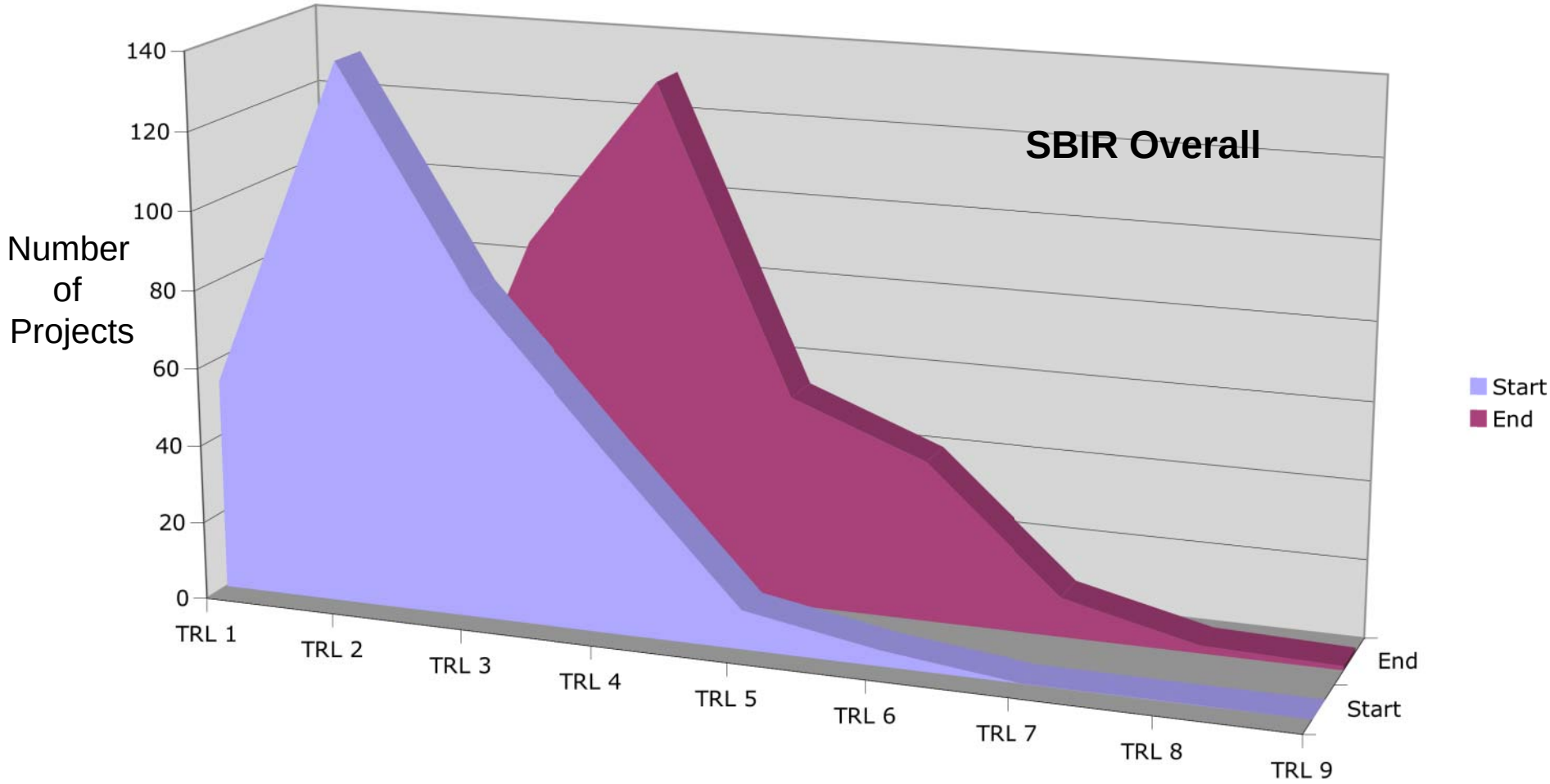
SBIR/STTR Program Master Schedule



SBIR/STTR Program and its many Interfaces

Ability to Move Technology
TRL Typical Maturation Profile

Firm Projected TRLs of Phase 1



Resent Program Impacts, Challenges & Improvements

- Reauthorization
- Program/OCT Strategic Transition/Integration
- Obligations and Costing FY2010 (CAS 1 year Appropriations)
- **SBIR 2.0 White House SBIR 2.0 Best Practices and New Initiatives**
- **OIG 2008-2009 Audit/Investigations Recommendations**

Strategic Program Initiatives

Participating in the White House /SBA Led SBIR 2.0 Interagency Initiative

- Streamlining the awards process (selection to award)
- Simplification of Data Rights/IP
- Performance Management – metrics
- SBIR portal and cross agency solicitation – one stop portal for information for all 11 agencies
- **Bridge Financing – Phase 2-E's**
- **Technology Transfer- use of the NIST model**

- **24 Phase 2-E's:** Initiated with 2007 Phase 2 contracts.

  Provide matching funds for Phase II firms nearing the end of their contracts to investigate and enhance their ability to apply their resulting SBIR/STTR technologies to other potential areas of utilization and incentivize the pursuit Phase III opportunities at the same time.

- **Technology Transfer:**

  This initiative leverages existing NASA investments in research and development to further the maturity of that R&D through utilizing SBIR and STTR as a development pathway to applications both for NASA and the Commercial marketplace.

NASA SBIR/STTR Program Response to OIG 2008 Audit and 2011 Report Recommendations

NASA's SBIR/STTR program: Improvements resulting from OIG audit

- **Increase SBIR/STTR Program Awareness**
  - Individual Performance Plan, monetary awards implications; in-reach at Centers.
  - Program EHB and Process Overview as part of IG Training (Completed October 12th)
- **Acquisition Integrity Training for COTR & program staff: Waste, Fraud and Abuse**
  - Implement training; establish SBIR/STTR program liaison with Acquisition Integrity Program. (Established)
- **SBIR/STTR EHB Enhancement**
  - Utilize Cloud Computing software for making comparisons among technical proposals. (EHB capability completed)
- **Increase Admin Management Level II**
  - Strengthen EHB security. (NAMS)
  - Re-establish commercial metrics survey of firms. (System in place ready for July2011 Start up)
  - **Waste, Fraud and Abuse media campaign (First Publication completed)**
- **NSSC Increased Support**
  - **Greater contract surveillance; Virtual sight Visits; (Validation completed with (29) 2009 Phase II ARRA projects)**
  - Past Performance validation. (Database Completed)
  - Quarterly re-certification. (Completed)
  - Greater scrutiny of technical proposals and cost/price analysis. (completed)
- **Increased Center Admin Management** (Completed increase for 2011)
  - SBIR/STTR Increased administration support at Centers to ensure sufficient internal controls oversight and contract performance surveillance (Additional 10 FTE's Requested for 2012 Support funds)

Waste Fraud and Abuse Media Campaign

Virtual Site Visit – Remote Project Assessments

“Virtual Site Visits”

Provide firms pre-developed briefing chart formats to be presented in a web-ex environment (using web-based visual and voice telecommunications) to allow virtual overview of current firm organization, project management, firm financial status and technical progress of project.

- Attendance by COTR, Technical Experts, Contracting Officer, Program Procurement and Financial Representatives, Acquisition Integrity Program and Others by Invite
- Presentations cover performance areas of Contract Administration and Technical Progress Assessment information.
- Presentations are approximately 15-20 minutes and 10 minutes for questions
- Follow-up review assessments by agency personnel performed to make risk determination for physical site visit requirement.

Virtual Site Intro Quad Chart

Facility and Staff

Example questions provided:

- How many people are working on the effort
- Where is the facility (please provide a picture of facility/lab on an additional chart

Research Goals

Example questions provided:

- Would like to prepare for a Phase 3 and for commercialization

Accomplishment

Example information:

- Have successfully tested a working model

Cost Status

Example information:

- Currently we have been awarded $__ and have used the funds to do

Current Program Award Status

From 2010 SBIR/STTR Solicitation, the following award selections were made:

- Existing SBIR/STTR Phase II's (In last Phases of contracts)
- FY2011 SBIR Phase I Awards 450 (under contract)
- FY2011 SBIR Phase II Awards 216 (Awaiting FY2011 funds)

- FY2011 STTR Phase I Awards 45 (under contract) fund to 60K
- FY2011 STTR Phase II 27 (Just awarded April 15th)
- FY2010 New Phase 2E 24 (under contract)

Program Initiatives and Features – NTTC Industry CD's

30 CD,s have been developed and mad available for distribution.

Example NTTC CD Product SBIR : Target for Space Operations Mission Directorate

- Contains information on 2002 - 2005 Phase I and Phase II communication technology SBIR contracts and products in quick scan "Quad Chart" format.
- Includes interface allowing access to on-line searchable data source
- Portfolios by technological area including enabling technologies
- Link to Solicitation, Awarded Proposal Abstract, Area of interest, SBC Website

Navigation CD included:

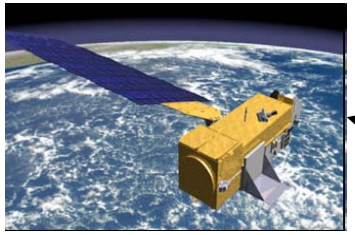
- 39 pertinent NASA and DoD SBIR-STTR companies
- 130 publications and articles from the NTRS
- 48 US Patents
- 83 US Patent Applications
- 22 foreign Patent Applications from the WIPO
- 42 Phase I SBIR-STTR awards from '05 through '07
- Non-US R&D and Academic Centers of Excellence

Small Spacecraft CD includes:

- 110 NASA and DoD SBIR/STTR companies
- 304 articles and publications from the NTRS
- 93 US Patents
- 87 US Patent Applications
- 78 foreign Patent Applications from the WIPO
- 83 Phase I SBIR-STTR awards from '05 through '07
- Non-US R&D and Academic Centers of Excellence

Presentations available by technological area on website:
http://www.sbipp.com under Technology Portfolios if access to a CD is not available.

SBIR/STTR Technologies & Mission Utilization



Aura

Phoenix

Hubble

Rosetta

Xionetics
Deformable Mirror Technology

Spaceborne, Inc.
Correlator Chip for Radio Astronomy

Yardney Technical Products
Lithium-Ion Batteries

SpaceDev
Wet Chemistry Analysis

Honeybee Robotics, Inc.
Icy Soil Acquisition Device

Starsys Research
Heat Switch Control Radiator

IA Tech
Planning Collaboration Software

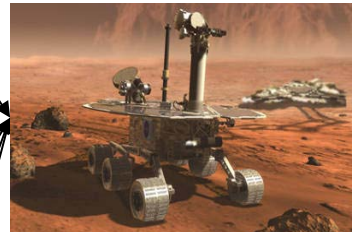
Maxwell Technologies
Electronics

Advanced Optical Systems
Video Guidance Sensor

Surface Optics Corporation
Mirror Coating Process

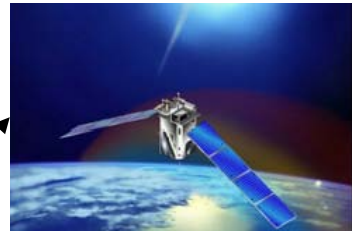
Sensor Sciences, LLC
UV Detectors

Palomar



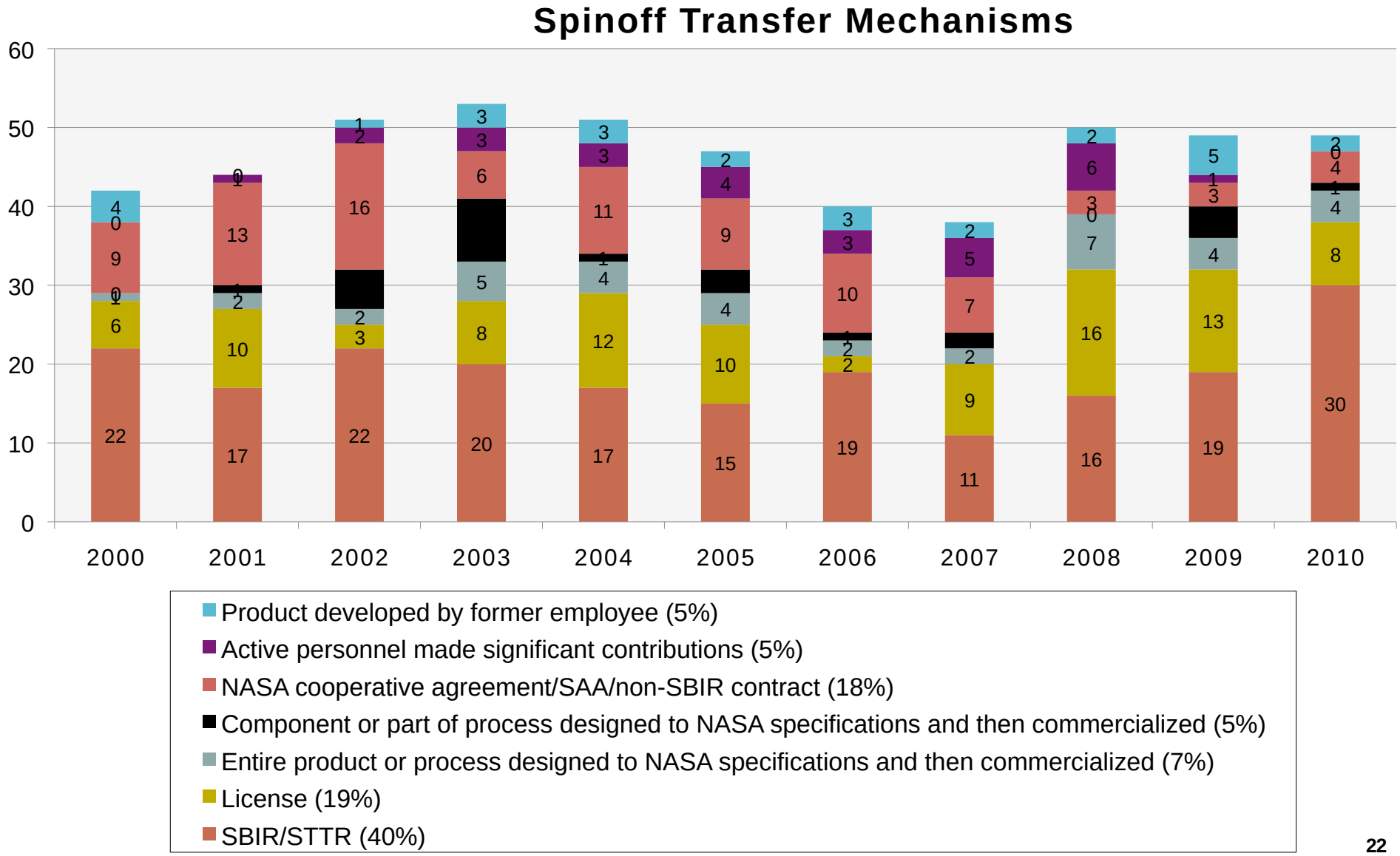
MER

Kepler



TIMED

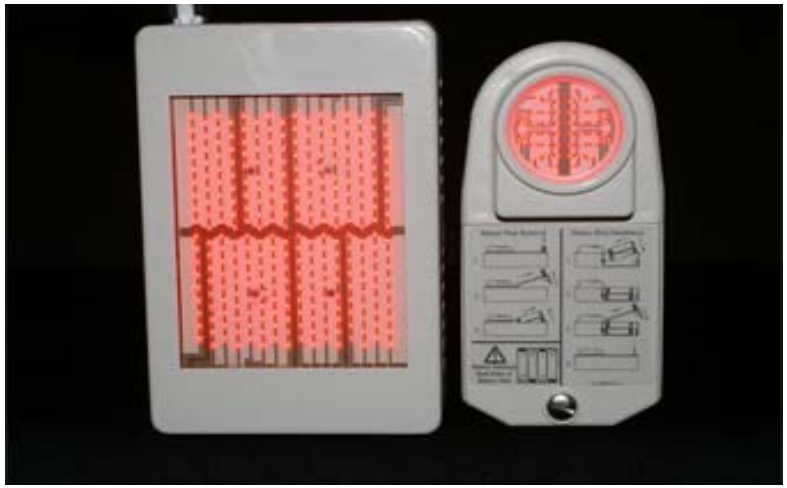
Sources of Spinoffs



Commercial Product - Spinoffs.

Health and Healing Photodynamic Therapy
WARP 75® Light-Emitting Diode (LED) Device

Quantum Devices, Inc.



INNOVATION (Phase 2 2003)

•The technology is a high-intensity LED unit intended for the treatment of chronic pain. This includes the temporary relief of minor muscle and joint pain, arthritis, muscle spasms and stiffness.

•The device is s 7.5 times larger, more powerful version (Fluence of 3.6 Watts) of the company's WARP 10® product

COMMERCIALIZATION

• WARP 75 is a registered trademark
• Product is commercially available
•Technology has become the industry standard for photobiomodulation (PBMT) research, photodynamic cancer therapy and agriculture research (Phase 3 2005)

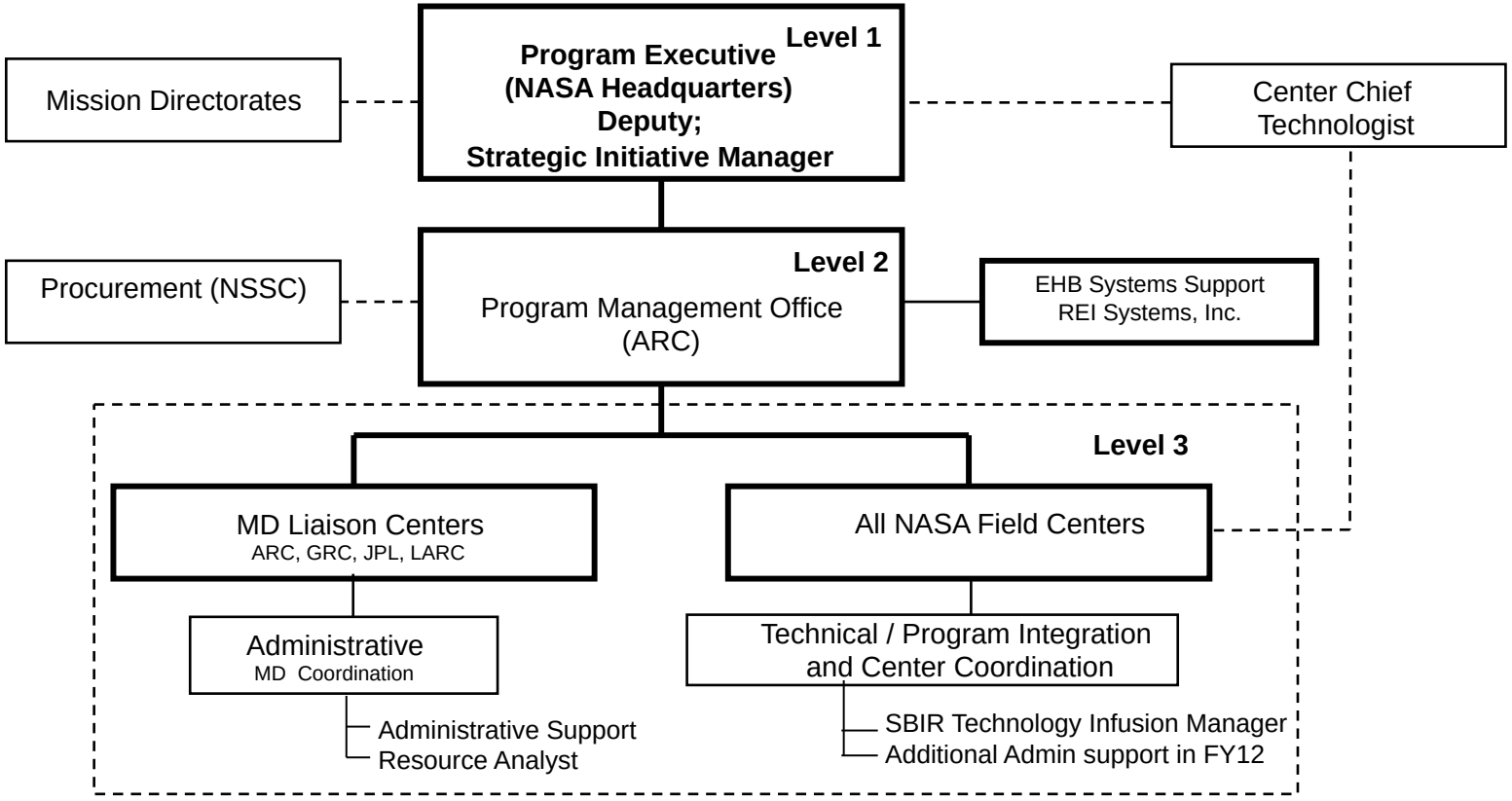
GOVERNMENT/SCIENCE APPLICATIONS

• Quantum's HEALS (High-Emissivity Aluminuferous Light-Emitting Substrate) LEDS were first used for NASA to grow plants in space as part of the Astroculture Plant Growth Facility

Backup

FY2011/12 SBIR/STTR Program Organization Structure

- Agency Road Map Technology Areas (TA)'s integration Supported by Center Chief Technologist
- Mission Directorate (MD) integration supported by assigned MD Representatives
- SBIR/STTR Program Liaison Centers
- All Field Centers administrative and Technology Infusion Manager support personnel



SBIR/STTR/Space Technology Program Benefits

The movement of SBIR/STTR to the Space Technology and the Early stage Division provides several new benefits and opportunities

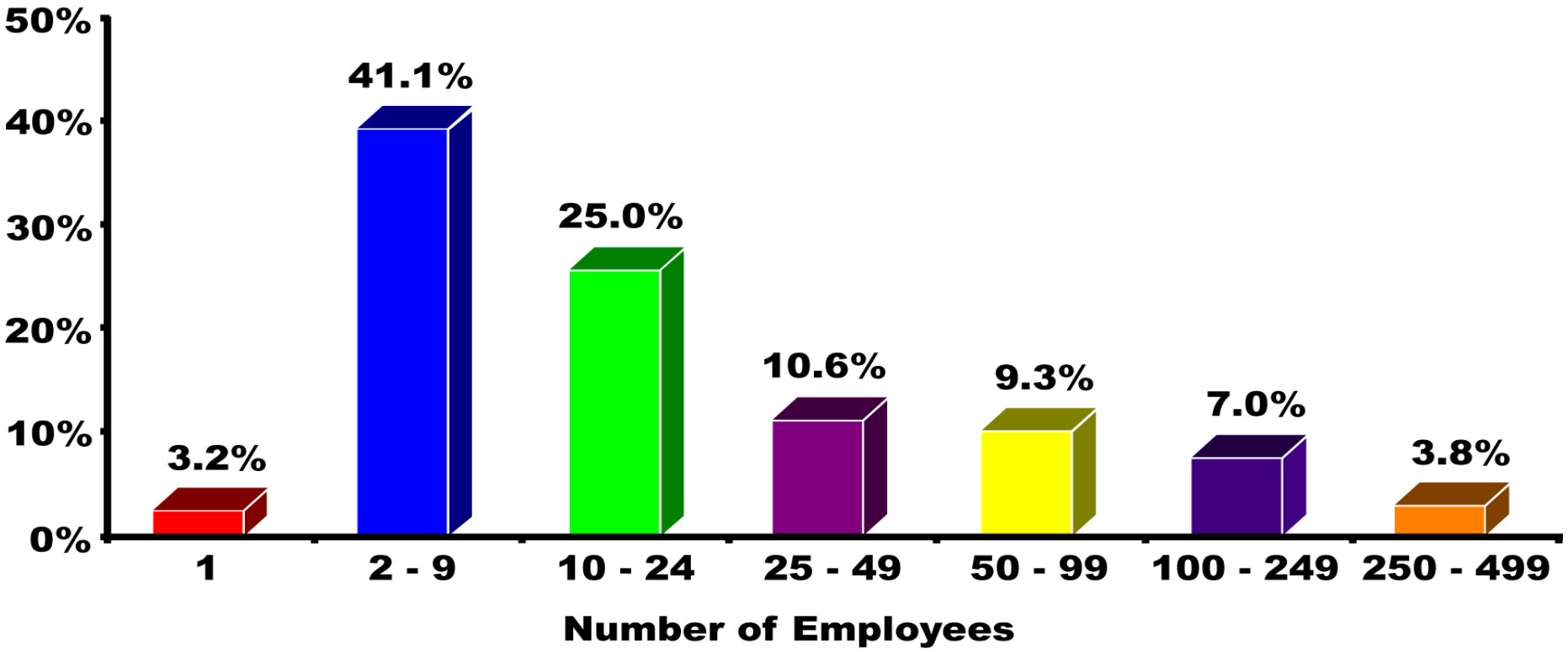
1. Increased strategic focus on technology provides more opportunity to address both current and future needs of the Agency
2. Multiple Early Stage opportunities will improve the quality of the application pool directed at the SBIR/STTR programs
3. The Space Technology program flow provides more structured approach for SBIR/STTR proposers to strategically plan potential paths for maturing their technologies; Help getting through “valley of Death” and additional opportunities for maturation on Early Stage outcomes
4. SBIR/STTR program resources will be more available with better coordination of resources at each center

Resent Program Impacts, Challenges & Improvements

- Reauthorization
  - Numerous continuing resolution since FY 2008
  - Current Reauthorization underway
- Program/OCT Strategic Transition/Integration
  - SBIR/STTR OCT Divisional Program
  - TRL levels (Stay the same)
  - New Center Structures for FY2011 solicitation inclusion of Roadmap TA's)
  - Technology Infusion Managers (expanded role beyond SBIR/STTR)
    - TIMS and MD liaison centers remain
  - Portfolio Management
  - Human Exploration and Operations Mission Directorate
  - External Coordination
- **Increase Center, NSSC/ Administrative Responsibilities (OIG 2009 Audit/Investigations recommendations**)
- Obligations and Costing FY2010 (CAS 1 year Appropriations
  - Contracts – SBIR/STTR Declared Severable
  - Requires some adjustment in Invoicing Structures
- SBIR 2.0 White House SBIR 2.0 Best Practices and New Initiatives
  - SBIR 2.0 – Program Streamlining
  - SBI 2.0 Simplification of Data Rights/IP
  - Performance Management
  - SBIR Portal and Cross Agency Solicitations
  - Bridge Financing
  - Leveraging Tech Transfer activities (NIST initiative)

Who Participates in NASA SBIR/STTR?

- ✓ Firms are typically small and new to the program and Federal Contracts or Grant administration .
- ✓ About 28% are first-time Phase I awardees.
- ✓ Small hi-tech firms from across the country.



FY2010 Appropriations Limitation Challenge

- **Due to 1 year CAS appropriation authority for FY2010 original $124M SBIR and $14.1M STTR budgets were adjusted with ”Op Plan” to move the balance of $83M and $3.5M respectively.**

- **To meet intent of the FY2010 program obligation the balance is being returned in FY2011 in addition to each programs current budget authorization.**

- **This results in an additional obligation of $41.45M and $10.25M respectively for each program or a total of $51.7 in additional FY2011 obligations**

Current Legislative Status

- Small Business Innovation Development Act of 1982
  - Public Law 97-219 enacted July 22, 1982
- Reauthorization Amendment extending program until October 1, 1993
  - Public Law 99-443 enacted October 6, 1986
- Small Business Research and Development Enhancement Act of 1992
  - Public Law 102-564 enacted October 29, 1992
- **Small Business Innovation Research Program Reauthorization Act of 2000**
  - **Public Law 106-554 enacted December 21, 2000**
  - **Law expired Sept 2008**
  - **Has continued under Continuing Resolutions and is currently under Congressional process for Reauthorization "SBIR/STTR Reauthorization Act of 2011"**

SBIR/STTR Participating Agencies

TOTAL ~ $2.2 B
FY 2011

- **DOD** SBIR/STTR
- **HHS** SBIR/STTR
- **NASA** SBIR/STTR
- **DOE** SBIR/STTR
- **NSF** SBIR/STTR
- **HLS** SBIR/STTR
- **USDA** SBIR
- **DOC** SBIR
- **EPA** SBIR
- **DOT** SBIR
- **ED** SBIR

SBIR/STTR: Projected Number Awards

Approximate Number of Projected Awards

SBIR	FY11	FY12	FY13	FY14	FY15
Millions of $	124	154.7	154.7	154.7	154.7
Phase 1 Awards	305	332	332	332	332
Phase 2 Awards	160	155	155	155	155
Phase 2E Awards	30	35	35	35	35

STTR	FY11	FY12	FY13	FY14	FY15
Millions of $	14.1	18.1	18.1	18.1	18.1
Phase 1 Awards	30	35	35	35	35
Phase 2 Awards	18	19	19	19	19
Phase 2E Awards	3	2	2	2	2

Assumes

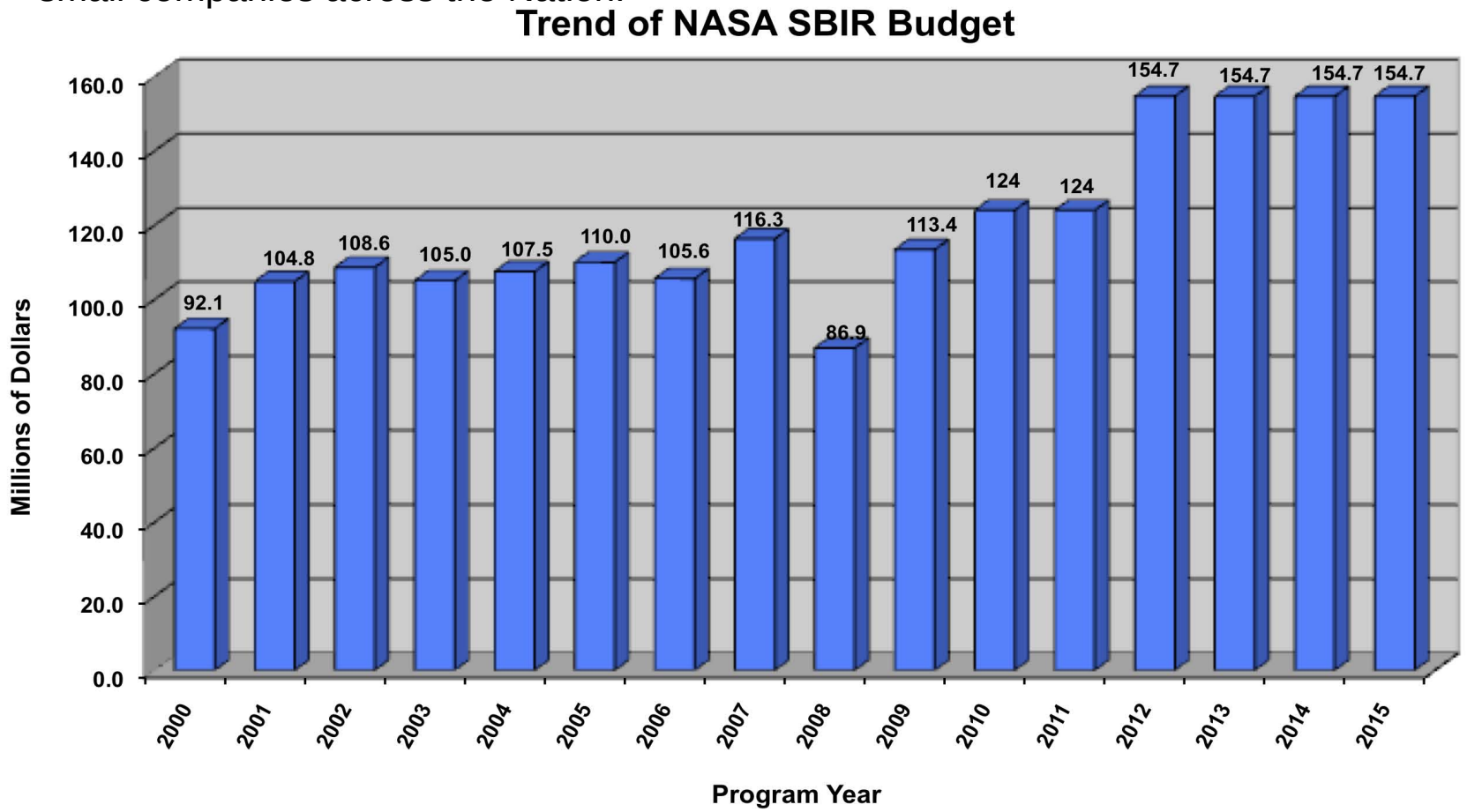
Phase 1 =100K

Phase 2 = 750K (exception FY11= 600K)

Phase 2E =150K

NASA SBIR/STTR Program - a Rich History of Innovation History

This is a long-standing engine of innovation for this country. Now an integral part of Space Technology, the SBIR program will build on its rich history and invest in both ideas and small companies across the Nation.

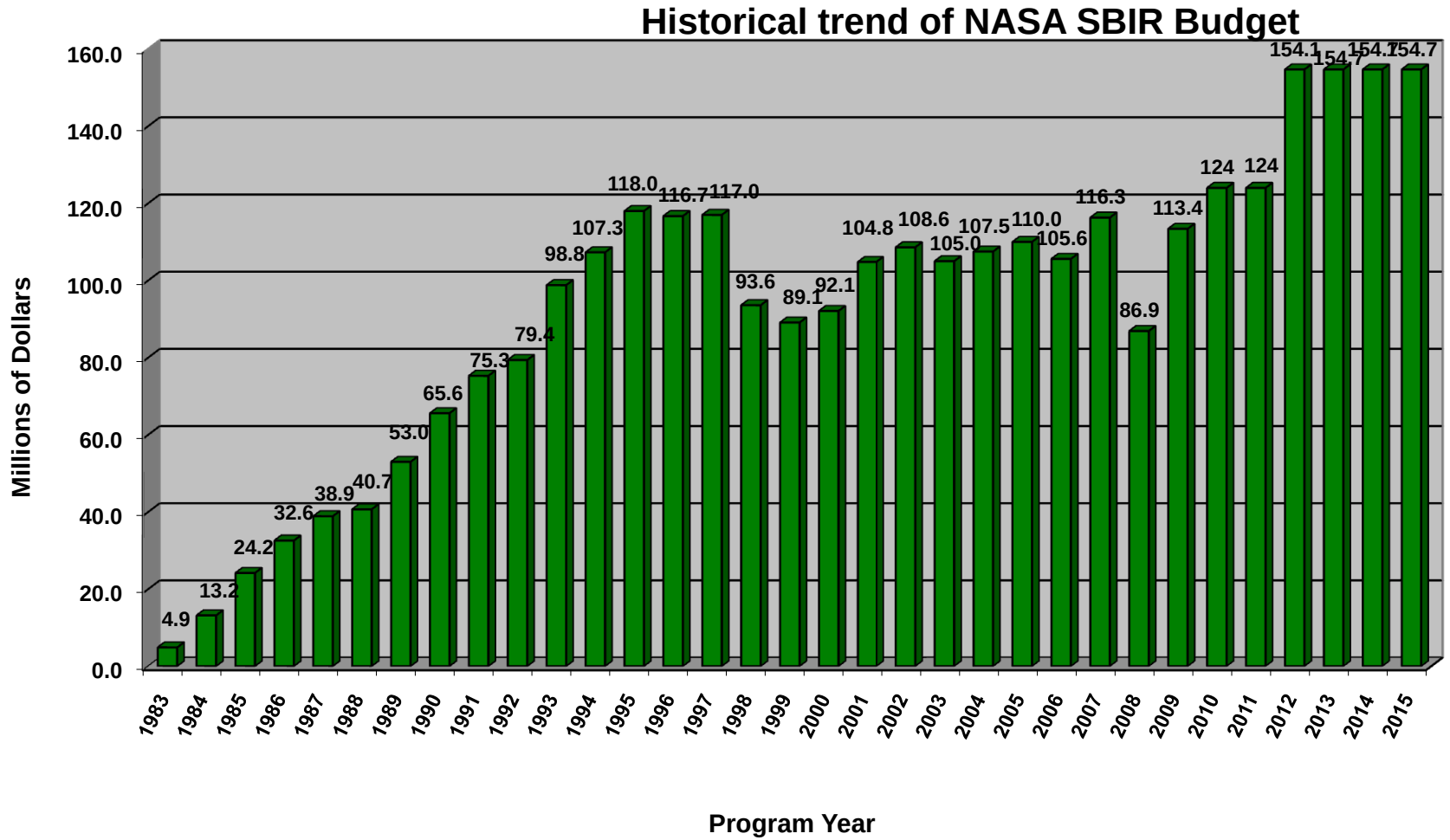


• Due to 1 year CAS appropriation authority for FY2010 original $124M SBIR and $14.1M STTR budgets were adjusted with "Op Plan" to $83M and $3.5M respectively. To meet intent of program obligation the balance is being returned in FY2011 in addition to each programs current budget authorization. This results in an additional obligation of $41.45M and $10.25M respectively for each program in FY2011 Obligations

OCT Space Technology Divisions

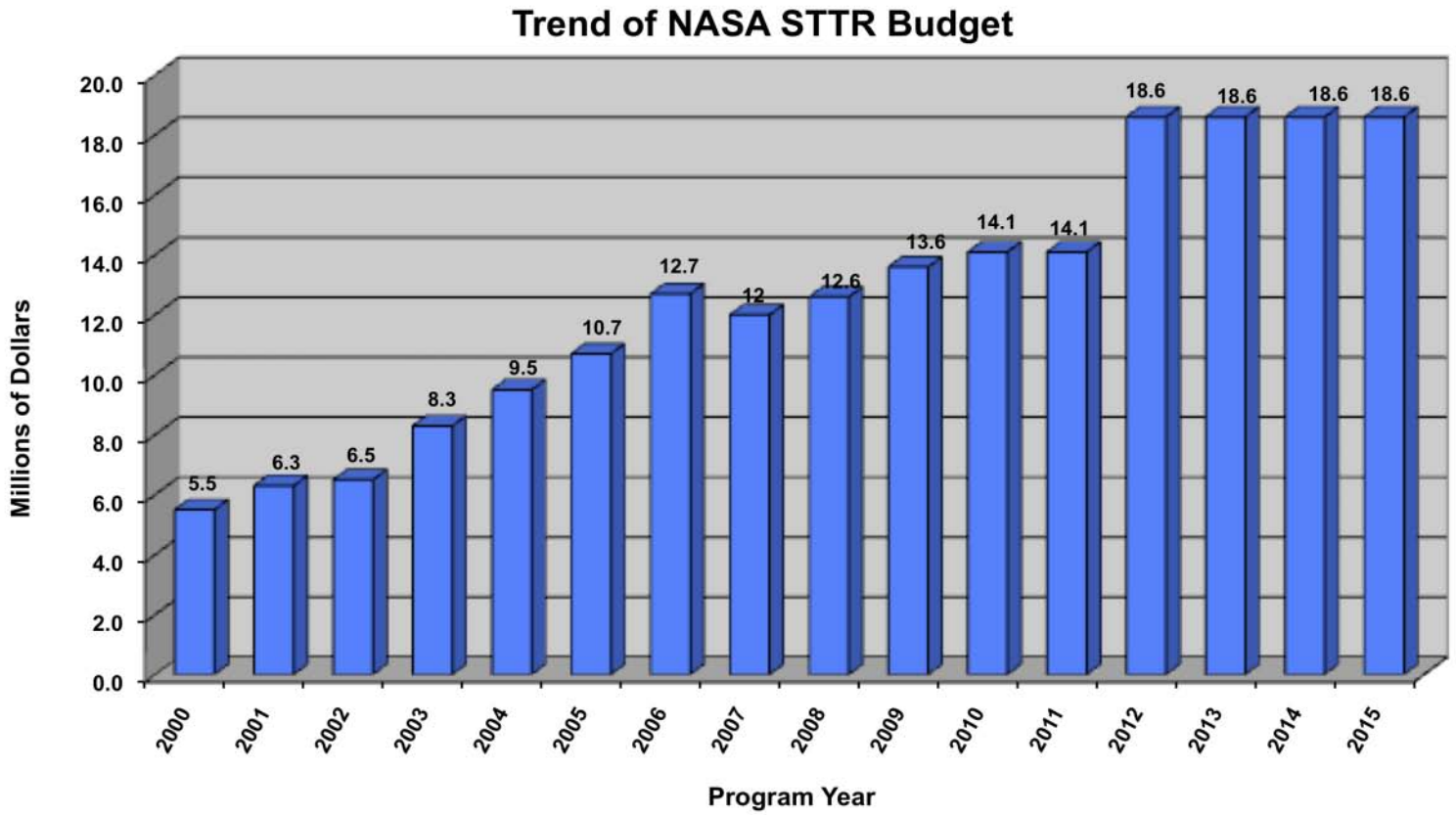
	Early-Stage Innovation	Game-Changing Technology	Crosscutting Capability Demos
Development Stage	Concept Validation (TRL 1-2)	Tech Demonstration (TRL 3-4/5)	System Qualification (TRL 6)
Programs	Space Tech Research Grants NIAC Center Innovation Fund SBIR/STTR Centennial Challenges	Game Changing Development Small Satellite Subsystem Technology	Technology Demonstration Missions Edison Small Satellite Missions Flight Opportunities
Number of Projects	100+	10-20	TDM: 3-8 ESSM: 1-3 FO: 20-40
Typical Project Cost	$50K-$800K	GCD: Large: $25M; Small: $6M SSST: $6M	TDM: $150M from OCT ESSM: $10M FO: < $5M
Project Duration	6 months – 2 years	2 yrs w/potential 1 yr extension	TDM: < 3 years ESSM: < 2 years FO: 6 months – 2 years
Performer Selection	100% Competed	> 70% Competed	> 70% Competed
Typical Performers	Academia, NASA, Industry	NASA, Fed Labs, Industry, Academia	Industry, NASA
Acquisition Strategy	Grants, Contracts, Cooperative Agreements, Prize Competitions	BAAs, Contracts	Contracts, Space Act Agreements
Cost-Sharing	Encouraged	Preferred	Required, 25% min for TDM
Partners	Academia Federal: NASA MDs, DARPA, DOD, DOE, NOAA, NSF, Other Industry: Aerospace, Non-Aerospace International Partners		

NASA SBIR/STTR Program – Budget Management



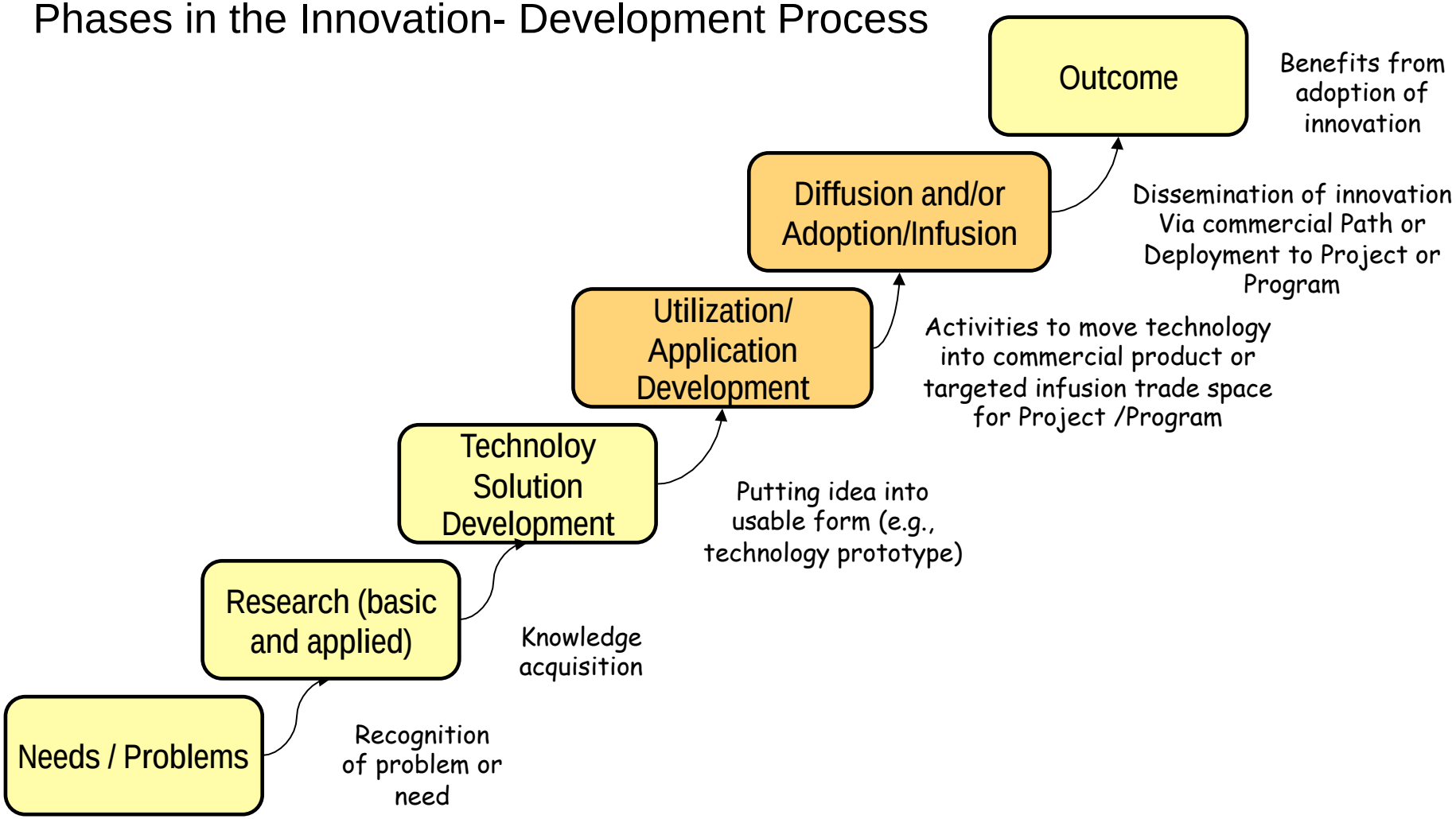
NASA SBIR/STTR Program - a Rich History of Innovation History

And NASA's STTR program as a featured program under Space Technology, will continue to leverage the results of our nations space Research Institutions to facilitate the application and commercialization RI developed technologies, through collaboration and partnerships with Small Business Concerns.



General Innovation Approach

Phases in the Innovation- Development Process

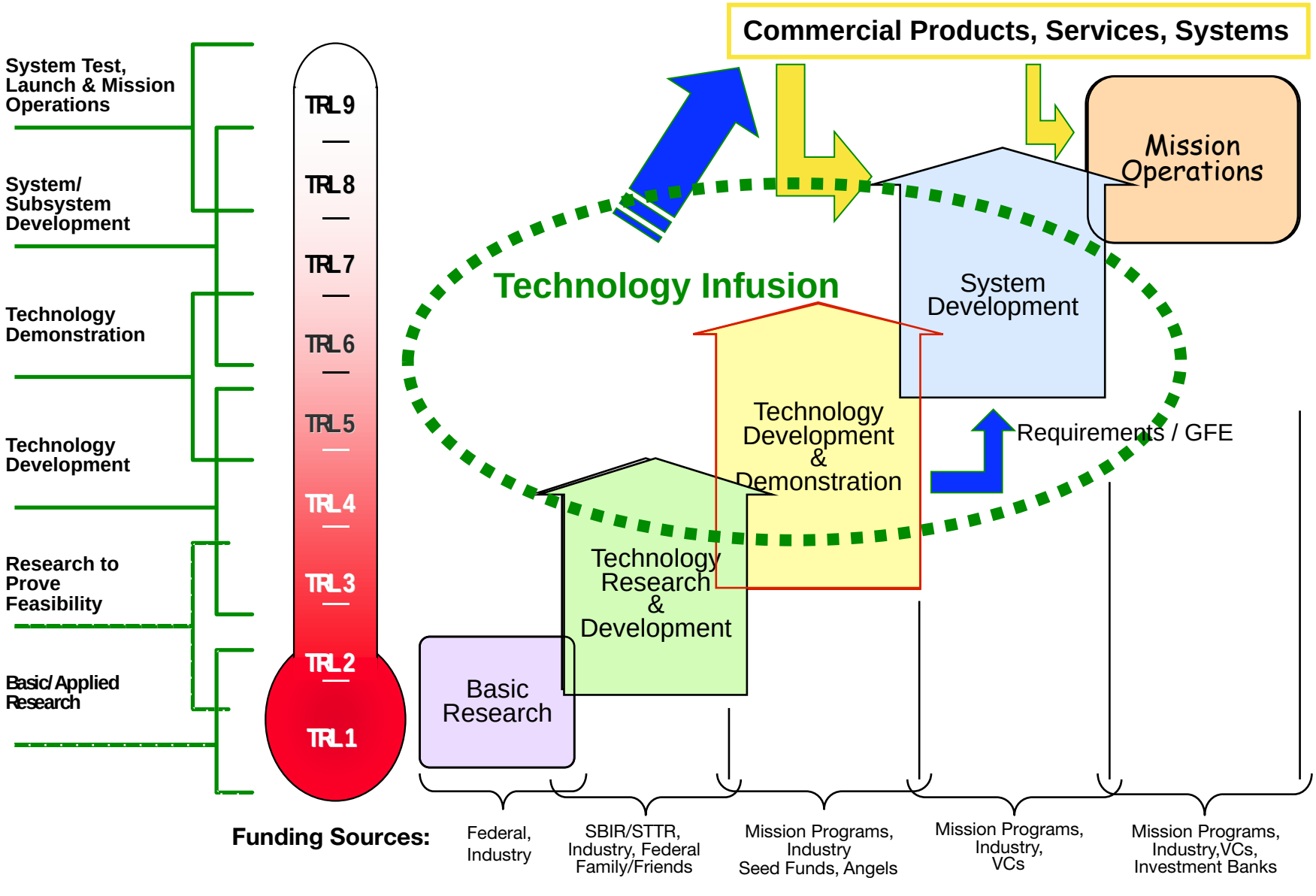


Adapted from: Rogers (1995),"Diffusion of Innovations"

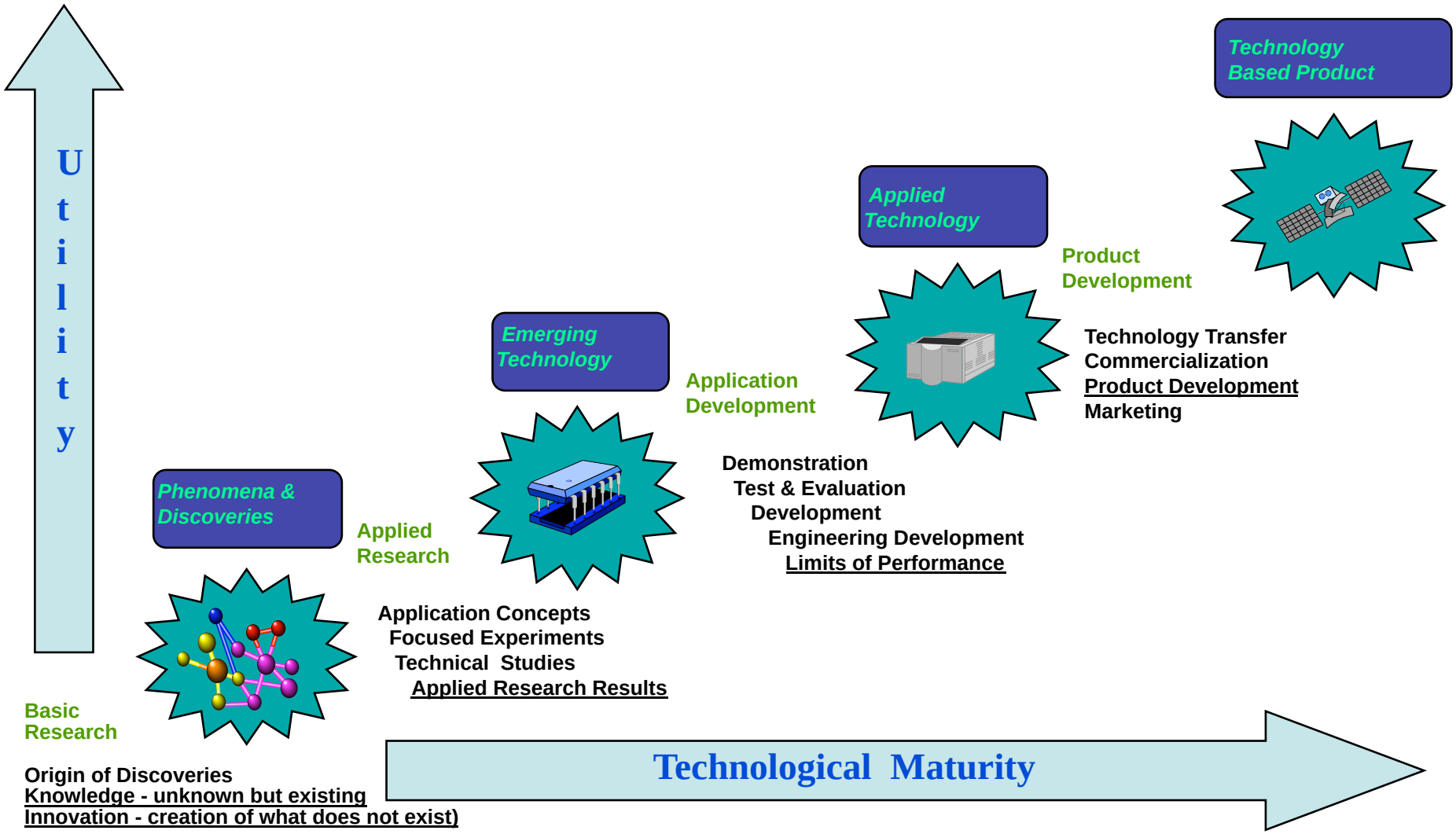
SBIR/STTR Strategic Infusion

- **Assessments** (Oriented towards understanding needs)
  - MD Needs /Challenges (Facilitated under OCT Early Stage Div Processes)
  - OCT Portfolio (Supported by SBIR/STTR Phase II successful Results)
- **Formulation**
  - Capabilities Vision
  - Solution Strategies
  - Portfolio Gap Analysis
  - Strategic Infusion Plans
- **Deployment**
  - Solution/Infusion Plan Development
    - Solution/Barrier Analysis
    - Gap Strategy Analysis
  - Communications and Interface Management
  - Advocacy/Adoption Development
  - Target Infusion Program Coordination
  - Technology Deployment and Integration
- **Reporting**
  - Portfolio Gaps
  - Infusion Activities

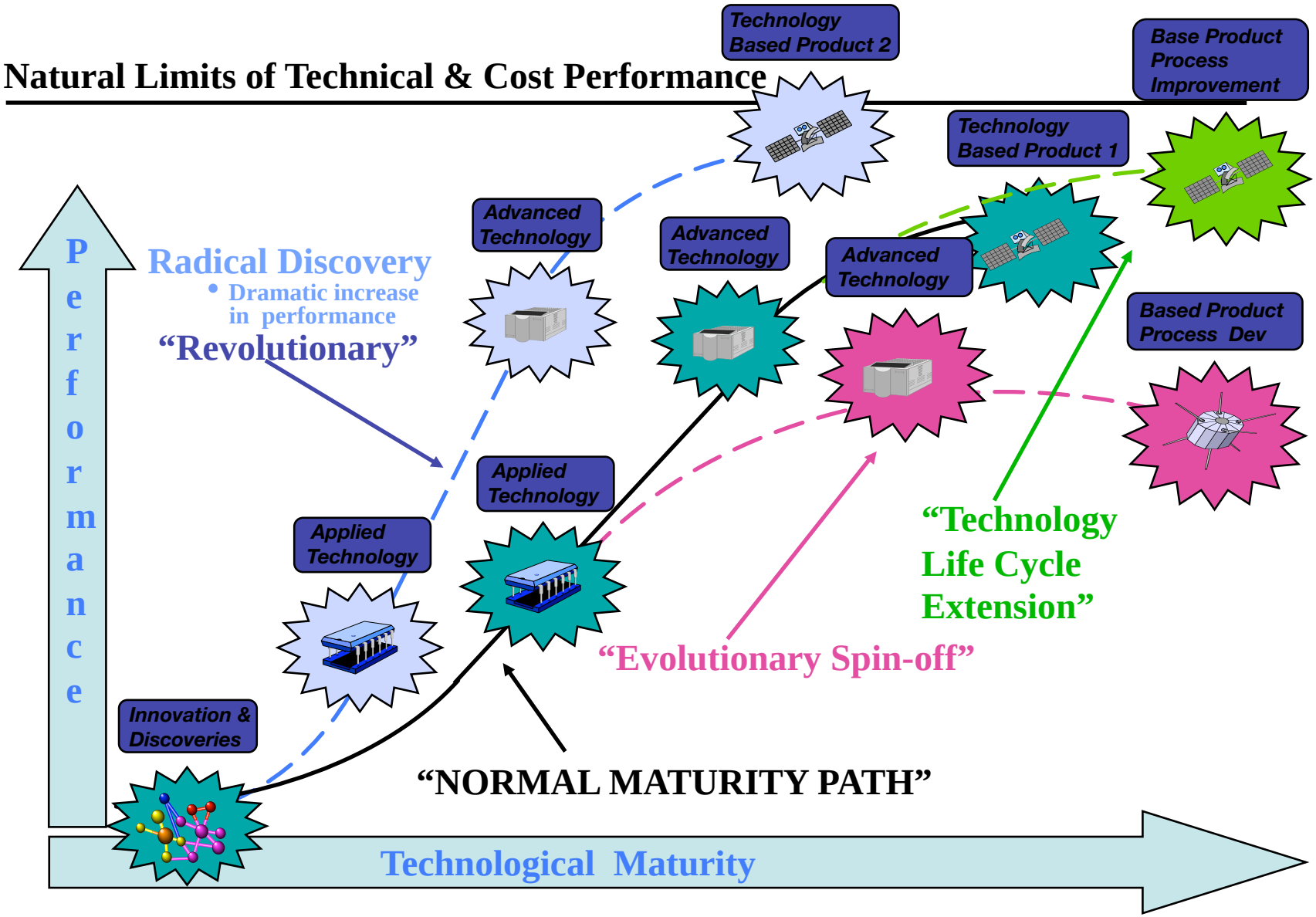
Technology Infusion



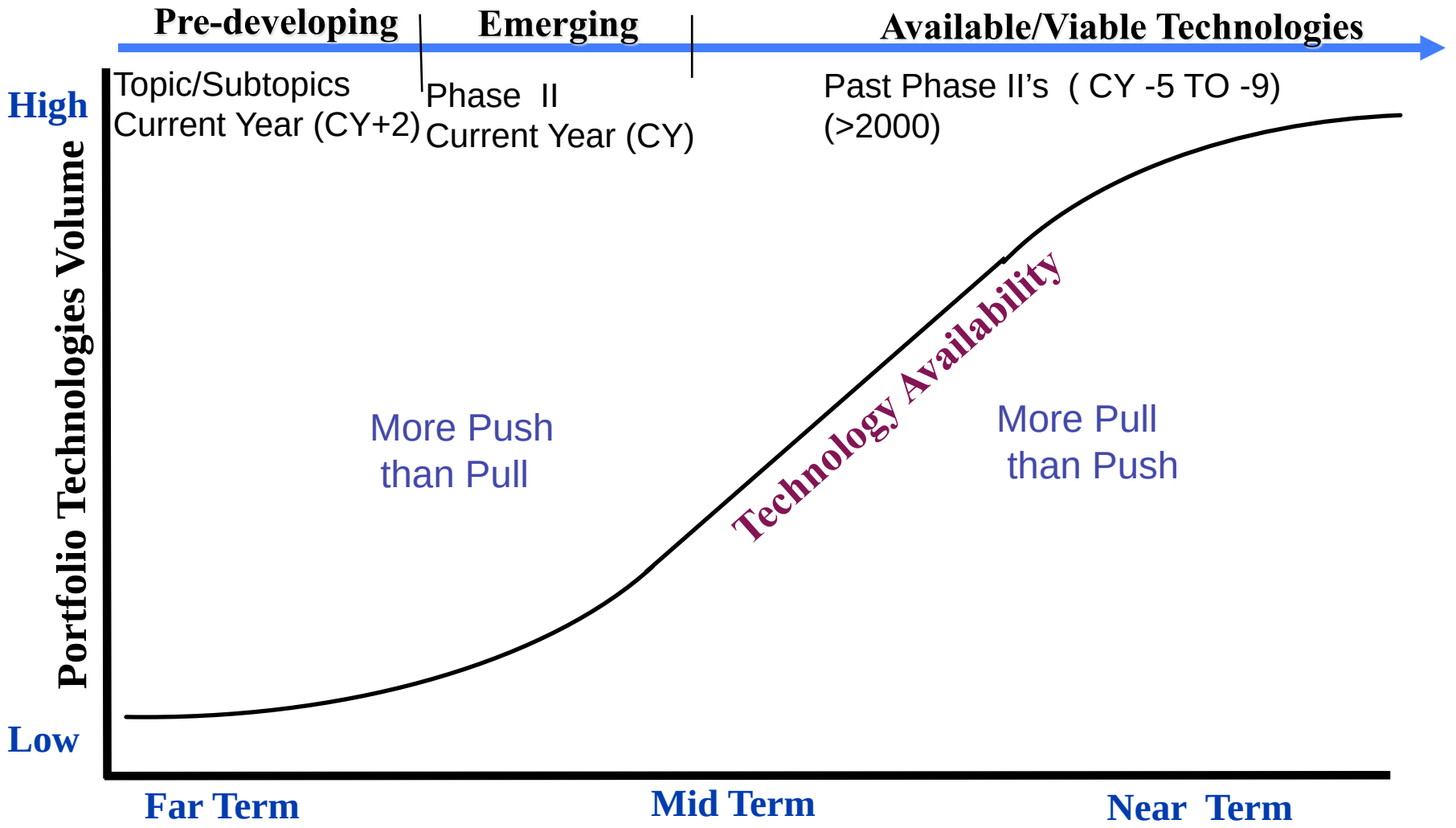
NASA SBIR/STTR Innovation and Development Path for New Technology Based Products



NASA SBIR/STTR Innovation Impacts & Pathways

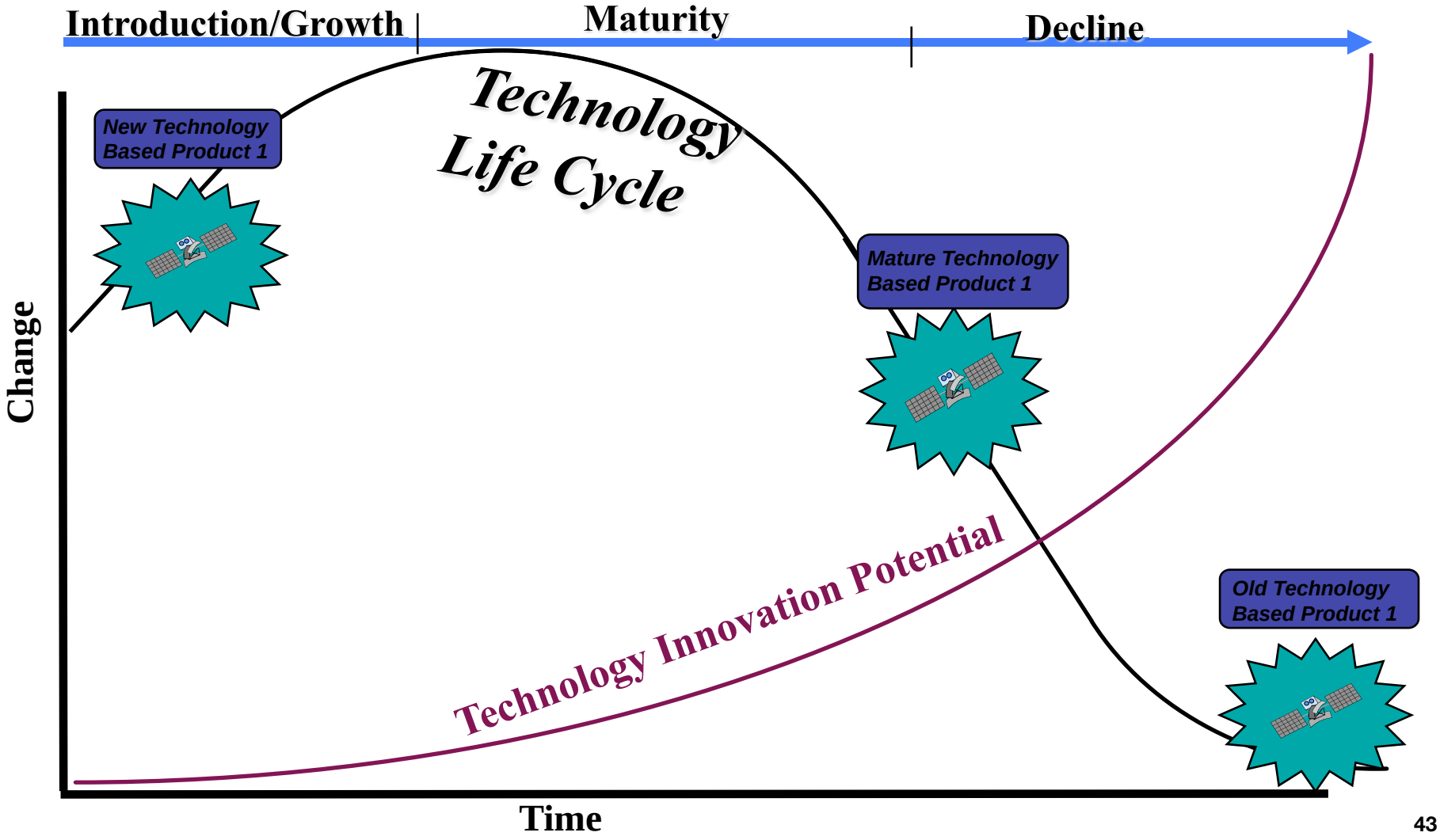


SBIR/STTR Portfolio Landscape



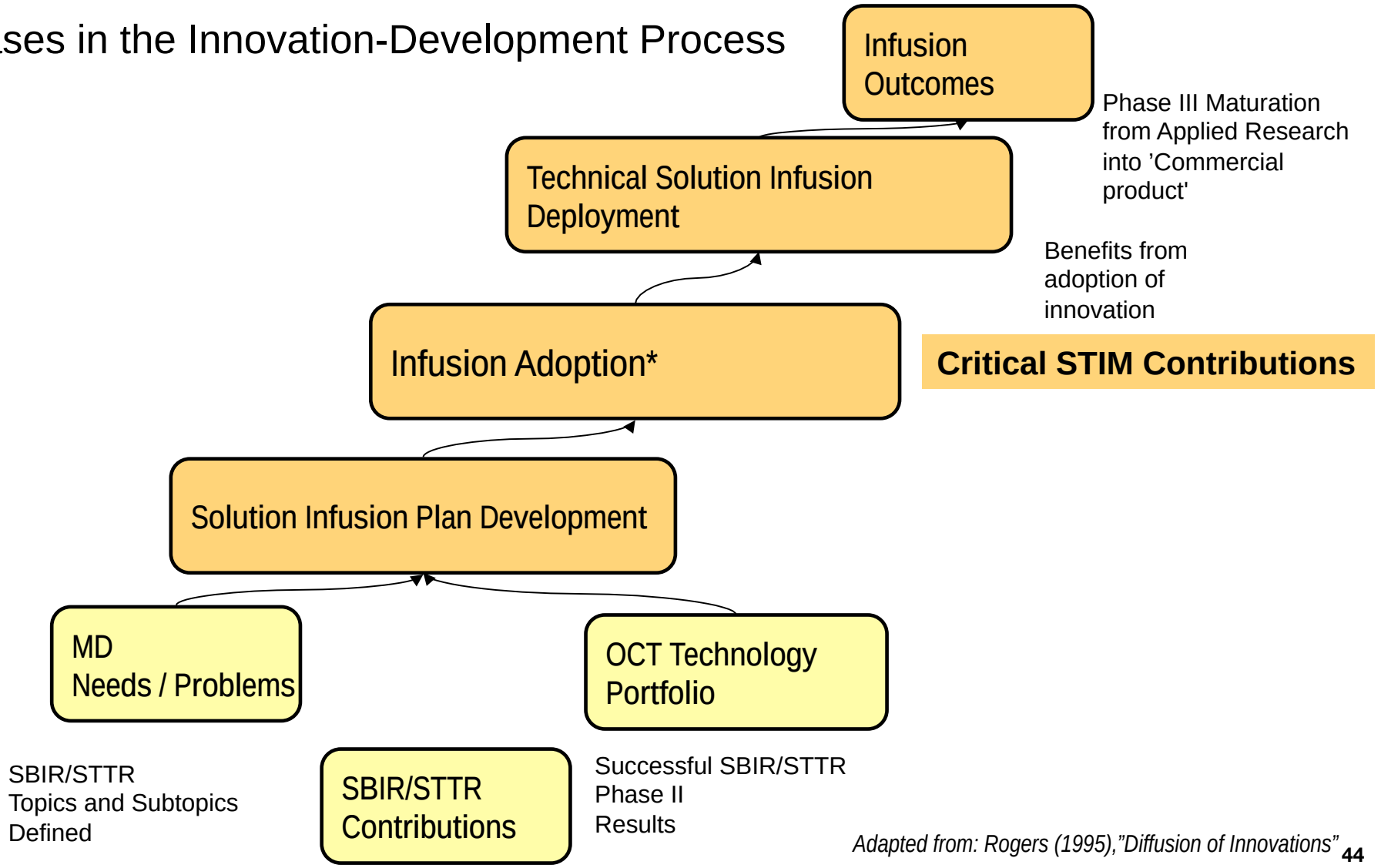
Trade Space Strategic Infusion Timeframes

Technology Life Cycle
Vs
Innovation Potential



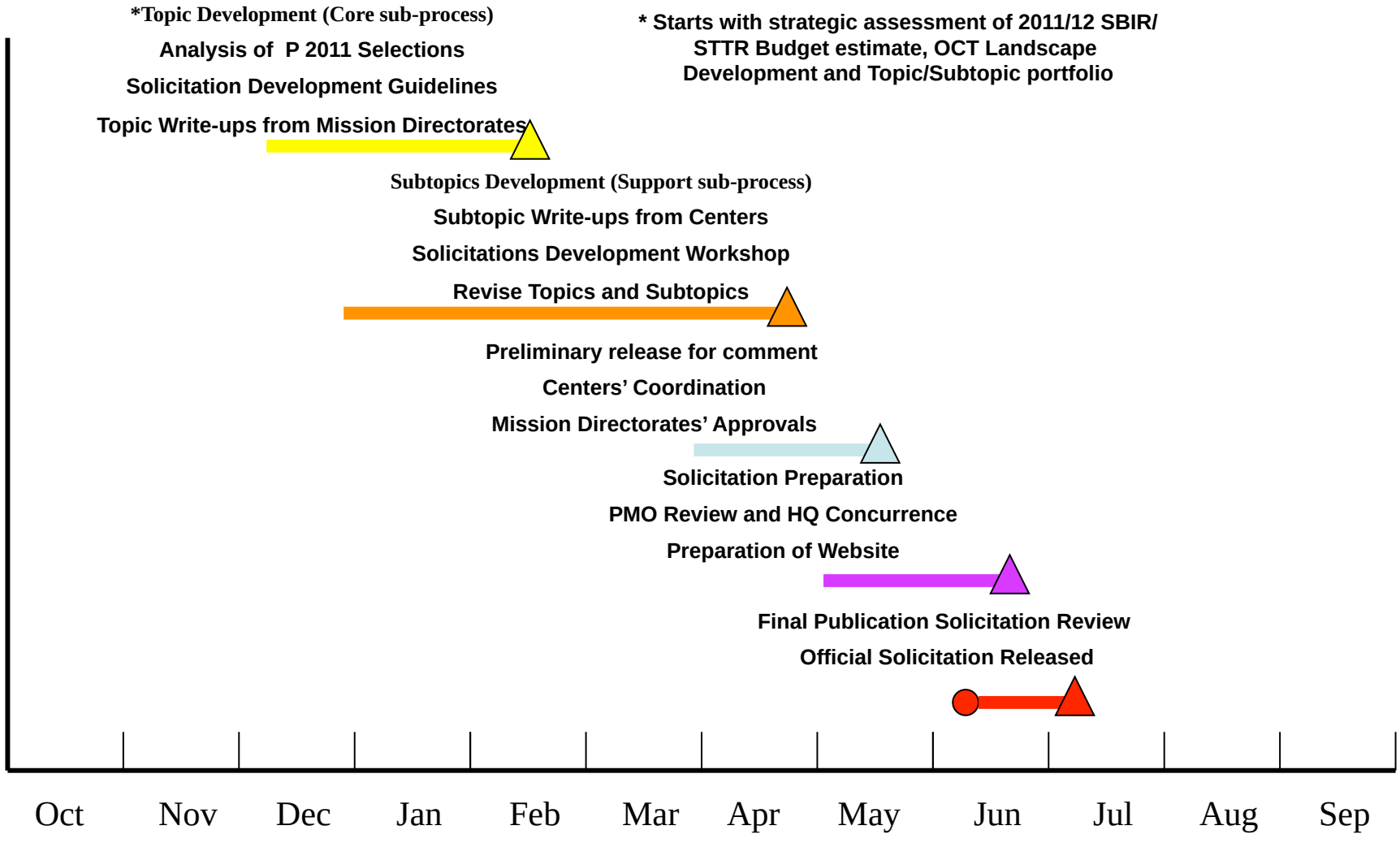
Infusion as part of the Innovation Process

Phases in the Innovation-Development Process

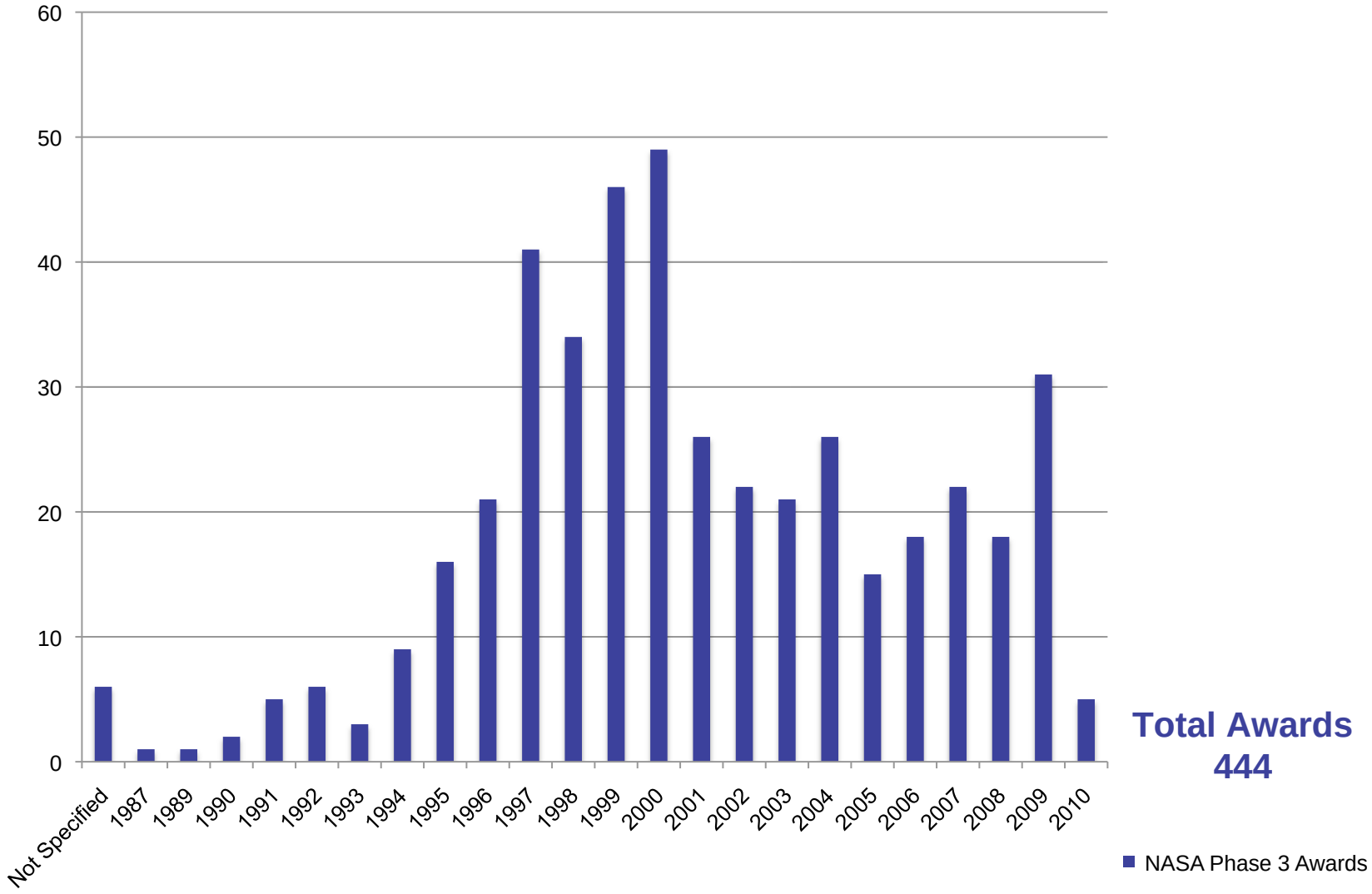


Adapted from: Rogers (1995),"Diffusion of Innovations"

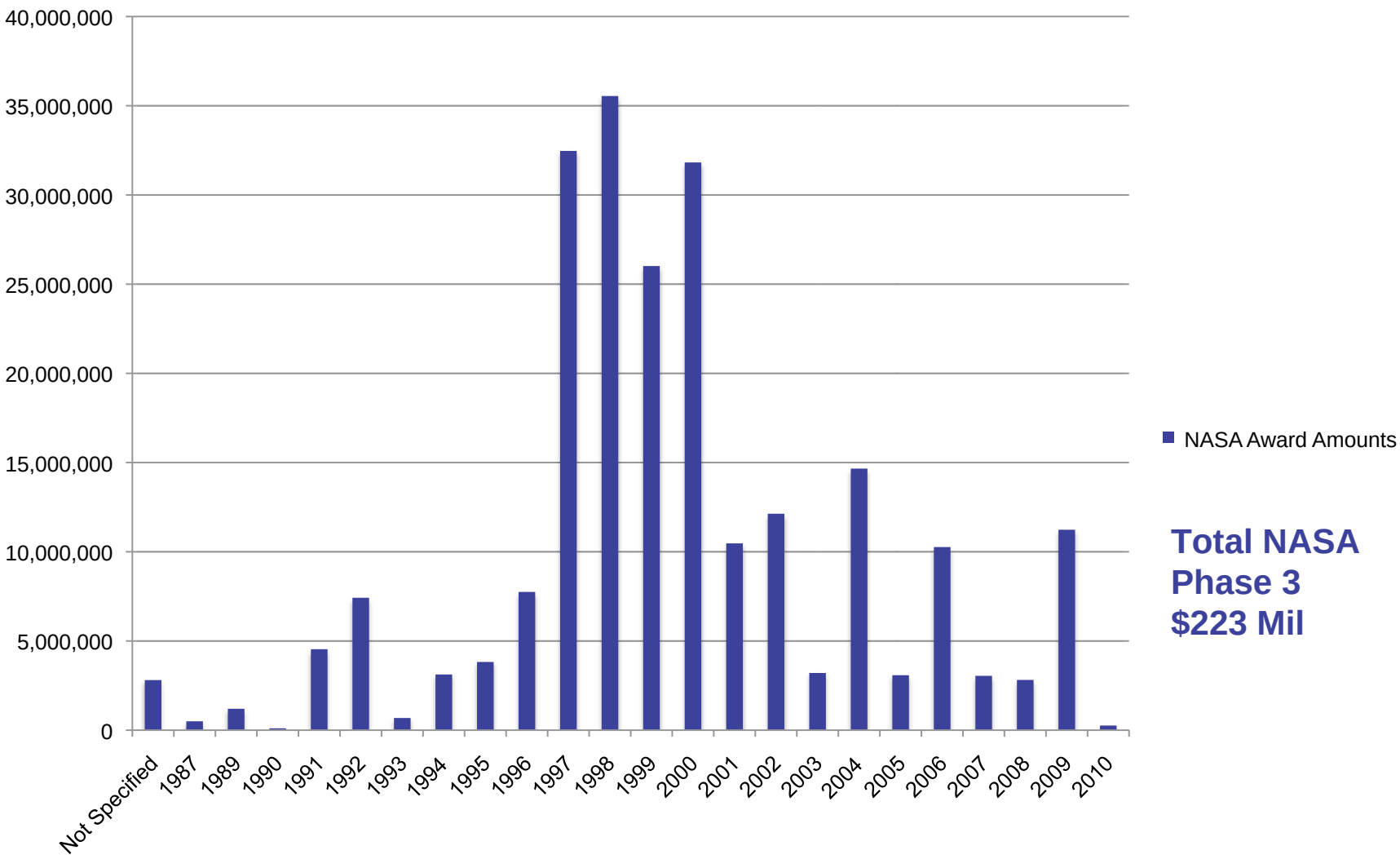
SBIR/STTR Solicitation Development & Solicitation Release Process Management 2010/2011 Milestones



NASA SBIR Phase III Awards

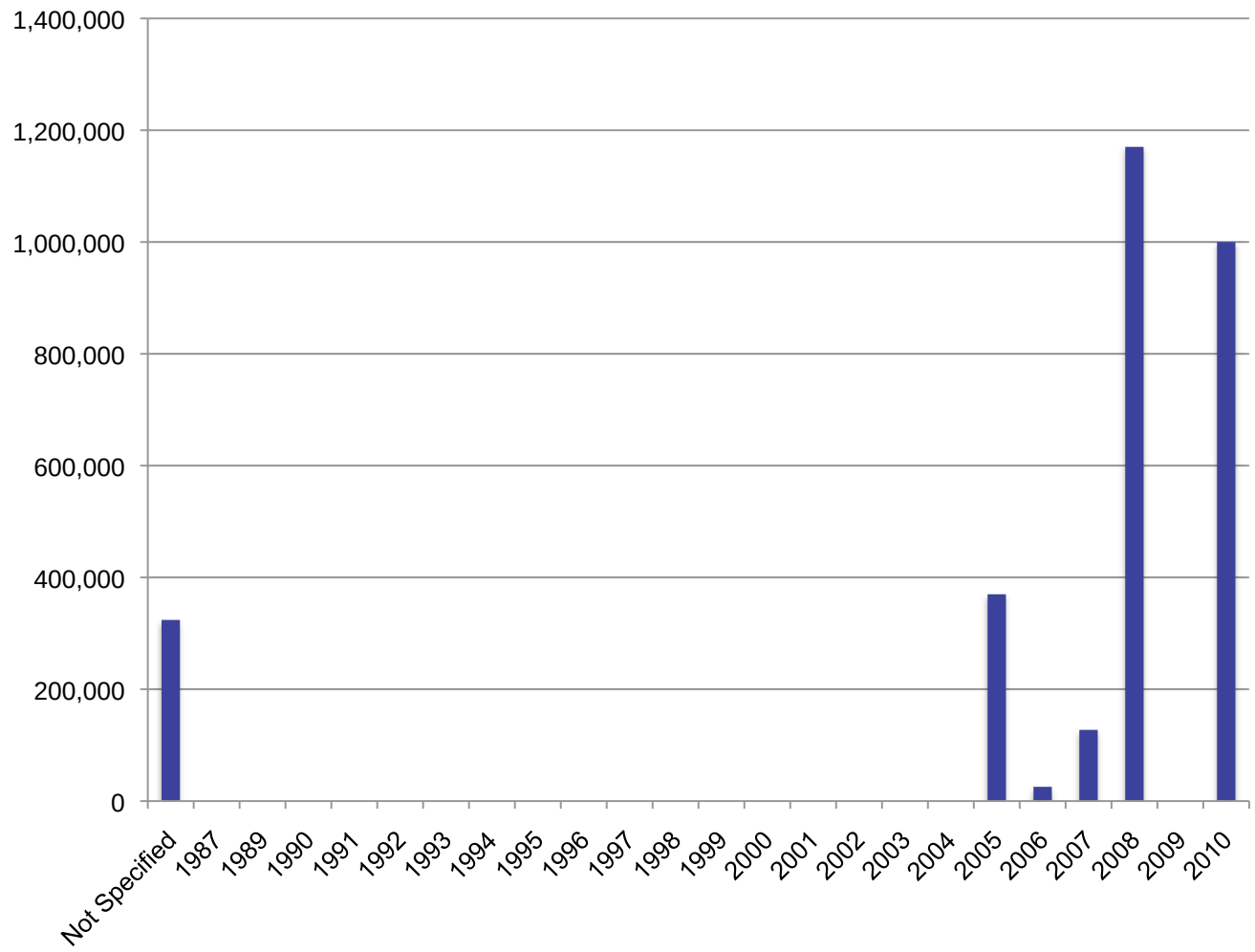


NASA Phase III Award Total Over Time



Total NASA Phase 3 $223 Mil

Non-NASA Funded Phase III Dollars



Total Non-NASA Award Amounts $3.1 Mil