Crossing the Valley of Death
The Small Business Innovation Research Program

Technology Caucus
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The National Academies
Current Global Mega-Challenges

- Fostering Economic **Growth** through Innovation
  - Driving domestic Growth and Employment
- Developing New Sources of **Energy**
  - Commercializing renewable alternatives to oil
  - Increasing the capacity to fuel growing global demand for electricity
- Addressing **Climate Change**
  - Growing a Green Economy; A major Growth opportunity
- Delivering **Global Health**
  - Transforming large investments in research to affordable and personalized treatment and care
- Improving **Security** through all of the above
Major U.S. Advantages in Innovation

• Openness to science and innovation
  • Trust in Science & Scientific Institutions

• Positive Social Norms
  • High Social Value on Commercial Success
  • Forgiving Social Norms allow more than one try

• Entrepreneur-friendly Policies
  • Markets Open to Competition
  • Gentle Bankruptcy Laws permit rapid recovery
  • Taxes give Prospect of Substantial Rewards

• Strong Intellectual Property Regime:
  • Encourages Research & Diffusion of Research Results
Good News: The U.S. has a Large Share of Global R&D

Total global R&D spending to reach $1,496 billion in 2013

The DoD R&D Budget is 48% of Total

Total R&D by Agency, FY 2014
budget authority in billions of dollars

- DOD, $69.5
- HHS (NIH), $32.0
- DOE, $12.7
- NASA, $11.6
- NSF, $6.2
- USDA, $2.5
- Commerce, $2.7
- All Other, $6.7

Total R&D = $144.1 billion

Source: OMB R&D data, agency budget justifications, and other agency documents.
R&D includes conduct of R&D and R&D facilities.
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And, ~90% of Defense R&D Spending is for Weapons Systems Development

Character of R&D, FY 2011
budget authority in billions of dollars

Source: AAAS, 2010
Federal R&D Spending: A Declining Share of GDP and the Federal Budget

This translates to less spending on basic research, which is our platform for innovation.
Impact of the Sequester on R&D Budgets
Over 8% reductions over 5 years—No Growth

<table>
<thead>
<tr>
<th>Agency</th>
<th>Average Annual Cut</th>
<th>Cut over 5-Years</th>
<th>R&amp;D Budget lowest since...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total R&amp;D</td>
<td>$11.5 billion</td>
<td>-8.4%</td>
<td>2002</td>
</tr>
<tr>
<td>Defense</td>
<td>$6.7 billion</td>
<td>-9.1%</td>
<td>2003</td>
</tr>
<tr>
<td>NIH</td>
<td>$2.3 billion</td>
<td>-7.6%</td>
<td>2002</td>
</tr>
<tr>
<td>Energy</td>
<td>$917 million</td>
<td>-8.2%</td>
<td>2008</td>
</tr>
<tr>
<td>NSF</td>
<td>$421 million</td>
<td>-7.6%</td>
<td>2010</td>
</tr>
<tr>
<td>NASA</td>
<td>$705 million</td>
<td>-7.6%</td>
<td>1988</td>
</tr>
<tr>
<td>Agriculture</td>
<td>$175 million</td>
<td>-7.6%</td>
<td>1998</td>
</tr>
</tbody>
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Chart from Matt Hourihan, AAAS, 14 November 2012 Capitol Hill briefing
U.S. Competitors are Investing More. We are Investing Less

Gross domestic spending on R&D as a % of GDP

Source: OECD STI Outlook 2012

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The Major Risks to the U.S.

• Complacency about our competitive position
• Focus on current consumption rather than investment for the future
  – A lack of investment in R&D on the scale of our fathers and our competitors
• Limited attention to the composition of the economy, including trade and investment policy
• Failure to focus on the commercialization of research and on manufacturing
Small Companies Drive High-Technology Innovation

- Small Companies are Key Players in Bringing New Technologies to Market (Audretsch & Acс)
  - Large returns to national economic and strategic capabilities can result from relatively small national investments
  - Innovations—with the right policy support—can become new products and services for the market and provide support for government missions
  - Small companies like Intel, Microsoft, Apple, Google, and Facebook all grew.

- But small companies don’t have the capital needed to transform ideas into innovations
A Major Hurdle for Innovators
The Valley of Death

Federally Funded Research Creates New Ideas

What’s needed?
Capital to Transform Ideas into Innovations

New Ideas are “new”; often they cannot attract support

No Capital
Dead Ideas

Innovation, Product Development and Growth
VC is Valuable but not a Panacea: Venture Funding by Stage in 2012

Total of $26.5 billion invested in 3,698 deals

Seed Stage: $725 Million; 274 Deals

Early Stage: $7.8 Billion 1,638 Deals

Expansion: $9.4 Billion 956 Deals

Later Stage: $8.6 Billion 830 Deals

Source: Jan 2013, PWC-Money Tree
How can Innovative Small Firms Cross the Valley of Death?

One Proven Path is the Small Business Innovation Research (SBIR) Program
What is SBIR?

- Competitively awarded support for technological innovation
- Uses up to three phased awards from federal research funds to address government mission needs: phases limit risk and cost.
- “SBIR provides funding for some of the best early-stage innovation ideas -- ideas that, however promising, are still too high risk for private investors, including venture capital firms.” Roland Tibbetts
The SBIR “Open Innovation” Model

$148 billion

Social and Government Needs

PHASE I Feasibility Research

$150K

Federal Investment

PHASE II Research towards Prototype

$1M

Non-SBIR Government Investment

PHASE III Product Development for Gov’t or Commercial Market

Private Sector Investment

Tax Revenue

Federal Investment

R&D Investment

$1M
SBIR’s Best Practice Features

• Focus on Valley of Death: Funds Proof of Concept and Prototype: “The first money is the hardest”

• Decentralized & Flexible: Each Government Department or Agency uses its funds to support research by small companies to meet its unique mission needs

• Competitive: 20% success rate

• No Program Capture: One-third of participants are new to the program every year

• Large Scale: Portfolio Effect
Why do Entrepreneurs like SBIR?

- Additional Research Funds
- No dilution of ownership
- No repayment required
- Grant recipients retain rights to IP developed using SBIR funds
- No Royalties owed to Government
- Certification of Quality attracts private investments
Why do Government Agencies like SBIR?

- A low-cost technological probe
  - **Fast**: Enables government to explore more cheaply and quickly ideas that may hold promise
  - **Cost Effective**: Identifies dead-ends before substantial investments are made

- Enhances Competition
  - **Diversifies** the Government Supplier-base
  - Brings in competition, low-cost solutions, new approaches to address mission needs
  - **Sole source** procurement for R&D Contractors
Why do Universities Like SBIR?

- SBIR links the University with Industry and helps Spin-outs
  - Lowers Risk: Faculty do not have to give up University post to apply
  - Lowers Overhead: Don’t need a company to apply
  - 15 to 20% success rates—comparable to other grants

- SBIR Innovation Awards **Directly Cause** Researchers to create New Firms and cause Firms to cooperate with Universities.

- New firms help grow the region and provide returns on R&D investments
How can we Grow the SBIR-University Link?

- Universities can incentivize faculty to innovate research ideas with SBIR
  - Inform them about the program
  - Encourage them to apply for SBIR awards
  - Develop university prizes as a signal to investors and to the university culture
  - Reward them for SBIR participation with prizes, credit towards tenure
After nearly 20 years of operation, The Congress asked the National Academies:

How well is SBIR Working Overall?
Answer:
Key Finding of the National Academies Assessment of SBIR

“The SBIR program is sound in concept and effective in practice.”
SBIR Success takes Many Forms

• **Employment Success**
  – SBIR helps new Start-ups grow, creating the high quality jobs of the future

• **Innovation Success**
  – New products, patents, licenses, and publications

• **Government Mission Success**
  – Acquisition and Procurement
  – NASA uses SBIR-funded Lithium-ion batteries to power the Mars Rover
  – DOD uses SBIR developed armor to shield against IEDs

• **NASDAQ Success**
  – SBIR investments contributed to the success of companies like Qualcomm, ATMI, Martek, Luna
SBIR: The Qualcomm Story

• SBIR program was an important source of start up funding for Qualcomm.
  – Qualcomm was awarded 10 SBIR awards (7 Phase I and 3 Phase II) between 1987 to 1990 from the Department of Defense for a total of $1,317,360.

• “Getting the grants translated into stamps of approval that allowed Qualcomm to pursue other sources of private capital.”
  – Irwin Jacobs, Founder of Qualcomm—Congressional Testimony February 2011

• Today, Qualcomm employs over 17,500 people and has a market value of $120 Billion.
• Technology originally developed through several NASA and DOD SBIR contracts for laser guided docking of space vehicles to satellites.
• This technology is today used to track eye movements to accurately guide laser pulses to reshape the cornea.
• Inducted in 2013 to the SBIR Hall of Fame
Key Recommendations of the National Academies Assessment of SBIR were adopted in the 2012 Reauthorization

- Keep the program; keep it stable
  - Program reauthorized until 2017
- Enhance program flexibility
  - Limit regulation—let Program Managers manage
- Improve Program Efficiency
  - Shorten Cycle Time from Application to Award—in process
- Adjust award sizes for inflation

NAS Recommendations → Legislation → SBA Directives → Implementation by Agencies
Major Changes Currently Underway

• Expansion of the Program
  – SBIR share grows from 2.5% to 3.2% in 2017
  – STTR share grows from 0.25% to 0.35% in 2017
  – Phase 1 and 2 award sizes increased to $150K and $1M

• More Flexibility
  – Phase 0 pilot program
  – Phase 1 awards from other agencies accepted for Phase 2 funding
  – VC backed firms accepted within limits
  – Sequential Phase 2 awards permitted

• More focus on Commercialization
  – Expanded commercialization support
  – Commercialization Readiness Program (CRP) made permanent
  – CRP extended to other agencies
The Current National Academies Review of SBIR

• Conducting follow up surveys—a second snapshot
• Assessing the efficacy of post-award commercialization programs
• Exploring strategies to encourage participation by minorities and women.
• Reviewing the role of SBIR, STTR and Universities in Commercializing Research
Our Next Conference

• February 5, 2014 at the National Academy of Sciences

• Topics:
  – The role of SBIR and STTR in the commercialization of university research.
  – The role of the STTR program

• We look forward to your participation
Conclusion

✓ SBIR is an outstanding—and underappreciated—early stage funding program. It works.
✓ It has just had a series of changes. These need to be implemented and evaluated.
Thank You

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