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***“Assessments and Improvements in the  
Government, Industry, and University  
Innovation Process”***

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Triple Helix Summit



World Health  
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# Objectives of Government Stimulation of Innovation



- National level – to get and/or stay ahead in growth areas
- Agency level – to achieve mission advances
- Industry level – for national economic competitiveness
- University level – for new ideas and future workforce

**Important to Recognize the Interrelationships  
and Collaboration Among These**

Free markets often do not do a good job of producing, or distributing new knowledge and information (esp. larger firms)

- Tend to under-invest in long-term research
- Tend to invest in “incremental” vs. “disruptive” R&D



# Concerns Regarding Government Role in Innovation



- Technology Cycles vs. Government Acquisition Cycles
- Bureaucracies not known for “picking winners”
- Government Labs lean to “incremental” (vs. “disruptive”) research
- Major mission and/or societal problems often require multidisciplinary (multi-agency) support
- Politically-based organizations tend to be short-term oriented

**Policies and Processes Must Address These Concerns Directly in Order to be Successful**



# Some U.S. Government/Industry/University Innovation Strategies



- Government Strategic Plans (area of desired focus)
- Government Labs funding and Cooperative R&D Agreements (CRADAs)
- Industry/University “pre-competitive” Consortia, with Government support (e.g. SEMATECH)
- Mission Agency’s Externally-funded Advanced Research (e.g. DARPA, IARPA, E-ARPA, HSARPA)
- Small Business Innovative Research (SBIR) / Small Business Technology Transfer (STTR)
- Public-Private Venture Capital Firms (e.g. In-Q-Tel)
- Publicly-Sponsored Industry Incubators



# Defense Advanced Research Projects Agency (DARPA)



- DARPA was established in 1958
  - The first U.S. response to the Soviet launching of Sputnik.
- DARPA's mission – assure that the U.S. maintains a lead in applying state-of-the-art technology for military capabilities and to prevent technological surprise from her adversaries.
- DARPA reports to the Under Secretary of Defense for Acquisition, Technology and Logistics (AT&L)
  - No Internal Labs
  - Approximately \$3B/yr of unrestricted research
  - Operates in coordination with, but independent of, the military research and development establishments.
  - All work is competitively funded out to industry and/or universities-often with multiple, competitive firms/universities



# DARPA Uses Many Innovative Approaches



- Broad Agency Announcements
  - The Broad Agency Announcement (BAA) is a competitive solicitation procedure used to obtain proposals for basic and applied research and that part of development which is *not related to the development of a specific system or hardware procurement.*
- “Other Transactions Authority” (OTA)
  - "Other transactions" is a shorthand expression used to refer to any instrument other than a procurement contract, grant, or cooperative agreement. Accordingly, the term includes multiple instrument types that can be very different from each other. The intent is to use commercial practices and encourage commercial firms to bid.
- Competitive Prototype Projects
  - Projects that embody technology that might be incorporated later into formal Service/Joint programs
- SBIR Program
  - Discussed in Detail in the next section
- Competitive “Grand Challenges”
  - Anyone can enter, and “winner(s)” (if successful) get award e.g. “Urban Challenge” for Autonomous vehicles operation in a city; winner received \$2M, and 2<sup>nd</sup> & 3<sup>rd</sup> received \$1M and \$500K

# Why Does DARPA work

- Searches out and hires the “best” people, and gives them flexibility
- Creates “Disruptive” surprise; doesn’t seek to avoid it
- Makes sustained investments - - from initial science into integrated systems
  - Some investments are impossible to justify in purely accounting terms
- DARPA’s success depends on it being a leader and an integration catalyst
- Defines strategic challenges *in detail* across multiple scenarios
- Does not just respond to “defined user requirements”
- Supports development of **integrated concepts** — not just individual capabilities — beyond purview of a single service
- Facilitates a “critical mass” of research effort
- Tests promising concepts in large-scale, integrated “proof of concept” demonstrations
- Expects that some “high risk” programs will not succeed.

# “DARPA”

**The freedom to act quickly and decisively, with high-quality people, has paid handsome dividends for DoD in terms of revolutionary military capabilities; and has had significant national benefit from research “fall-out” e.g. Internet, Jet Engines, Communication Satellites, etc.**

# SBIR/STTR: Capitalizing on The Small Business Advantage

## Small Businesses:

- Generated 60 to 80 percent of net new jobs annually over the last decade
- Employ 39 percent of high-tech workers, such as scientist, engineers, and computer workers
- Produce 13 to 14 times more patents per employee than large patenting firms
  - Patents are of high quality
- Are a source of innovation by themselves and for large companies

*Source: National Research Council*

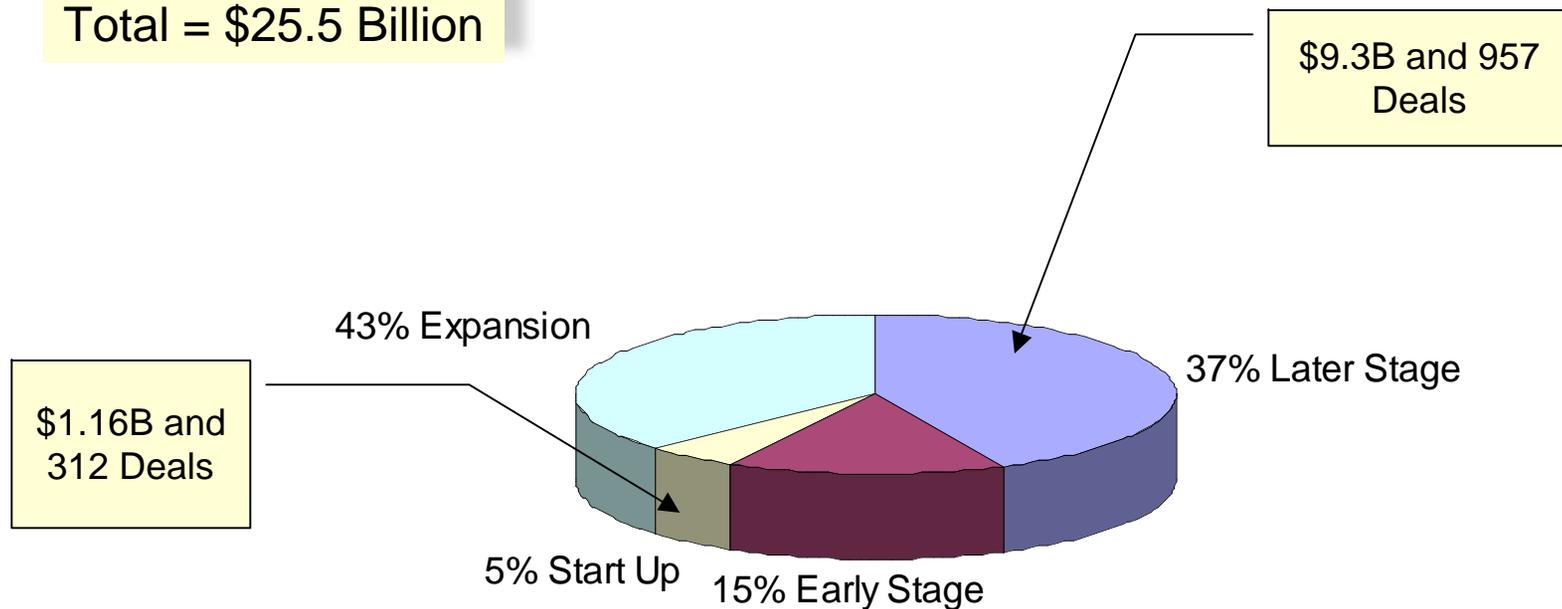


# U.S. Venture Capital Market is not Focused on Early-Stage Firms



## Breakdown of U.S. Venture Capital by Stage of Development

Total = \$25.5 Billion



Source: National Research Council



# Small Business Innovation Development Act of 1982



- A mandated “set-aside” program designed to foster technological innovation by small U.S. businesses with 500 or fewer employees
- Congress designated 4 major goals for the Small Business Innovation Research (SBIR) – 2.5% of all externally-funded R&D (over \$2B/yr)
  - Stimulate technological innovation
  - Increase small business participation in federally funded R&D
  - Foster and encourage participation by minority and disadvantaged firms in technological innovation
  - Increase private sector commercialization of federally supported R&D
- Small Business Technology Transfer (STTR) – 0.3% of all externally-funded R&D
  - Same basic objectives as SBIR.
  - Added requirement to link university research with industry.



# SBIR/STTR: 3-Phase Program

- PHASE I
  - Feasibility Study
  - \$100K and 6-month (SBIR) or 12-month (STTR) Award
- PHASE II
  - Full Research/R&D
  - \$750K and 2-year Award (SBIR/STTR)
- PHASE III
  - Commercialization Stage
  - Use of non-SBIR/STTR Funds

## Notes:

1. Some agencies have been funding a “Phase II B” and are considering use of SBIR funds for Phase III projects in order to help small firms through the “valley of death” (before they reach commercialization).
2. A DoD “fast track program exist to accelerate selection and funding for small firms that receive complementary external funds



**In 2002 Congress Mandated a three-year Assessment, by the National Academies, of SBIR Program, and areas for potential improvements (reports in preparation)**

- **Focus on 5 “Big Funders” (DoD, DOE, NASA, NSF, NIH) – 96% of Program**
- **Phase I Survey targeted 3000 Firms**
- **Phase II Awards (1992-2002) Survey of Over 4000 Firms**
- **Also surveyed Program Managers and Technical Managers**
- **Approximately 100 Detailed Case Studies Conducted**
- **Four, Large, Public Conferences Held**



# The National Academies Committee found that...

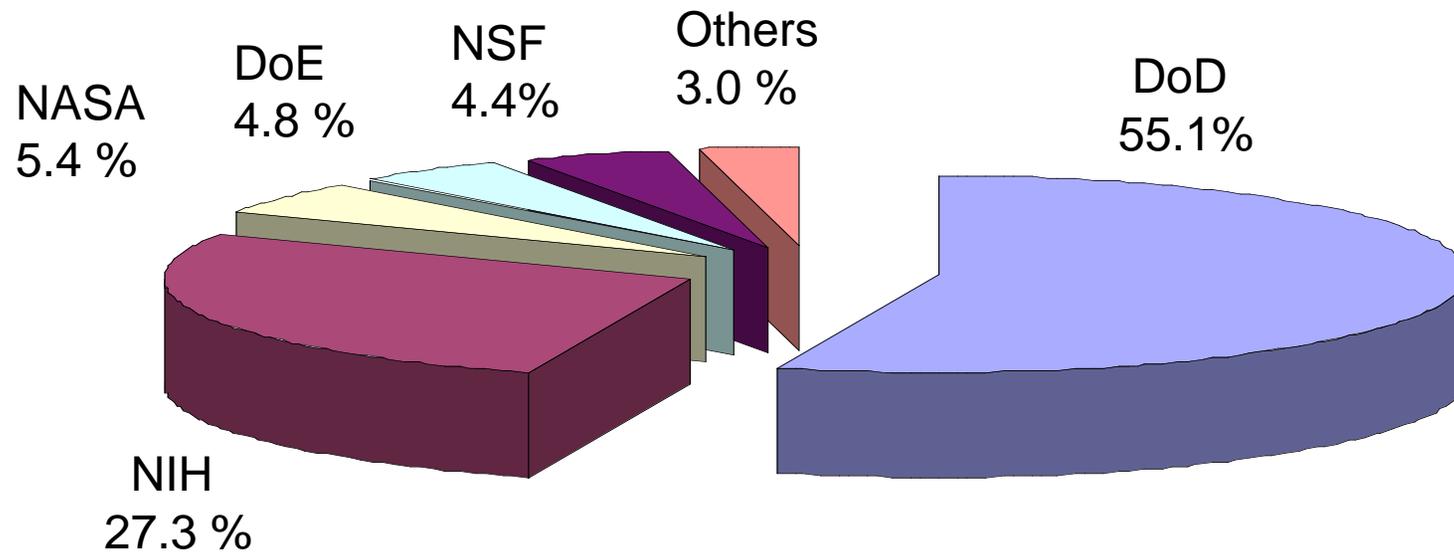


- SBIR is a Diverse and Flexible Program
  - SBIR is effective across the agencies in part because there is no 'one-size-fits all' approach
- SBIR is Making Significant Progress in Achieving Congressional Goals for the Program
  - SBIR addresses Agency missions
  - SBIR supports small businesses (over 14,800 firms got Phase II awards between 1992 and 2005)
  - SBIR fosters and encourages participation by women and minorities in technological innovation (though more monitoring and assessment is needed)
  - SBIR stimulates technical innovation
  - SBIR helps commercialize results of Federal R&D

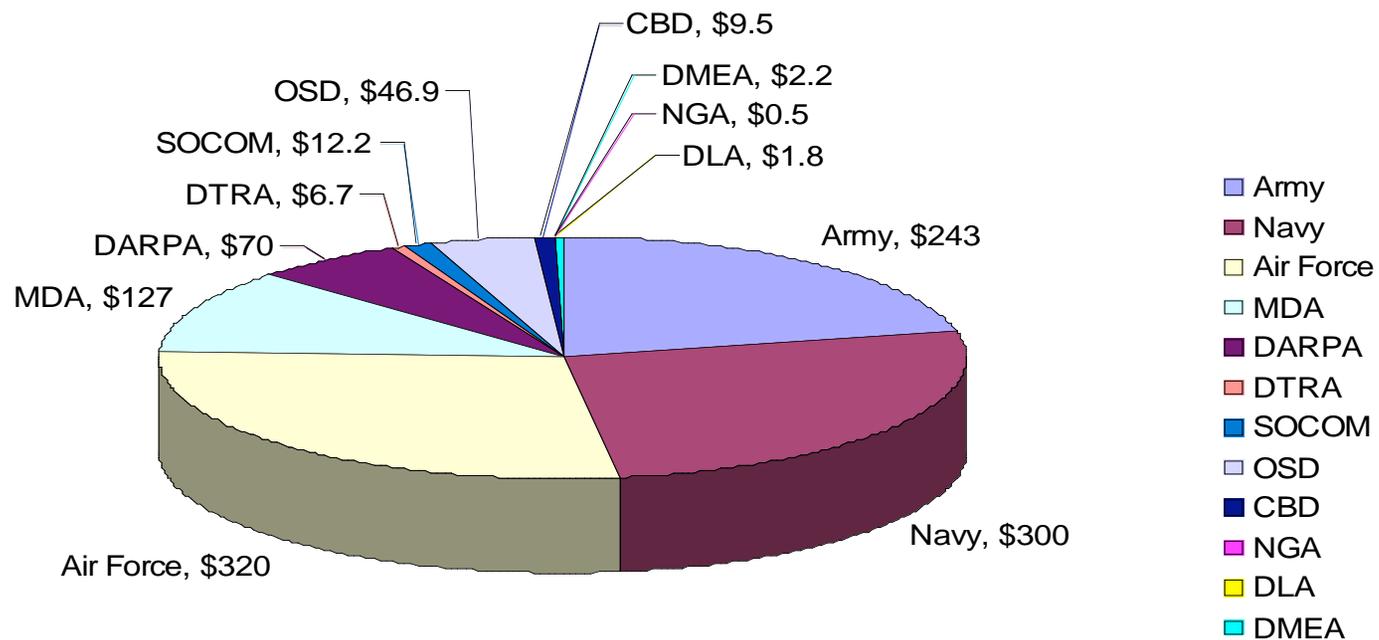


# SBIR/STTR Agency Funding FY 2006

Total \$2.2B



# DoD SBIR FY07 Budget (Millions)



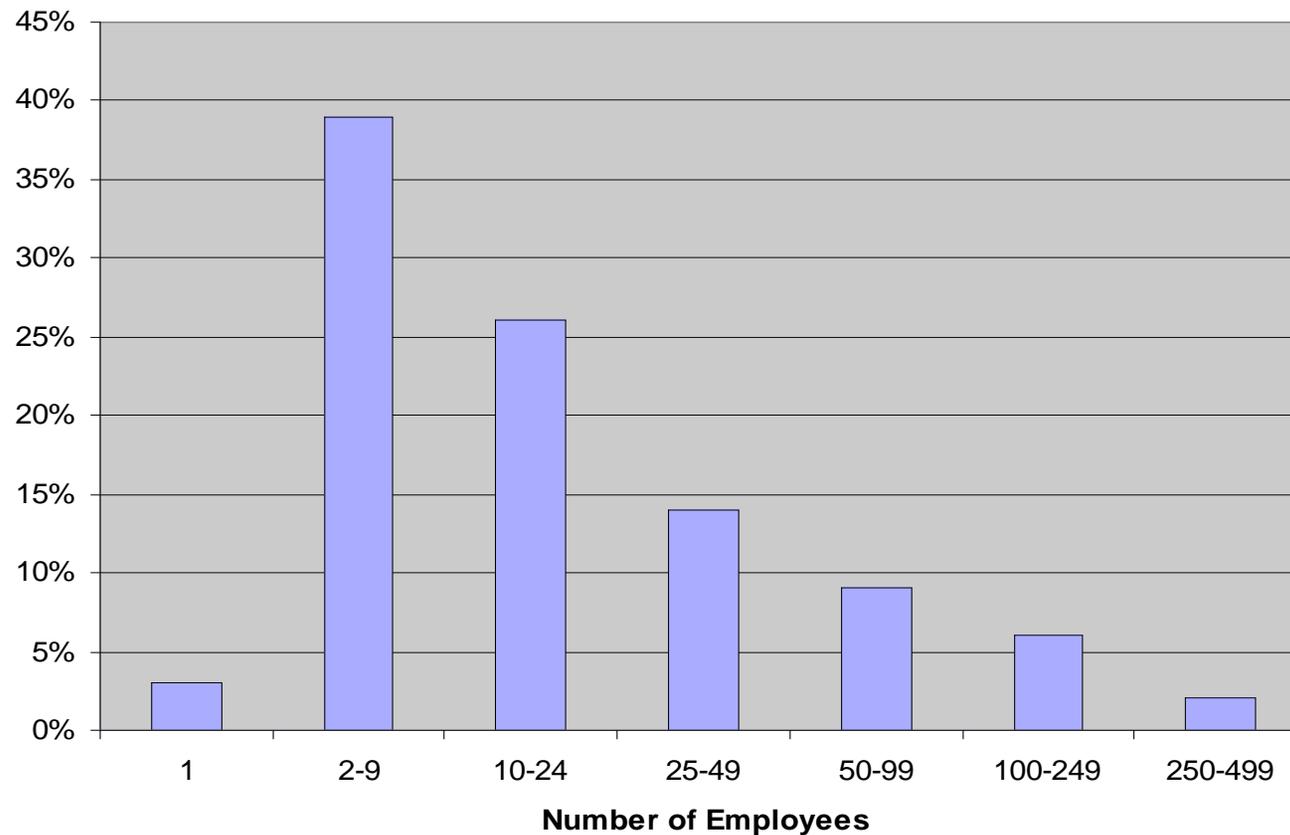
**DoD Total is \$1.13B**



# DoD Phase I Award – FY 2006



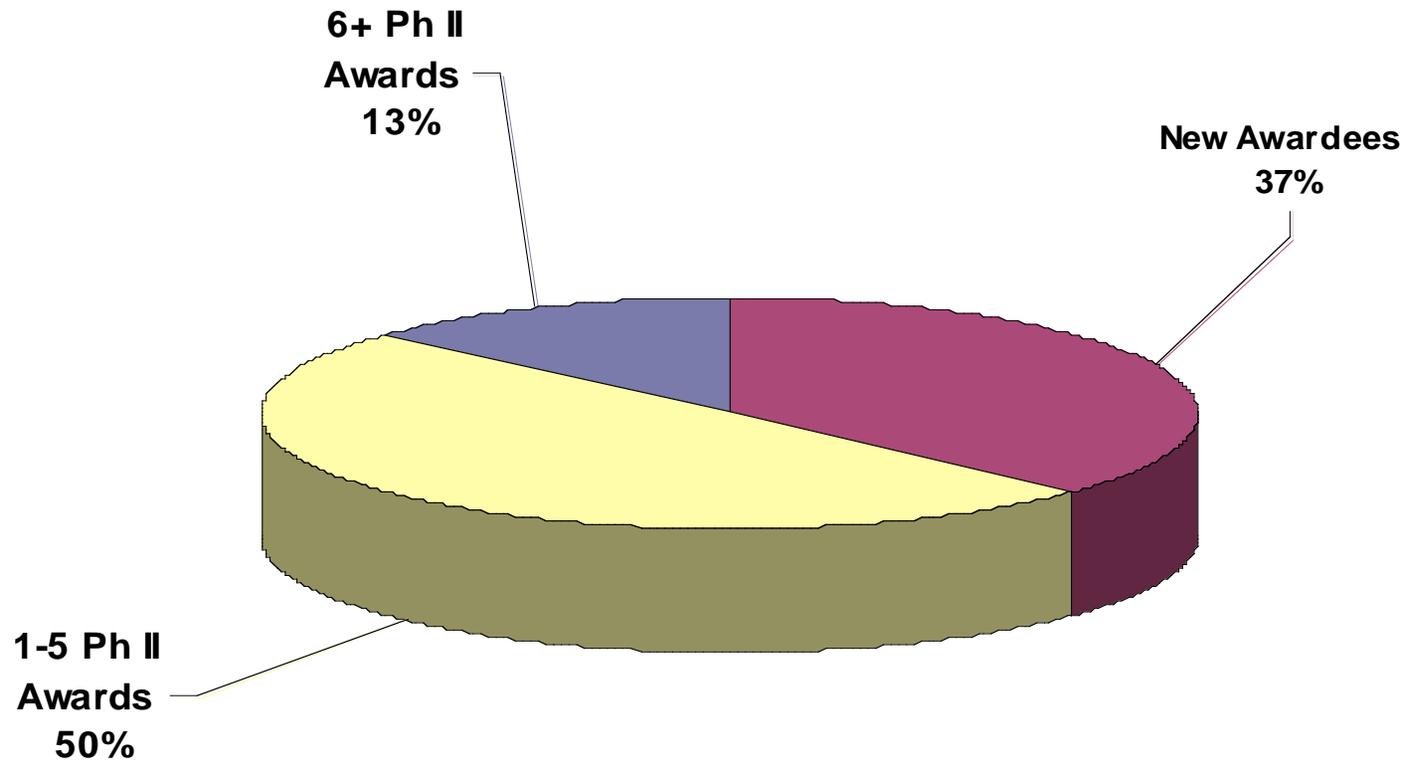
Percentage of Firms Receiving Phase I Awards



Data from presentation by Michael Caccuitto, DoD SBIR/STTR Program Administrator

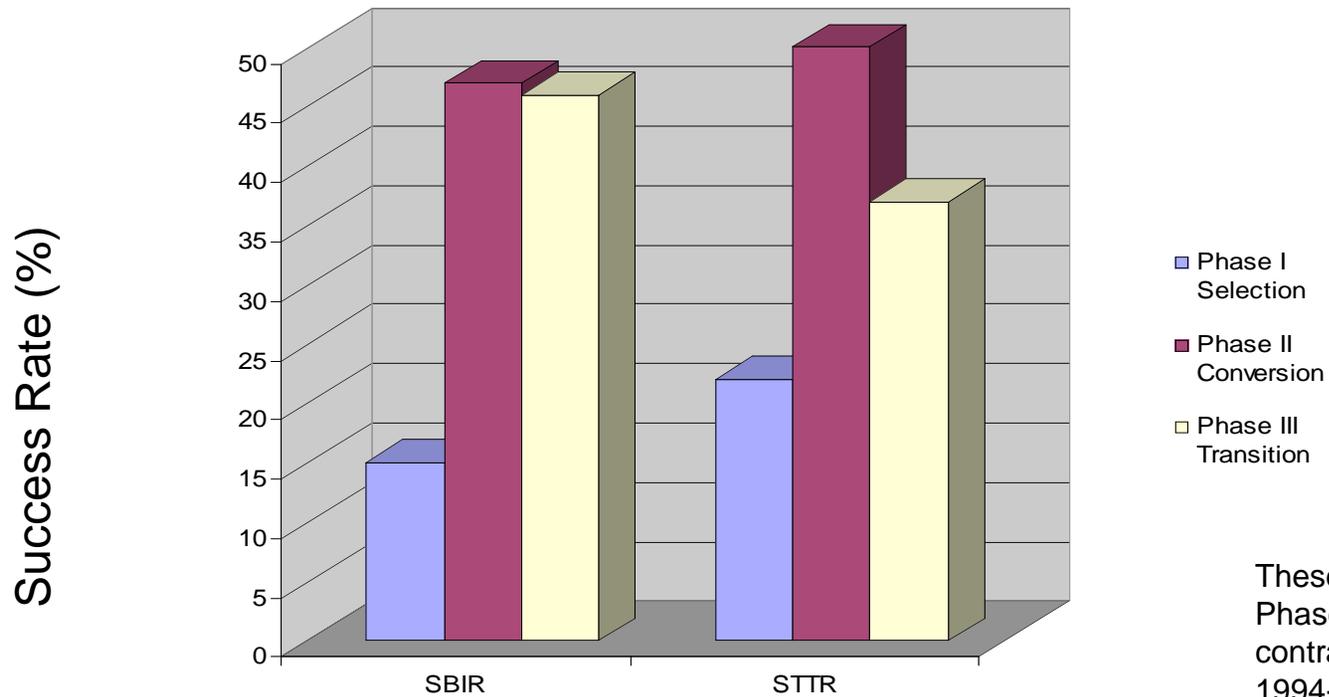


# New Winners in the DOD SBIR Program, FY 2005



Source: Michael Cacciutto, DoD SBIR/STTR Program Administrator and Carol Van Wyk, DoD CPP Coordinator. Presentation to SBTC SBIR in Rapid Transition Conference, September 27, 2006 Washington DC

# Historical DoD Success Rates



- Phase I Selection
- Phase II Conversion
- Phase III Transition

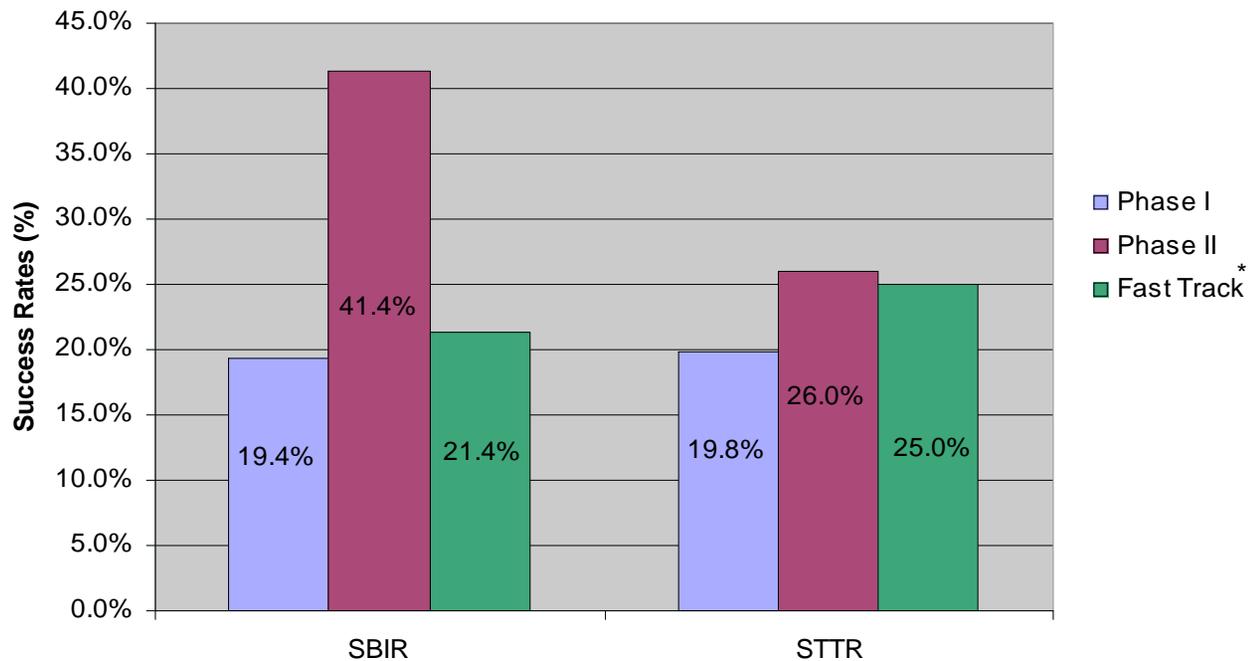
These are based on all Phase I and Phase II contracts derived from 1994-2003 solicitations. PHASE III is the commercialization stage – use of non-SBIR/STTR funds.

Data from presentation by Michael Caccuitto, DoD SBIR/STTR Program Administrator

# NIH SBIR/STTR Funding FY 2006

Total NIH SBIR/STTR Funding \$640 M

NIH SBIR/STTR Bid Success Rates FY 2006



\* The NIH fast track program differs from the DOD program. NIH fast track requires firms to apply for Phase I and Phase II funding concurrently, unlike the DOD Fast Track where applicants must attract outside investors who will match the DoD provided phase II funding.



# SBIR/STTR Program Impacts

- Proven record of stimulating innovation
  - Contributions include analytic models, algorithms, prototype products and processes, spin-off companies, and scientific and engineering papers.
- Supports the transfer of research from academia into the market place.
- Small firms use awards to advance projects, develop firm-specific capabilities, and create new products and services
- Awardees more likely to receive commercial venture funding
- Positive correlation between awards received and increased company employment
- SBIR awards played a key role in decision to pursue a project (In 70% of companies surveyed)
- Many successful, large firms today received their start through SBIR funding (over 25% of surveyed large firms)



## Major Finding: SBIR Awardees Come From & Work Closely with Universities

- **Over a third of respondents in the Academies Phase II Survey of 4000 firms reported university involvement in their SBIR project. Of these:**
  - More than 80% of NIH respondent companies had at least one founder from academia
  - About 1/3<sup>rd</sup> of founders were most recently employed as academics before founding the company
  - About 1/3 of projects had university faculty as contractors on the project and 1/4<sup>th</sup> used universities themselves as subcontractors
  - 15% SBIR awards involved graduate students

**University faculty, graduate students, and /or a university itself have helped to develop SBIR-based technologies for the market.**

# Noted Concerns

- Some studies indicate that a few firms receive a disproportionate share of the awards.
- Some feel that a significant number of small firms live off of SBIR funding without subsequently commercializing their research.
- Studies have found that sponsors are more likely to give awards to companies based on their likelihood of success, rather than the potential disruptiveness of their technology.
- Firm's products and services might only focus on short-term needs, instead of long-term goals.

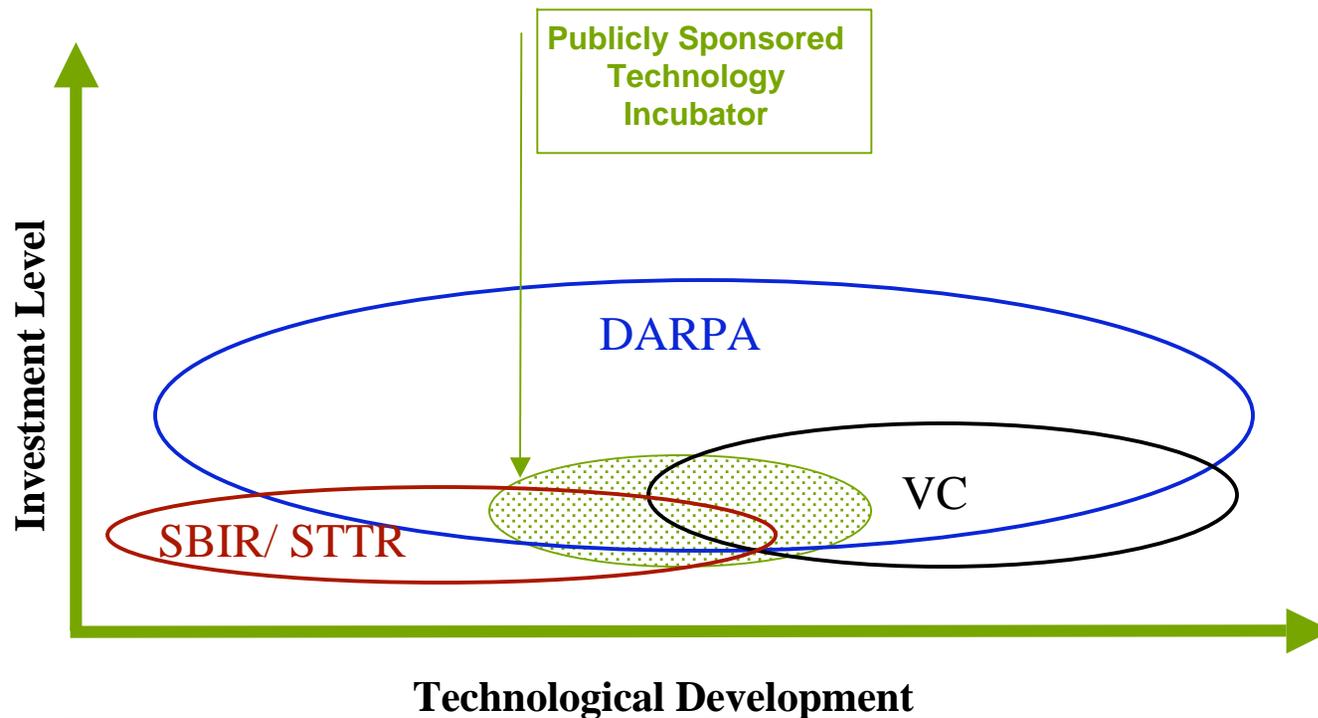
**Each of these concerns must be explicitly addressed in administering the program. Currently, these concerns are being addressed by program administrators.**

# Key Committee Recommendations

- Regular Internal and External Evaluations
- Reduced Times Between Phase I and Phase II Awards
- Allow Larger Award Size (to adjust for inflation) e.g. Phase I up to \$150,000, Phase II up to \$1 Million
- Allow Agencies to Continue to Experiment with Supplementary awards (e.g. NSF Phase II B initiative)
- Provide Adequate Funding for Effective Management and Evaluation (e.g. marginally increase the amount set-aside to pay for this)

# Summary

## Innovation Strategies and Technological Development



Although there is an overlap, the different strategies are complimentary not redundant

# Conclusion

- Continued Innovation is the key to economic competitiveness, growth, and security
- Success depends on the synergism between Government, Industry and Universities
- Funding for basic and applied research is critical (for both products and people)
- Education and training are essential (to keep up with the exponential growth of technology)
- The pace of global competition is accelerating (in both the rapidly-developing and developed world)

**It is Not a “Zero-Sum” World; Everyone Can Benefit, and Must Learn to Work Together, In Today’s Globalized World!**



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Second Annual

# Triple Helix Summit

February 2 – 5, 2008

Sheraton Waikiki Hotel  
Honolulu, Hawaii