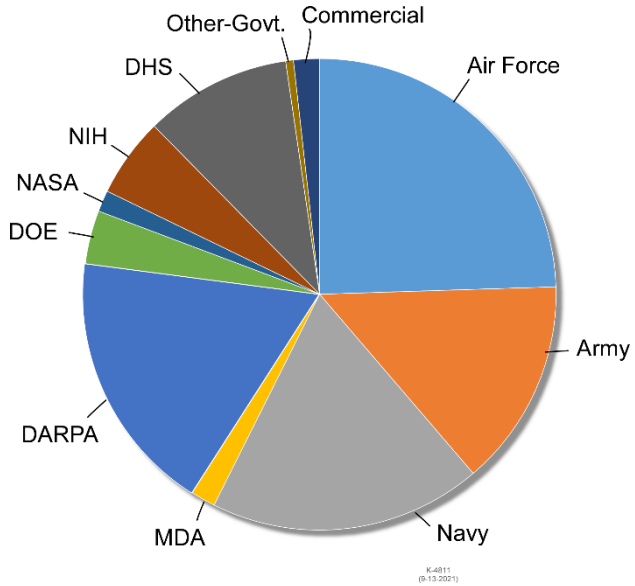
Physical Sciences Inc.

Physical Sciences Inc

- **Mission:** Advanced Technology Development and Transition
- **Ownership:** 100% Employee-owned through an ESOP
- **Founded:** 1973
- **Employees:** ~275
- **Customers:** Government agencies and their prime contractors
- **SBIR/STTR:** "Experienced" – "Multi-Award Winner (MAW)"



Wilmington Production Facility

Andover Laboratories and Headquarters

New Hampshire Energetics Facility

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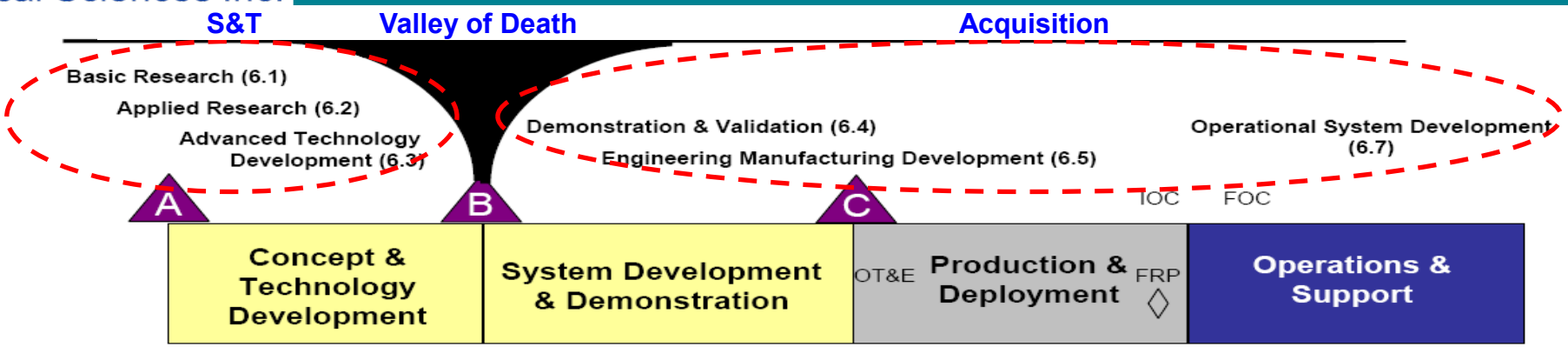
Crossing the "Valley of Death"



Why is it so Hard?

- Multiple Organizations
- Transition = Risk
- "Not Invented Here" Syndrome
- Calendar Driven Budgets – Event Driven Programs

S&T (SBIR) = Technology Push
Acquisition = Requirements Pull

Navigating a Changing Paradigm

- Multiple organizations → universities – small businesses – government agencies – prime contractors
- Technology Development → Product Engineering → Manufacturing
- Missing/conflicting user requirements → Capability Development Documents (CDD) → Technology Platform Roadmaps
- Key Performance Parameter creation and Risk Management
- Classified Program and Information Security requirements
- Quality systems and advanced production facilities
- ITAR and EAR compliance

SBIR is the primary mechanism used by DoD to fund Small Businesses to do Technology Transition

SBIR as Venture Capital: "America's Seed Fund"

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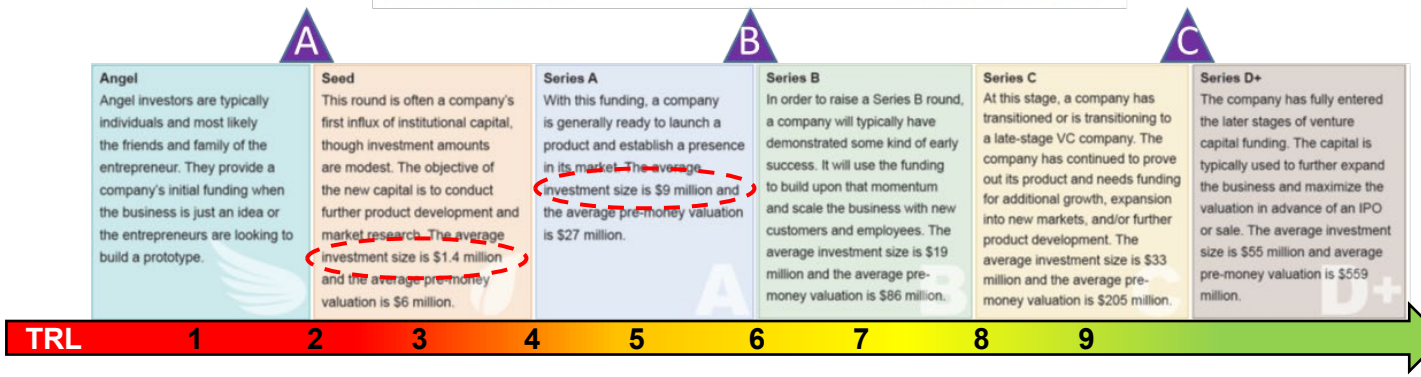
AMERICA'S SEED FUND SBIR·STTR

Venture Funding → Monetary return on investment at the highest margin (5-7 years)



DoD R&D Funding → Capability return on investment at the lowest margin (7 to 12 years)

- **Mismatched expectations on investment return and time scales**
- **Limited equivalent of "Series A" funding → Technology Platforms**

A SBIR Single Technology Award
- Component technology
- Phase I - Feasibility
- Phase II - Prototype for a single application

B SBIR Technology Platform
- Multiple Phase I/II SBIR awards
- Development and Maturation > TRL 6 for specific application(s)
- Component technology insertion into Programs of Record

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Council on Foreign Relations – Independent Task Force 77
Innovation and National Security: Keeping Our Edge

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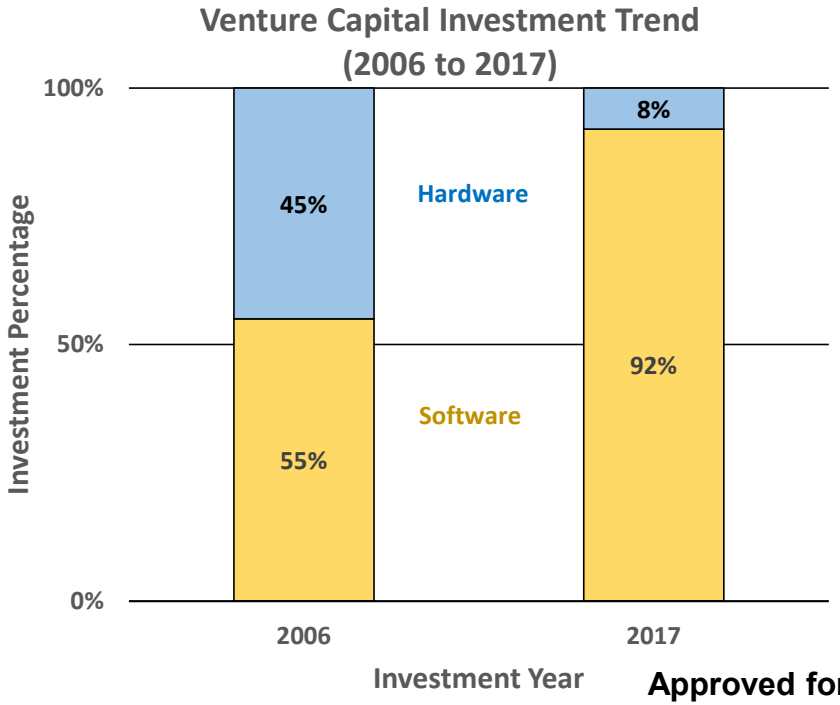
- *"Companies built around hardware face high risk in terms of technology development and high costs associated with building research facilities, attracting scientific expertise, and manufacturing."*
- *"Given the smaller risks of investing in software, VC firms funnel the vast majority of their investments to software, resulting in a funding gap for hardware."*
- *"In 2017, 92 percent of U.S. VC dollars—up from 55 percent in 2006—went toward software-based technologies that have lower capital requirements, less invention risk, and quicker returns."*
- *"Early-stage ventures thus often focus on the commercial sector, with its more reliable revenue and shorter sales cycles."*



- *"Not everything, of course, can "fail fast.""*
- *"Weapons platforms that involve large numbers of warfighters in the loop, such as airplanes, submarines, and ships, will always demand longer development times, exceptional performance, and steady oversight."*

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Imperia Batteries® for Defense Applications

SBIR Investment in Technology Development and Maturation

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Critical SBIR Developed Technologies

High Active Coating Process

- Increases Cathode Energy Density
- Patent US11289699B2

Core SBIR – DoE and DLA

Low Volatility Electrolyte

- Reduces flammability and improves safety
- Low temperature operation

Core SBIR – Air Force

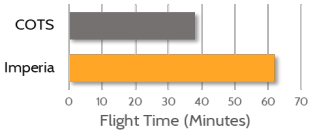
Lithium Metal Technology

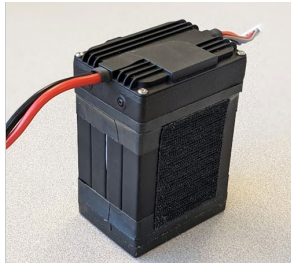
- Increases anode energy density
- Improved cycle life

Core SBIR – MDA and Navy

Engineering

Improved UAV Mission Performance

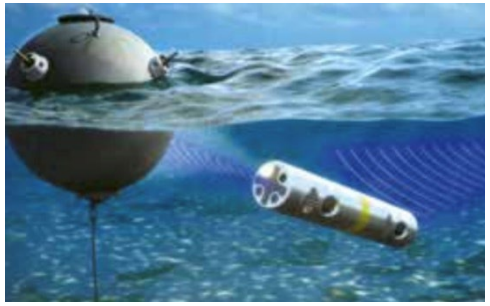




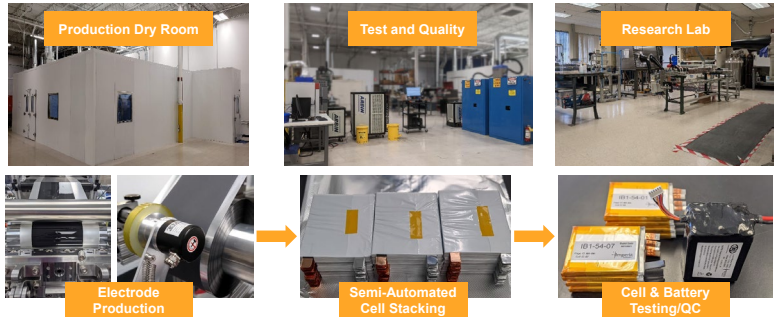
Application Specific Configurations

Manufacturing

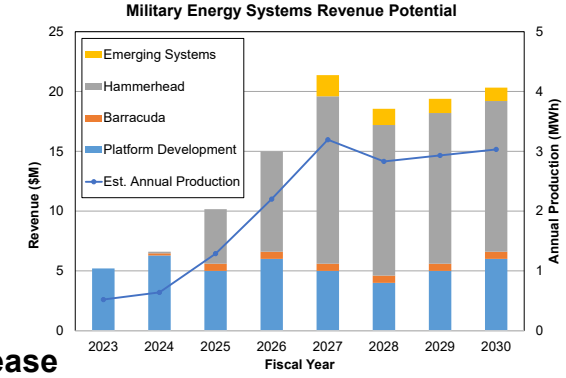
SBIR Tech Transitions to Multiple DoD Programs, incl. AN/WSQ-46 Barracuda Mine Neutralization System



Production (1 MWh/Year) and R&D Facility



- **Projected ~3X fold increase in production in 2 years**
- **Annual revenues in $15M to $20M range**



~$14M in SBIR/STTR funding matched by >$12M in non SBIR funds

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Spectroscopic Radiation Detection for Nuclear Security
SBIR-driven Technology Insertion

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PSI's Spectroscopic Radiation Detection Systems are at the US Southern Border, at Sensitive Sites in the US, at locations in the United Kingdom, and in the Eastern Europe Conflict Area

Advanced Technology Acquisition and Deployment

DHS CWMD IDIQ (2019 - 2024)
Build and deliver R/N systems into operations; develop and evaluate advanced prototypes.

DoE NSDD/PNNL IDIQ (2021 - 2024)
Build and deliver R/N systems into operations.

Krieger System Cargo Screening

Mobile Urban Radiation System (MURS)
PERM-Mobile
US, UK, and Europe

Archer System Vehicle Screening

SBIR Supported Radiation Detection Technology Development

Physical Sciences Internal Research and Development (2010 and 2014)
Established new and advanced mathematical underpinnings for the Poisson Clutter Split (PCS) algorithm (2010). Developed new data acquisition and thermal stabilization software for NaI scintillators. Package becomes known as the PCS-Enabled Radiation Monitor (PERM) (2014)

Agency R&D Supported Technology Development

DNDO E-DIRTUE (2010 to 2013)
Initial demonstration of advanced PCS algorithm achieving real-time isotope identification at speeds up to 45 mph using existing SRPMs

DNDO RAIN (2014-2019)
Developed/operationally evaluated a new PERM-based gantry system demonstrating a significant increase in threat intercept probability. RAIN was transitioned as the ARCHER capability for USBP operations.

DARPA SIGMA (2015 to 2019)
PCS algorithm is optimized and implemented in DARPA's SIGMA system now used by PANYNJ in a SPRDs and PERM sensor network.

SBIR Supported Advanced Technology Insertion

DNDO SBIR (2012 – 2016)
Developed advanced R/N search algorithm that led to maximization of angular resolution for vehicle systems. This design was transitioned into PSI's commercial MURS capability

DNDO SBIR Phase III (2017 - 2020)
Effort builds and operationally deploys 7 MURS prototypes to government organizations. Leads to PSI's commercial MURS product.

DHS CWMD SBIR (2017 - 2021)
Advanced video analytics developed and transitioned into various CBRN sensors including the PERM radiation detection system. Enables unattended monitoring to detect, identify, and analyze scenes.

- **Collaboration between DNDO → DHS CWMD, and DARPA**
- **Ten-year technology development effort supported by SBIR technology insertion at multiple points**
- **Two-year test and evaluation process involving CWMD, CPB, DoE and the use of Special Nuclear Materials**
- **Estimated annual revenues from all applications ~$20M**

Emerging SBIR Technologies

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- **Maturation of SBIR technology platforms is key to transition success**
  - Builds capability as technology matures (manufacturing, security, IT, contracting…)
  - Accesses multiple applications across multiple organizations to improve transition probability
  - Award cycles match DoD technology adoption timelines and increase company viability
  - STTR supports focused early-stage university R&D and develops STEM professionals
- **Multiple SBIR awards provide the missing equivalent of Venture Capital Series A funding**
- **“Not everything that counts can be counted” – and not everything that can be counted counts**
  - Small businesses are the “System Innovators” providing enabling technology for the System Integrators
  - “Phase III” awards are not the sole metric for SBIR program success
  - SBIR-developed technology is widely available and non-proprietary to the “Integrators”
- **DoD capital investment is needed to advance small market DoD-specific technologies**