Strategic Options for the DOD SBIR Program:

Assessing the role of multiple award winners and venture capital models in the DOD SBIR program

Dr. Robin Gaster
President, Incumetrics Inc.
May 2025

Incumetrics

Innovation analytics

Executive Summary

Current efforts to transform the DOD SBIR program into a venture fund by excluding multiple award winners are based on mistaken analysis and are contradicted by numerous prior studies of the program. This paper concludes:

- The DOD SBIR program is highly successful, as numerous evaluations by NASEM and others have demonstrated. NASEM concluded after two extensive studies that the program successfully met Congressional objectives, and in particular provides valuable support for DOD. TechLink studies found that the program generated more than 20 times its cost in overall economic impact.
- Multiple award winners (MAWs) have played a crucial role in this success. The PW Communications study itself found that the top 25 MAWs collectively generated DOD-related ROI of more than 2.5 times the SBIR investment.
- PW's study profoundly understates actual outcomes, focuses too closely on reported Phase III contracts, and seems to exclude private sector sales and further R&D investments – key parts of the NASEM\TechLink methodology.
- The paper's methodology does not follow NASEM, TechLink, and others, generates highly misleading conclusions by using companies (not SBIR investment portfolios) as the unit of analysis, and excludes critically important outcomes from the analysis.
- Case studies also show that MAWs have been the source of critically important DOD technologies, like Progeny's close-in torpedo which has become the standard for both the U.S. and key allies.
- SBIR is not a venture fund, and efforts to make it one would likely be disastrous. Unlike SBIR, venture capital investors
  - Seek to fund a single technology per company and focus only on commercial returns and company exits, not DOD needs
  - Have few seed stage deals - most of which are highly focused on AI and software
  - Anticipate exit on average at 5.7 years, shorter than DOD acquisitions cycles
  - Require highly specialized due diligence capabilities and retain critically important hands-on ties, including strategic influence and often Board seats.

  None of these characterize SBIR. Some would be illegal. Applying this model to SBIR would undoubtedly be disastrous, leading to over-sized projects funded without sufficient due diligence, and of limited relevance to DOD.

- STRATFI largely funds companies with *substantial* venture funding – much provided prior to STRATFI funding – and overwhelmingly located in California, Massachusetts, and Colorado. Many recipients are large companies. In short, STRATFI is not anything like SBIR Phase I and Phase II, and replacing SBIR with a program like STRATFI would be a disastrous mistake.

Introduction

The SBIR program was created in 1982 to support the commercialization efforts of innovative small businesses across the economy.[1] Over the decades since then, it has been the subject of numerous detailed and extensive analyses by the National Academies of Science, Engineering, and Medicine (NASEM),[2] by GAO, and by other academic researchers such as TechLink. It is perhaps the single most studied government R&D program. These evaluations have guided the evolution of the program, leading to innovations such as sequential Phase II awards, direct to Phase II awards, open topic solicitations, and much more.

These evaluations have also been careful to note that the SBIR program was designed to meet multiple objectives, and that these objectives have not been substantially changed by Congress during previous reauthorizations. Congress has also deliberately not prioritized amongst them. Thus, while a considerable share of analytic activity has focused on commercialization, that is in part because commercialization is the easiest objective for which it is possible – with care and with appropriate methodologies – to develop quantitative outcome metrics.

The four program objectives are (in no specified order): (1) to stimulate technological innovation; (2) to use small business to meet federal research and development needs; (3) to foster and encourage participation by minority and disadvantaged persons in technological innovation; and (4) to increase private sector commercialization derived from federal research and development. [3]

The SBIR evaluations generated by NASEM (a series of 13 volumes to date) as well as those of TechLink and others have overwhelmingly concluded that the SBIR program has been effective in meeting Congressional objectives. NASEM's 2014 report on the DOD SBIR program concluded that SBIR projects at DoD commercialize at an appropriate and substantial rate, generate significant amounts of additional R&D funding, and are in broad alignment with the agency's mission needs. Outputs from the program are taken up by federal agencies and in particular by DoD and by its primes, while SBIR also supports the development and adoption of technological innovations. Connections to universities are strong, and patenting data shows that innovation is substantial. These findings were based in part on surveys commissioned by NASEM,

[1] The STTR program was created in 1992. For convenience, all references to SBIR in this report should be taken to include STTR awards as well.
[2] NASEM has generated reports on SBIR under previous names such as the National Research Council and the National Academy of Science. To Avoid confusion, all National Academies reports are referenced as NASEM reports in this document.
[3] National Academies of Science, Engineering, and Medicine, *SBIR at the Department of Defense* (Washington DC: National Academies Press, 2014), https://www.nap.edu/catalog/18821/SBIR-at-the-department-of-defense.

analysis of DOD outcomes data (notably Phase III contracts), and on an extensive series of interviews with SBIR award recipients and agency staff.[4]

For DOD in particular, the adoption of SBIR technologies for use by the military is a critical output from the program. Adoption can allow for the deployment of new weapons systems, improvements to existing programs, cost savings, and reduced maintenance needs. Sometimes these benefits – along with commercialization itself – flow through companies other than the SBIR awardee via licensing agreements or acquisitions. Many of these benefits are difficult to measure, and often rely entirely on self-reported data (for example, licensing and cost savings data, which were excluded from quantitative analysis by NASEM because of data collection concerns). However, even if these benefits cannot be tightly measured, they clearly do exist, as case studies show (see Impact Indicators section below).

The most comprehensive primary source analysis of SBIR outcomes was a study undertaken by TechLink on behalf of DOD in 2016. This project surveyed all Phase II awards made by DOD in 1995-2012,[5] and after enormous outreach effort, generated responses for 97% of awarded contracts. The survey found that 58% of projects reached commercialization by generating sales, and these projects reported an average of $12.2 million in sales each. Approximately one quarter of these sales were military products or services, while 60% were commercial sales in the private sector. Follow-on R&D contracts accounted for a further 13%. Total direct sales amounted to $121 billion, generated from a DOD SBIR investment of $14.4 billion – an ROI of ~8.4:1. Military sales alone were $27.5 billion, an ROI of just under 2:1. TechLink then implemented an economic impact analysis using IMPLAN;[6] the overall estimated economic impact was $347 billion (ROI 24:1). Surveyed projects also generated related tax revenues of $39 billion. TechLink had previously undertaken a separate survey of outcomes at Navy and Airforce which generated similar results.[7]

The enormous effort required to track these outcomes illustrates how challenging it is to fully capture program outputs; it also requires careful development and application of a well-designed research methodology. NASEM developed such a detailed methodology based on previous GAO reports,[8] and this methodology has since been largely adopted in subsequent evaluations (e.g. by TechLink).

To assess commercialization outcomes quantitatively, NASEM concluded that multiple metrics would be required. These include direct sales by companies to DOD, as

[4] National Academies of Science, Engineering, and Medicine.
[5] TechLink, National Economic Impacts from the DOD SBIR Program, 1995-2018 n.d.
[6] IMPLAN is a widely used software tool for estimating economic impacts. See www.implan,com.
[7] TechLink, 2015 Report: Air Force SBIR/STTR Economic Impact January 2016
[8] National Academies of Science, Engineering, and Medicine, *An Assessment of the Small Business Innovation Research Program: Project Methodology* (Washington, D.C.: National Academies Press, 2004), https://doi.org/10.17226/11097.

reflected in Phase III contracting data collected by DOD (which in theory but not in practice is supposed to capture SBIR-related many or most sales made through DOD prime contractors). But a range of other metrics are also included, notably sales to the private sector and the acquisition of further funding for technology development. NASEM argued convincingly that in an era of increasing technology cross-over between military and civilian technologies (see for example the use of civilian drones in Ukraine), it was necessary to include civilian sales, particularly as civilian markets tend to be larger, tend increasingly to drive the cutting edge of technology development, and may be necessary if a technology is to reach a large enough scale of production, making new technology affordable for DOD deployment. NASEM also adopted additional metrics to capture innovation impacts, notably patenting data and survey data identifying program-related links to universities. TechLink added further depth to this methodology by using IMPLAN economic forecasting data to assess the wider economic impact of the SBIR program at DOD.

Using these varied assessment tools, NASEM and TechLink concluded that the DOD SBIR program was commercializing at an appropriate rate, that it was supporting the mission of participating DOD components, and that the program was also more broadly encouraging innovation in small businesses and generating substantial additional economic impacts, while growing the DOD industrial base. These conclusions provide the broad framework within which the remainder of this paper is situated; it reviews some proposed changes to the basic structure of SBIR, some of which imply that the program should be transformed completely, and offers a range of analytic approaches to address these recommendations. As we will see, these analyses do not meet the gold standard of methodologies for program assessment, and lead to flawed and quite dangerous conclusions.

Misunderstanding the mission

In recent years arguments have been made about the SBIR program that assume the sole objective is to generate new technologies at commercial scale for adoption by the DOD. These positions have been largely informed by a study conducted by PW Communications, which has also been presented to the Committee.[9] As we have seen, SBIR has four Congressionally mandated missions. While there has historically been a tendency to focus heavily on "commercialization," in reality the primary mission for SBIR at DOD is to develop technologies that can be used by DOD, to some degree regardless of commercial outcomes. Supporting the warfighter is the prime directive.

[9] Amanda Bresler and Alex Bresler, "Assessing the Effectiveness of Defense-Sponsored Innovation Programs as a Means of Accelerating the Adoption of Innovation Forcewide," PW Communications, nd. This paper has not been peer-reviewed.

Commercialization should therefore be viewed as one way of measuring this support, rather than a primary and sole end in itself.

Two further points of context should be noted. First, SBIR is explicitly designed so that DOD can undertake relatively high-risk innovation in a carefully staged way, at relatively low cost. "Failed" projects are therefore baked into the model. Indeed, one significant concern reflected in the NASEM studies was that the SBIR programs were too safe - that too *few* projects failed. Second, procurement units tend to view SBIR quite differently than private sector buyers do. To be adopted by DOD acquisition offices, SBIR technologies must of course meet needs and be priced competitively… but the companies themselves must also be sufficiently stable to meet rigorous military qualification requirements, deal with long procurement timelines, and guarantee product support for years or decades into the future. Companies with multiple Phase II awards tend to be larger and older, and are therefore likely to be seen by procurement officials as better candidates for eventual inclusion in the defense industrial base. [10]

Misleading methodology

The frequently referenced PW Communications paper provides a distorting mirror, generating false conclusions drawn from poorly constructed methodology that does not follow the gold standard set by the many NASEM studies and followed by others. This divergence introduces unnecessary biases into the analysis, and leads to conclusions that better methodology would not support.

- **Unit of analysis**. The PW Communications paper focuses on the success or failure of companies in acquiring Phase III contracts. But company level analysis is not appropriate. SBIR programs are not collections of individual companies. They are collections of *projects* that should be viewed as a portfolio for the program. Focusing on whether a given company generates revenues that are greater than SBIR input dollars is beside the point: SBIR *program* success is determined by whether the entire portfolio of *projects* contains enough big winners to pay for the inevitable losers that emerge from a program explicitly focused on high-risk investment in small companies. And the evidence is, as we will see, that SBIR at DOD does indeed return a strongly positive ROI.
- **Beyond Phase III**. The NASEM and TechLink studies explicitly rejected the view that Phase III contracts alone would be an appropriate metric for judging commercialization success. Instead, these studies included other important quantitative metrics covering in particular additional sales to DOD, and private

[10] The term "SBIR mill" has been applied in the past to SBIR multiple award winners that had no significant commercialization. After at least a decade of SBIR reform focused on improving commercialization, multiple winners without a good commercialization record would no longer be eligible for SBIR funding. The term "mills" is now used indiscriminately to reference all multiple award winners.

sector sales, including third party revenue, and exports. Excluding these metrics deeply biases outcomes downward. In an era when private sector and defense technologies are increasingly intertwined, and, in particular, where the adoption of a technology for civilian use may generate economies of scale that are key to making dual-use technology useful for DOD, ignoring non-DOD commercialization is inappropriate. The PW Communications paper itself indicates that about 58% of commercialization by the top 25 multiple award winners (MAWs) occurs at DOD outside Phase III contracts, but ignores all commercialization outside DOD.

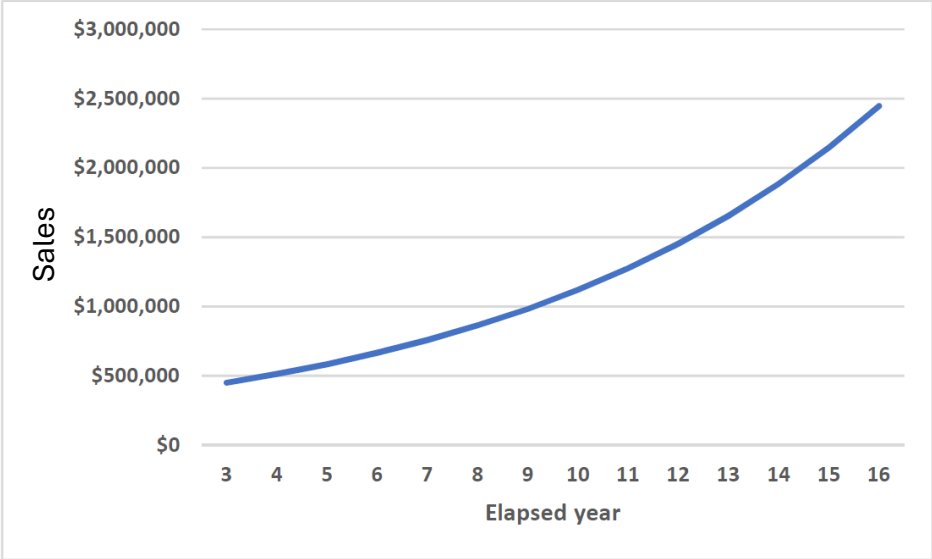
- **Further R&D investment marks a significant milestone.** Most technologies do not develop in linear fashion, as the PW Communications paper implies: SBIR $ -> product -> adoption. The NASEM studies emphasize the often-circuitous route to market for important technologies, which may require multiple iterations, loops, pivots, and adjustments. Further R&D funding – whether from within DOD or from outside – is therefore a critical metric showing that SBIR technologies have commercial potential. That's why the standard studies include this key metric (and why Congress explicitly includes technology development as a program objective).
- **Limitations of Phase III as a metric**. While Phase III contracts are a useful marker for commercialization, they have significant flaws as a metric for success. Phase III certification requires positive recognition and action from DOD contracting officers, who are often poorly trained on SBIR and unaware of the importance of Phase III certification (they are usually part of the contracting system, not the SBIR system, and these positions rotate regularly making effective training difficult). The result is that many contracting officers resist using the powerful transition tools offered by the SBIR's Phase III concept, so certification as a Phase III contract often requires direct intervention from both the company and the sponsoring program. Many companies do not pursue this, and many DOD programs have what they see as more important concerns to focus on. As a result, numerous DOD procurement contracts that would qualify as Phase III contracts are not recorded as such.
- **Excluding the impact of mergers and acquisitions**. As SBIR companies mature, they are often acquired. As of 2024, 2,120 SBIR firms have been acquired, injecting their innovations into larger companies. L3 Com, GE, SAIC, BAE, Lockheed Martin, Raytheon, Gen Dynamics, Philips, Teledyne have each acquired 10 or more SBIR firms. L3 Com alone has acquired 43 SBIR firms. These companies usually lose their own corporate identity and are folded into the acquiring defense prime or subprime, boosting the acquirer's product performance, sales and profitability. Subsequent contracts are therefore often not certified as Phase III awards, even though the original technology was developed with SBIR support. The adoption and integration of these acquired

technologies through the primes effectively severs them from outside tracking (e.g. via FPDS), even though they may provide critically important components of larger weapons systems. Of the 61 companies reporting $75 million or more in SBIR funding, 12 no longer participate in SBIR, almost all because they have been acquired. So ignoring the *substantial* downstream successes of SBIR companies again biases program outcomes downward, and often excludes from analysis the most successful companies and projects.

- **Excluding the impact of licensing**: Most technology advances occur through implementing technologies to improve existing product lines, and this is also true of SBIR innovations. Criticisms of SBIR commercialization often ignore the very large impact that SBIR technologies have upon their licensees. In such cases the SBIR firm may collect a royalty, but the licensee may double its sales in a product category or even transform its market share because of beneficial impact on its product lines of the inserted SBIR-developed technology.
- **The ROI metric**. The PW Communications paper argues that companies which do not generate more in Phase III contracts than they receive in SBIR funding are in effect failures. But this is an entirely artificial metric. There is nothing magical about this ratio: companies that "fail" this test may provide enormous value to DOD across multiple dimensions. And the authors provide no justification at all for using this ratio as the benchmark. It is not used by any of the NASEM, TechLink, or GAO studies.
- **Data sources.** It is standard practice to provide data sources so that calculations can be replicated and the analysis tested. Unfortunately, the PW Communications paper does not define or explain the "more liberal" metrics that it uses, other than these are DOD dollars from non-SBIR sources. In fact, it does not identify or share any of the data sources that it uses beyond Phase III contracts (presumably from FPDS) and SBIR awards data (presumably from SBA). It is therefore impossible to replicate the analysis, and to determine whether the additional data have been extracted and employed accurately.
- **Time period for study**. Using a ten-year window is insufficient and misleading. Just reaching commercialization takes an average of 7 years from the start of Phase II. A statistical analysis of TechLink data in a peer-reviewed journal found that simply taking a snapshot of commercial outcomes at a single point in time substantially biases outcomes downward by excluding any commercialization that takes place after the reporting date of the survey, both because some projects simply take longer to reach the market and have not commercialized yet, and also because sales from projects that do reach the market often continue for many years (see figures 2 and 3). The ten-year window for awards ending only in 2021 therefore substantially understates the eventual value of the commercial output. So, for example, non-software projects with SBIR awards in 2021 are *on average* not yet reaching the market, and have generated

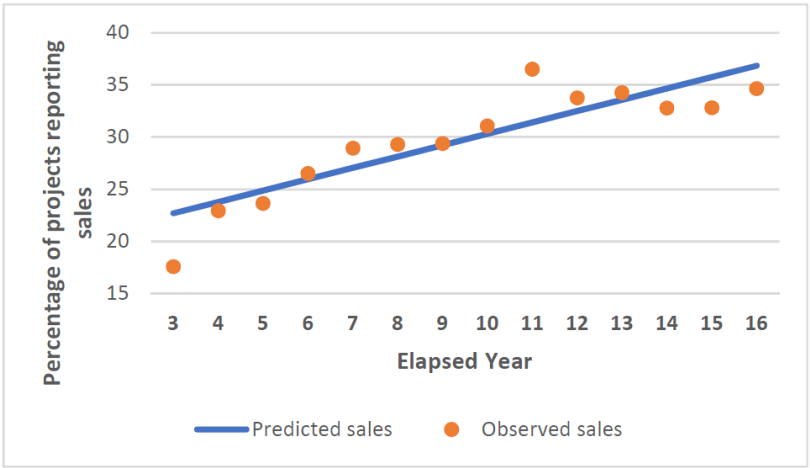
approximately zero percent of the total sales that they will eventually make. As a result, the timeframe used imposes a sharp downward bias to measured outcomes.

Figure 1 Project commercialization by elapsed year since Phase II[11]



A regression model built on the comprehensive TechLink survey of Air Force and Navy SBIR Phase II projects found that average sales per project continued to grow through the 16 post-award years tracked by the study, and that sales continued to increase in later years (see figure 2).

Figure 2 Predicted sales by elapsed year, estimated from regression model



- **Combining Phase I and Phase II awards in a single analysis is simply wrong.** The PW Communications paper may be conflating Phase I and Phase II awards,

[11] Robin Gaster et al., "Estimating Outcomes and Impacts from Innovation Programs: The Case of Air Force and Navy SBIR/STTR Programs," *Technology & Innovation* 21, no. 1 (October 31, 2019): 49–61, https://doi.org/10.21300/21.1.2019.49.

as the SBIR funding data seems to include both stages (the paper itself does not make this clear). If so, that would mistake a process for an outcome: Phase I/Phase II is a single process, not separate awards. Using Phase I and Phase II awards separately would increase the size of the denominator, which makes success rates much lower and reduces the average dollar commercialization per award. NASEM methodology specifically decided that analysis must focus on Phase II.

- **Differentiation by component.** Each DOD agency that participates in SBIR/STTR operates an independent program. It is therefore a methodological mistake to review only at the DOD level; for more than a decade, Navy and Air Force have been significantly more successful than other components in commercializing SBIR technologies, while introducing some potentially important SBIR commercialization initiatives, while Navy has itself been significantly more effective than Air Force, and much more so than Army and other components. DOD level analysis is important but not sufficient.

Analyzing commercialization from SBIR awards is complex. Revenues and further investments can come through a variety of channels; companies themselves merge or are acquired and their subsequent revenues – based on SBIR technology – can become invisible to outsiders. Investments attracted by SBIR technologies can come in a variety of ways, including equity investments and strategic partnerships, many of which are opaque. So selecting only Phase III DOD contracts as the primary metric for measuring commercialization clearly suffers from the well-known "drunk under a lamppost" methodology problem: Phase III data may be the easiest to obtain, but it is far from sufficient for evaluating commercialization. And as we will see in the later section on impact indicators, it is important to go beyond quantitative metrics altogether in assessing SBIR outcomes. But before turning to that, a second set of misleading arguments must be addressed.

SBIR as Venture Capital

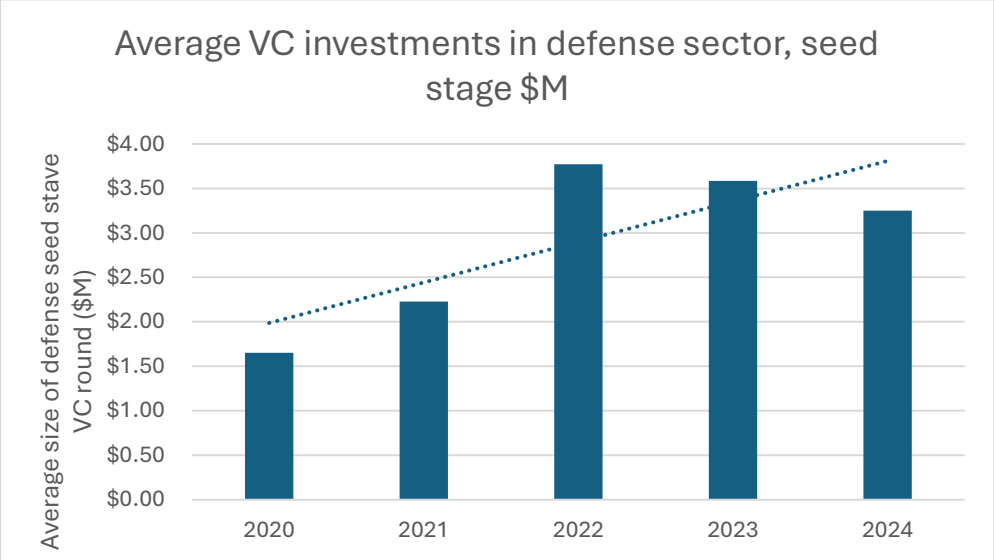
Almost since its inception, academics and others have claimed that SBIR is the government's venture fund.[12] It is even described by SBA (which manages the overall SBIR program) as "the world's largest seed capital fund."

During previous reauthorizations, SBIR was therefore criticized for duplicating the existing and effective venture capital (VC) ecology that has funded many of the most

[12] See for example Josh Lerner, "The Government as Venture Capitalist: The Long-Run Effects of the SBIR Program," Working Paper (National Bureau of Economic Research, September 1996), https://doi.org/10.3386/w5753.

successful U.S. firms. However, on closer view it is apparent that SBIR is not in fact much like a venture fund at all, for multiple reasons:

- **Objectives.** VC investors have a simple outcome in mind: exiting the investment at a substantial multiple of the original investment. This requires effective commercialization but also requires finding a large addressable market. SBIR at DOD in contrast is focused primarily on providing a technology that meets DOD needs. This may mean a very small market, and historically VCs as a result have been relatively uninterested in funding technologies aimed at DOD. Non-commercial objectives are a feature not a bug for SBIR.
- **Timelines**. VCs need to exit investments within a reasonable period of time. The median time between VC investment and IPO is 5.7 years. DoD cares about speed not for its exit but for its competitive advantage into the future, A Phase II investment at DOD takes longer to reach the market, and may not be at peak value for more than 16 years (see figure 2).
- **Size of funding.** As VCs firms have become better funded, the size of deal has increased significantly. While this has not dramatically affected seed funding rounds, overall VCs have sought to do bigger deals because they must deploy larger sums of money, so VCs are actively seeking larger deals. As a result, VC seed stage investments in the defense sector now consistently top $3 million.[13]



Source: Pitchbook

- **VC selection filters.** VCs select projects very differently than SBIR programs. They focus on the size of the addressable market, the likelihood that the technology will be successful, likely speed to market, potential market

[13] Seed stage data from Pitchbook.

competitors and alternate technologies, and – perhaps above all – the quality of the founders and team. VCs also expect that a single technology will be the primary or sole focus of the company. SBIR at DOD in contrast focuses primarily and consistently on the utilization of the technology within DOD.

- **VCs do much more than hand out money.** VCs typically take board seats after an investment, and are intimately involved in strategy and implementation. They also support the venture by providing access to critically important nodes in their powerful networks – other funders, key markets, essential suppliers, and government regulators. SBIR officials don't have the training, the capacity, or indeed the legal ability to perform any of these functions – which the literature on VCs strongly asserts are absolutely central to the success of VC investments.
- **Scale.** From 2020 to 2024, DOD made 7,254 Phase II awards. In sharp contrast, VC investors made 624 seed stage investments in defense technologies – less than 10% of that number.[14] This matters, because the VC model with its deep due diligence and deep connection to firm strategy plus other highly specific selection filters simply cannot be scaled to SBIR numbers.
- **Geographical concentration of VC funding**. VC funding is heavily concentrated in California and Massachusetts, and more generally along the coasts, with a few scattered centers around major universities elsewhere. In part, this is because VCs are so hands on, and VC firms themselves are highly concentrated geographically. SBIR is not nearly so concentrated.
- **Software focus.** While software is, as Marc Andreeson famously said, "eating the world," that is only partly true at DOD, where it is also critically important to develop new hardware tools and capabilities. According to the Council on Foreign Relations, "*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 return.*"
- **AI focus.** VC investors are herd animals. They flock from one hot technology area to the next. Currently, the hot sector is AI, which according to Pitchbook attracted 83% of all seed stage deals worth $5 million or more in 2024.[15] SBIR provides sustained funding for innovative defense technologies.

Recent proposals concerning the DOD SBIR program have inverted the traditional criticism that SBIR is a VC fund that duplicates existing VC activities, to claim that it is not, but that should become one. A recent letter to Congress to this effect from NVCA and others, has argued that becoming a government-funded VC operation would

[14] SBIR data from SBA; VC data from pitchbook
[15] NVCA yearbook 2025

generate more commercialization. The differences between VCs and SBIR outlined above help to underscore why this is a profoundly mistaken idea.

- **Commercialization-only focus**. The VC model only works if commercialization is the sole focus. Including other objectives makes the (already difficult) job of VC investors essentially impossible. Using a process focused only on commercialization while still requiring additional mission objectives would lead to failure in both directions.
- **Sector.** The VC focus on software does not fit well with DOD, even though software is an important element of both DOD innovation and its operations. A VC model would inevitably be biased against hardware projects. And the recent lemming-like rush into AI among VCs would be disastrous for DOD SBIR.
- **Timeline**. A VC model would be profoundly biased against projects that take longer to mature, even though those projects may be the most important and transformative for DOD.
- **Selection**. DOD is not set up for the intensive selection process used by VCs, which usually includes multiple rounds of interviews, deep dives into the history of founders, and extensive due diligence. DOD has neither the funding nor the personnel to manage a VC-style selection model. It would therefore be making VC-type investments without VC-level information and understanding.
- **Geography**. VC funding is highly concentrated in a few regions, partly so that investors can keep a close eye on their portfolio companies; SBIR is much more widely spread out across the United States. Indeed, deeper analysis shows that per PhD in the working population, SBIR funding is even more widely dispersed geographically than it initially appears.[16] National programs like SBIR reflect the needs of non-coastal states; a VC-model SBIR would not.
- **Size of funding**. One recommendation in recent testimony has been for DOD to fund smaller faster awards. But VCs are moving in precisely the opposite direction, seeking to fund larger and fewer awards, while extending due diligence. A VC model could not operate a program with a small award component.
- **Ongoing strategic and operational linkages to companies**. It would likely be illegal for government officials to act in ways similar to standard VC actions on behalf of their portfolio companies, and program officers have neither the training nor the expertise to do so.

[16] Michael P. Wallner et al., "Comparative Economic Outcomes from SBIR Funding: 'Underserved' Versus High-Award States," *Technology & Innovation* 22, no. 3 (December 28, 2022): 385–405, https://doi.org/10.21300/22.3.2022.11.

In reality, SBIR is only a VC program on one dimension: both provide funding for innovative small businesses. Aside from that, the differences are clear, and remaking SBIR as a VC program would badly damage the direction and effectiveness of the program.

STRATFI as a model for SBIR

NVCA has argued that STRATFI's investments in DOD-oriented technologies show that a VC-style model would work for DOD SBIR. Aside from the obvious rebuttal that the STRATFI model implies a level of due diligence and participation in funded companies that SBIR officials are prohibited by sheer scale and in many cases by law from undertaking (e.g. they cannot hold board seats), a closer review of STRATFI data illustrates other problems as well.

- NVCA claims that STRATFI investments are "highly successful."[17] However, STRATFI invests heavily in companies that are already funded by VCs: 57 percent of STRATFI companies received VC funding *before* their first SBIR Phase II award, and those investments totaled well over $6 billion. STRATFI funded 11 companies that had received at least $100 million in VC funding before their first SBIR; Archer Aviation had received $2.3 billion before its first SBIR award. These companies have already cracked the innovation funding code, and for them it is difficult to see why SBIR funding is anything other than a modest handout to well-funded companies – can it really be argued that these investments make the difference between success and failure?
- Similarly, STRATFI companies also received substantial VC funding *after* SBIR awards (about $6 billion). This is a standard path to success for SBIR in some sectors (e.g. healthcare), and demonstrates again the importance of using multiple metrics for evaluating success. However, only one STRATFI company (Privoro) received their first VC funding only after their first SBIR award; all other companies in the STRATFI portfolio that received post-award VC funding had also received initial VC funding before receiving SBIR funding. Anduril Industries received $4.2 billion in VC funding after its first award, and currently employs 4,300 people. Clearly, STRATFI has not been a catalyst for initially attracting VC investors, and a program that provides funding for companies of this size is not a program focused on funding small businesses, although it may still be performing well for DOD on other metrics, and indeed may meet a critical need.
- STRATFI investments have not as yet proved highly successful. About 56% have generated Phase III dollars, but the median Phase III revenues even just

[17] NVCA et.al. Letter to Congressional Committee Chairs, n.d.

for these successful projects is $12 million– much less than the average $16.6 million investment. We have no published data on STRATFI success outside initial Phase III contracts.[18]

- STRATFI awards are highly concentrated geographically. More than 50% went to companies in three states: California, Massachusetts, and Colorado. That reflects the strong biases of VC firms: of the $13 billion dollars of venture capital investment in STRATFI companies, $11 billion went to firms in California alone.
- Finally, STRATFI awards can be as large as $30 million, and average $16.5 million per company. That is the equivalent of ~16 Phase II awards. The source of these funds is not transparent. Dedicated SBIR funds are in principle matched by other DOD funds, and those combined funds are then in principle matched by private sector funds. However, STRATFI provides no reporting on these breakouts, and information from at least one awardee suggests that in practice the funding sources may be different. Clearly, if STRATFI funds its contracts directly out of SBIR funding, that must result either in a substantial cut to the number, or a reduction in the size of SBIR Phase I and Phase II contracts (or both).

In short, STRATFI is an interesting program aimed at helping innovative technologies cross the well-known valley of death at the end of research funding. That is a worthy and important objective. But it is not an SBIR program, it does not operate like an SBIR program, and its funded companies do not look like SBIR companies. It provides massively more funding per contract SBIR, targets a different stage of project development, requires a different degree of due diligence, and its funded companies benefiting from very substantial amounts of VC investment, in most cases before receiving SBIR funding. It is therefore in no conceivable sense a model for SBIR. And It's also worth noting that investments in a handful of companies offer no significant evidence that this model can be scaled to cover the ~1,500 Phase II contracts awarded by DOD annually.[19]

[18] Attracting $6 billion in additional investment following SBIR awards would not count as a commercialization metric using the PW Communications methodology. And the PW Communications methodology would also conclude that these VC investments were disastrous: the 58 STRATFI companies (as of end 2024) generated a total of about $1.1 billion in Phase III awards, but total VC investment was about $13 billion – revenues amounting to only 8.5% of the VC investment. Either the methodology is wrong, or VC investors are idiots.

[19] Data from SBA awards database for 2024

The importance of multiple award winners (MAWs) to the DOD SBIR program

Critics have tried to show that MAWs are not meeting an appropriate bar for participating in the SBIR program at DOD. The PW paper argues that companies should generate more Phase III contract dollars than they receive from SBIR awards, and that this is the only appropriate benchmark for assessing ongoing participation, and that many of the top 25 MAWs do not meet this bar. This approach is methodologically flawed (as we saw above) and leads to highly misleading conclusions.

- **Unit of analysis: company "ROI".** As described above, using individual companies as the unit of analysis ignores the obvious and well-understood point about SBIR programs at all agencies: they make investments in a *portfolio of projects*. The point is to ensure that the overall project portfolio generates highly positive returns. Portfolio investment program – like those run by VCs – do not seek to ensure that every project or every company is successful. VCs don't care whether 9 out of 10 investments in a portfolio fail provided that the remaining investment is a big winner. It is understood that multiple failures are the necessary price for overall success. So it is fundamental methodological mistake to look at ROI by individual company, instead of collections of projects.
- **Phase III focus vs total revenues.** Phase III contracts are not appropriate as the only outcome metric. The PW Communications paper itself reports that certified Phase III contracts account for only 28% of all known SBIR-related DOD revenues for participating companies (see appendix A). Arbitrarily excluding these extended outcomes seems perverse, especially as the excluded data includes DOD subcontracts, which account for a further 34% of total revenues. This exclusion is apparently designed to show that MAWs offer a poor ROI; however, the more appropriate broader measure – somewhat closer to those used in NASEM and TechLink Reports – shows that MAWs have a highly positive ROI (2.6:1) on SBIR dollars invested.
- **Lack of context and comparison**. The PW Communications paper attacks multiple award winners (MAWs), but provides almost no comparison with non-MAW companies. The only comparison available from within the study states that 6 percent of all SBIR companies generate more Phase III contract dollars than they receive in SBIR funding. The data provided in the paper shows that 25 percent of the Top 25 MAWs do so.[20]

[20] An unpublished study at another agency showed conclusively that smaller, firms, younger firms, and firms with fewer awards all tend to have less commercialization (for obvious reasons they have less capacity to commercialize, and fewer established markets). We suspect that a similar comparative analysis would show similar results at DOD, especially as DOD procurement is well known to favor more established companies (often for good reason).

These conceptual mistakes flow through to the conclusions of the PW Communications paper. It reports that "even using the most liberal definition," only half of the Top 25 MAWs have a positive ratio of SBIR Phase I/II to Phase III contracts. But using the same data for a review of the *whole top 25 MAW portfolio*, rather than a company-level analysis, the same Top 25 companies in aggregate generate an ROI of 2.6:1 on the original investment in total related revenues – $5.9 billion in revenues, on an investment of $2.3 billion. This is, for reasons explained earlier, still most likely a significant understatement of ROI, as data collection problems and time lags bias outcomes downwards.

The lack of context generates further problems. The paper does not provide the percentage of non-MAW firms that reached breakeven on either Phase III contracts or "more liberal" measures, or the total ROI for non-MAW firms. It is therefore impossible to compare outcomes for MAW and non-MAW companies from these data, a comparison that is surely relevant when considering whether to bar MAWs from the program.

Other critics have pointed to the March 2024 GAO study, where the headline finding was that MAWs receiving more than 50 Phase II awards generate $0.89 per dollar of SBIR investments, compared with smaller companies that generate $1.15 per dollar. However, the report also concludes that MAWs generate $0.45 per dollar in DOD sales and investments, compared with $0.40 for non-MAWs. Given that MAWs tend to be quite heavily focused on DOD, it is entirely unsurprising that they generate more DOD revenues and less private sector revenue than non-MAWS.

There are also substantial problems with SBA's commercialization data, on which GAO relies. These data are only collected or updated when a company applies for a new SBIR award, so companies that have exited the program (often through acquisition, or outgrowing the size limits) do not update their data. SBA has no authority (and makes no effort) to ensure that records are accurate, and has not cross-referenced the data against other sources.

Still, despite data issues, what conclusions there are strongly suggest that the DOD SBIR program is funding MAWs that generate a higher return on investment *at DOD* than do non-MAWs.

The data in these various studies is important. But we can go further to review some individual projects that have enormously important and influential; these drive the overall success of the program. This leads us directly to the importance of non-quantitative indicators.

Impact indicators: Beyond quantitative metrics

The discussion above demonstrates just how difficult it is to develop quantitative metrics that fully capture the impact of the SBIR program at DOD. That is why, along with quantitative analysis, NASEM undertook 18 detailed company case studies of SBIR Phase II awards for its 2014 study of the DOD SBIR program, and why various DOD components publish extensive case studies of successful projects.

These case studies can be viewed as an effort to develop not metrics but *indicators of impact*; relying only on quantitative metrics ensures that important impacts are excluded from the analysis. We can identify three areas where impact indicators can be helpful:

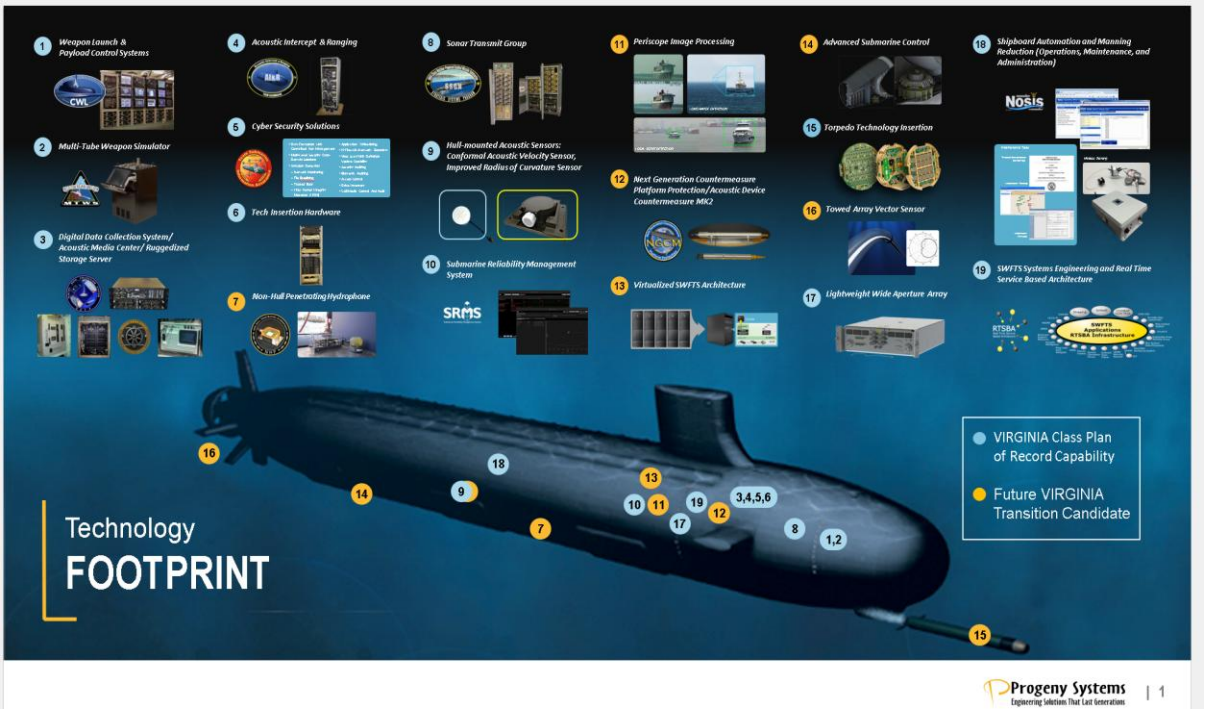
- Cost savings
- DOD perspectives on meeting agency mission
- Success stories

Cost savings. From a DOD perspective, cost savings can be as important an outcome as positive revenues Phase III contracts, because they directly stretch DOD dollars further. Air Force estimates cost savings generated by Triton technology developed with SBIR funding at $550 million over the course of the F-35 life cycle.[21]

Further examples from Progeny illustrate the scale of savings made through the application of SBIR technologies introduced by MAWs. Progeny's Common Weapons Launcher saves 66% of the cost of a previous system from a prime contractor, and Progeny estimates that backfitting it for all VA-class submarines alone would save $228 million. Similarly, Progeny's AN\WLY-1 Acoustic Intercept System is more than 85% cheaper than the previous design, saving $3.6 million per system, and potentially saving $124.8 million across the VA class fleet. Ignoring these savings and improvements – which are drawn from data prepared by Navy and charts released by Navy – distorts

[21] Air Force, "Materials technology set to lower costs, reduce environmental hazards in F-35 and other aircraft," Triton SBIR Success Story, n.d.

outcomes evaluations.



Success stories. It is also possible to gain some insight into the impact of MAWs by identifying the extent of their DOD activities as reflected in success stories. An initial scan found that more than half of the top 25 MAWs had success stories listed on the Navy web site, and just under half on the DARPA web sites (separately). These case studies explain the multitude of ways in which SBIR supports DOD and the warfighter, as the cases listed in box 1 illustrate. These reflect the impact of MAWs following DARPA awards; all these projects would be excluded under the proposed bill.

Box 1. MAW projects listed as DARPA success stories

Advanced Technologies for Reducing Decompression Obligation and Risk
Creare LLC

Streamline Intelligence Activities to Overcome Data Overload
Charles River Analytics

Active Collaborative Automatic Target Recognition (ACA)
Scientific Systems Company, Inc.

Small Autonomous, Sensor Agnostic, Sense-and-Avoid (SA3)
Scientific Systems Company, Inc.

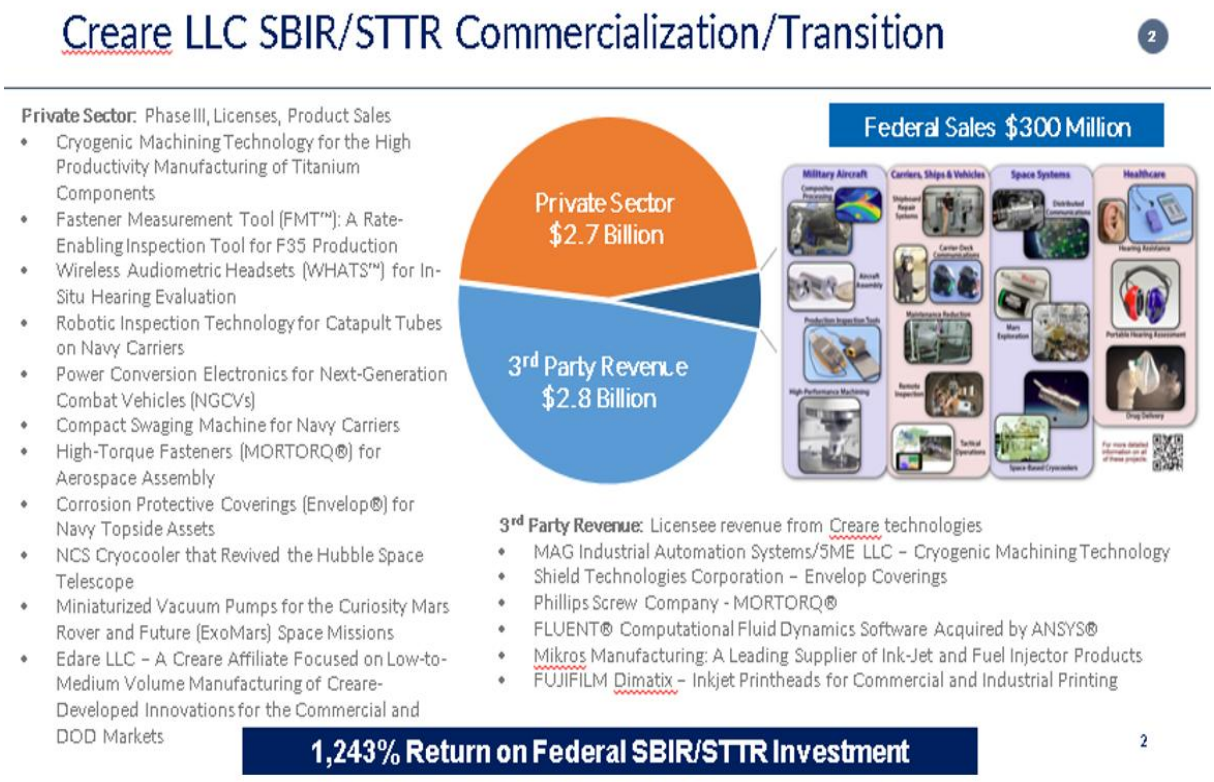
Teammate Aware Autonomy (TAA)
Scientific Systems Company, Inc.

Explainable AI to support Veterans Transition Assistance Programs (XAI-VTAP)
Soar Technology, Inc. (SoarTech)

Low-Cost, Multi-Channel Arbitrary Waveform Generator & Advanced Data Converter Module – ADCM
Trident Systems, Inc.

These benefits can be illustrated using a case study approach. One such project is the Progeny MK-54 Lightweight Torpedo. Using about $3 million from SBIR and Rapid Innovation Fund funding, Progeny developed the torpedo as a replacement for previous torpedoes that performed poorly in shallow waters. By 2017, Progeny had received $379 million in Phase III contracts from Navy, and the MK-54 quickly established itself as primary anti-submarine warfare weapon used by U.S. Navy surface ships, fixed-wing aircraft, and helicopters. Based on this success, Progeny was acquired by General Dynamics Maritime Division (GDMD) in 2022. In January 2025, GDMD received a further U.S. Navy contract for $808.6 million, a contract perhaps unlikely to be recorded as a Phase III, but one that would not exist without Progeny and SBIR. Further, Progeny\GDMD torpedoes are now the primary torpedo for key U.S. allies, including Australia and Canada among many others. These export orders are of course not Phase III contracts; nor would Phase III analysis illustrate the strategic importance of becoming the primary torpedo provider for numerous allied countries.

Navy has provided other success stories that further illustrate the impact of cost-saving technologies whose impact is not reported through FPDS, such as the Navy chart below on Creare, another multiple award winner:



These cases and others described here still do not fully capture impact indictors for SBIR. But they are sufficient to show that SBIR has many important impacts on DOD components and indeed on warfighters that are not captured in any quantitative metrics, and least of all by a narrow focus on Phase III.

DOD success stories are qualitative testimony that should help guide proposed changes to the SBIR program, and these stories reflect the significance of MAWs in generating successful technologies that can be adopted by DOD, even if they are not necessarily large commercial successes.

DOD view on MAWs. The observers best positioned to understand these impacts have also rejected previous efforts to exclude MAWs. As OSD observed in an informal memo to the Committee in 2022, "Phase I award winners require sustained investment in order to cross the valley of death and be integrated into programs of record or fielded systems. Most successful Phase III companies received multiple Phase I and II awards. These multiple awardees were chosen because they deliver innovative solutions to the Department's needs."[22] OSD on that basis has non-concurred with prior efforts to exclude MAWs from SBIR.

Overall, while we still lack definitive evidence – especially high-quality quantitative evidence – about MAW impacts on the DODS SBIR program, the quantitative evidence that we do have suggests that this impact is positive and substantial, while qualitative indicators offer considerable further evidence in support of that conclusion. Under a draft bill before the Senate Small Business Committee, both Triton and Progeny for example would have been excluded from the SBIR program as a MAW. And a venture-focused SBIR program would undoubtedly have rejected both of the Triton projects because they would not have been focused on sufficiently large addressable markets, and the benefits of these projects accrued primarily to DOD, not to the company.

Conclusions

SBIR plays a critical and unique role at DOD, creating a pathway for small innovative firms to develop technologies that can be used by DOD and by bringing in small businesses to the DoD industrial base. In some cases, this looks like a standard commercial arrangement, captured by Phase III commercialization metrics. But in many other cases, that metric is insufficient to fully capture impacts. The intertwining of defense and non-defense technologies continues to expand and become more complex. Sales to the private sector are increasingly important as a mechanism through which technologies can reach scale, reduce costs, and become affordable for DOD. Excluding non-DOD revenues from a commercialization analysis is therefore to ignore a key success metric, one emphasized by numerous previous studies from NASEM, TechLink, and others.

Similarly, adopting a simple linear model for product development ignores realities. It is conceptually based on the VC model, where a startup focuses on one technology for

[22] The Office of the Under Secretary of Defense, Research and Engineering, "Response to Senate Small Business Committee Request for informal view, June 2022

one market and drives forward toward that goal. But even in the VC world, successes are often based on pivots, loops, iterations, and changed direction. Technology development is rarely simple, so finding additional resources to continue development through the Valley of Death is a critically important marker for a technology's growing maturity. Ignoring that additional investment introduces a false dichotomy between "successful" projects which have reached the market and generate a positive ROI, and "failed" projects that have not (yet) done so. Understanding the need for further development, and the longer timeline that is necessary especially in the context of DOD, is central to understanding SBIR program outcomes at DOD.

Further, even focusing on Phase III, Phase III documentation is weak and incomplete, so overall Phase III documentation systematically understates successful Phase III commercialization from SBIR awards, a conclusion also drawn in the NASEM reports, and reiterated in the recent NASEM workshop on metrics and methodologies for tracking outcomes at DOD. Further, as companies are acquired, subsequent contracts which might have been certified as Phase III awards are often not certified, further biasing outcomes downward.

The consequences of these and other methodological weaknesses are reflected in the PW Communications paper. It offers broad claims based on a narrow selection of data, some of which is misleading. In some cases, it simply offers assertions without providing any data at all. Using the company as the unit of analysis leads to adoption of a spurious metric: the ratio of SBIR dollars to reported Phase III revenues. This metric tells us nothing about the success or otherwise of the DOD SBIR portfolio as whole. Relying primarily on this metric to assess impact is therefore deeply unsound, systematically biases outcomes downward, and is likely to lead to misleading conclusions.

Using portfolio analysis instead of company level analysis, data from the PW paper shows that in aggregate, DOD sales for the Top 25 MAWs generate an ROI for SBIR investment of 2.6:1 when using the more appropriate "broader" outcomes data that reflect all sales to DOD, not just reported Phase III contracts. .and this still ignores many other important metrics.

The relevance of VC models to SBIR has been systematically overstated (in part by SBA), and this has sometimes led to calls for a more VC-like SBIR. One example is the letter in 2024 to the Committee from NVCA. The reality is that venture investments are fundamentally different than SBIR: they focus on a single mission – commercial success and exit – to the exclusion of all else; total addressable market is a key filter for all VC investments, but is much less relevant in the context of DOD; VCs operate on a different and much shorter timeline; investment can be much larger and often focused on a different state of development; and VC investments are tightly clustered geographically (especially in California and Massachusetts). The latter is related to VC's

need for much deeper due diligence. This is a critical component of the VC model, and is entirely unavailable to SBIR program officers. Venture investment also usually involves a lot more hands-on activity from venture investors – they take board seats, provide strategic direction, and tap their extensive networks to improve the chances of success. VC investors add significant value, but none of that is available within the context of SBIR.

There is no evidence that a program structured like a venture fund would generate more Phase III dollars, still less that it would meet SBIR's other objectives. A VC-style program would prioritize private sector markets, as these are typically larger than DOD acquisitions, and defense markets take a long time to reach maturity. More generally, a VC style program requires VC style staffing, structures, and procedures, none of which are available at the scale needed to support SBIR at DOD. Applying a VC model would therefore likely result in a disastrous series of poorly evaluated and insufficiently supported projects.

Misleading company level analysis and the attempted application of the VC model have led to a misplaced effort to exclude multiple award winners (MAWs) from the SBIR program. The argument seems to be that MAWs generate poor commercialization outcomes, and that a switch toward a VC model while excluding MAWs would result in more small businesses following a linear route to commercial success. But there is no convincing evidence that MAWs generate poor commercial outcomes.

The evidence presented here – including the work of both PW Communications and GAO – shows (with proper scrutiny and appropriate methodology) that MAWs have had a profoundly positive impact at DOD, even though more data and better analysis would be helpful. Critically, this strongly suggests that the burden of proof is on MAW critics who would seek to exclude these companies from the DOD SBIR program. Language that would have excluded both Triton and Progeny and their enormous contributions to DOD must therefore be tightly supported by the data. But the evidence presented to the Committee from NVCA and others simply does not stand up to the scrutiny necessary to make such a deep and substantive change to what is widely regarded not just as a successful program, but as a model for early-stage government funded innovation programs around the world. A similar argument applies to those who would make SBIR more like a venture fund: the evidence strongly suggests that this is not likely to be successful, and the burden of proof is on those who would seek to radically restructure what has been a highly successful program.

Especially in that context, it's worth noting that all the numerous studies of SBIR have emphasized the fact that Congress provided multiple mandates for the program, and that at DOD the most important of these is to provide support for the warfighter either directly or indirectly by meeting agency needs. MAWs are critically important for meeting these needs. They offer a sustainable long-term resource on which to draw for

technical needs that DOD components cannot meet themselves. They offer – as NASEM concluded – a more flexible and inexpensive alternative to prime contractors in meeting agency needs, and the potential to become future primes or to energize existing primes when the SBIR firms are acquired. These needs may be for technologies that become commercially viable, or even enormous commercial successes like Progeny's naval torpedo, but they may also be for critically important technologies that have only minimal commercial potential. Without the MAWs and their relatively rapid technology discovery and development process, DOD components would have a much harder time meeting their technology needs. Efforts to exclude these companies must therefore satisfy a burden of proof that so far has not been met. And as DOD itself concludes in OSD's 2022 non-concurrence letter to the Committee, excluding MAWs from the SBIR program would have a negative impact on DOD, "multiple awardees were chosen because they deliver innovative solutions to the Department's needs."[23]

Dr. Robin Gaster is President of Incumetrics Inc., which provides analytics and strategic advice to high level clients in the private, public, and nonprofit sectors. He was lead investigator for the NASEM reports on SBIR from 2010 to 2018. Previous clients include the US Navy, Deloitte, SBA, and the EU. Much of his work has focused on program design and evaluation for innovation initiatives. Dr. Gaster is also a senior non-resident fellow at the Information Technology and Innovation Foundation, where he directs work on innovation in the energy sector. Previously, he was CEO of two startups. He has a Ph.D from U.C. Berkeley, and degrees from Oxford University and the University of Kent in the UK.

[23] The Office of the Under Secretary of Defense, Research and Engineering, "Response to Senate Small Business Committee Request for informal view, June 2022

Appendix A. Aggregated outcomes from PW Communications paper

PW Communications data shows that after including non-SBIR DOD $ and DOD subcontracts, the DOD ROI for SBIR investments in the top 25 MAWs is 2.61:1.

Company	Total DoD P1/PII $	Total PIII $	non-SBIR DOD $	DOD subcontracts	Total DOD-related revenues
Aptima	70,561,859	82,468,290	111,014,578	83,081,400	276,564,268
Arete Associates	86,856,904	125,140,457	54,273,729	52,312,878	231,727,064
Cfd Research	103,029,444	450,378	20,671,694	32,145,267	53,267,339
Charles River Analytics	153,639,314	15,930,109	190,283,601	35,217,274	241,430,984
Cornerstone Research Group	59,984,693	4,820,260	16,172,646	6,310,922	27,303,828
Corvid Technologies	64,965,146	26,602,284	86,312,938	88,869,802	201,785,024
Creare	158,034,669	53,366,123	32,377,302	2,762,046	88,505,471
Esss	57,145,087	66,924,136	110,567,884	1,387,970	178,879,990
First Rf	53,791,669	33,006,900	37,975,852	398,000,271	468,983,023
Intelligent Automation	172,174,305	14,607,362	53,629,128	18,472,633	86,709,123
Intellisense Systems	55,685,545	15,624,644	15,793,955	26,990,180	58,408,779
Luna Innovations	115,727,487	3,616,872	29,267,794	3,537,953	36,422,619
Lynntech	95,715,220	3,849,136	16,736,893	156,036	20,742,065
Mainstream Engineering	70,653,705	143,565	26,015,896	25,161,329	51,320,790
Maxentric Technologies	55,054,742	6,290,024	15,743,525	5,683,849	27,717,398
Oceanit Laboratories	54,091,626	22,630,526	29,494,028	1,441,395	53,565,949
Physical Optics	198,222,973	296,550,639	210,201,982	37,083,145	543,835,766
Physical Sciences	168,520,875	10,303,411	64,637,973	26,971,677	101,913,061
Progeny Systems	76,422,839	875,436,015	451,431,341	741,714,573	2,068,581,929
Sa Photonics	75,002,150	11,267,031	71,140,466	123,257,647	205,665,144
Soar Technology	67,302,292	5,760,555	98,416,685	109,764,821	213,942,061
Systems Technology Researc	52,631,563	49,937,790	544,873,845	82,537,103	677,348,738
Tda Research	56,439,024	610,100	16,773,252	1,056,318	18,439,670
Toyon Research	92,398,212	19,174,422	110,115,264	98,880,130	228,169,816
Triton Systems	121,816,610	6,430,752	29,114,160	546,157	36,091,069
Total	**2,265,306,094**	**1,668,473,491**	**2,443,036,411**	**2,003,342,776**	**5,920,756,700**

	ROI (% return on SBIR Phase I/Phase II investment $ - top 25 MAWs)	ROI (ratio of DOD-related revenues to SBIR investment)
Phase III	73.7	0.7
Non-SBIR	107.8	1.1
DOD Contracts	88.4	0.9
Phase III+DOD contracts	162.1	1.6
Total DOD-related revenues	**261.4**	**2.6**

These data still miss much of the actual impact of DOD SBIR:

- Actual DOD Phase III contracts are undercounted
- MAWs that have left the program are largely not included
- Further R&D funding is not included, although it reflects DoD transition support
- Private sector commercialization is not included
- Cost savings are not included
- Sales by acquirers and licensees are not included.