

## TERRAFORMING THE VALLEY OF DEATH

*Making the Defense Market Navigable for Startups*

Over the last 25 years, the Department of Defense (DoD) has engaged the growing U.S. technology ecosystem with a series of top-down olive branches. Perry created joint research and development (R&D) projects; Carter, the Defense Innovation Unit (DIU); and now Austin, the Office of Strategic Capital (OSC). This continued outreach is a good sign our military's leaders understand a divided technology ecosystem will ultimately undermine U.S. national security competitiveness, especially against centralized military-civil fusion in China.

However, these olive branches do not mark the end of the valley dividing non-recurring defense R&D funding from recurring defense revenue. At best, they are provisions to aid this valley's crossing. At worst, dangerous Sirens in a "valley of death." With U.S. private investors unprecedentedly pro-defense at a time of global security challenges, **the need for reform is immediate.**



While DoD undertook meaningful strides over the past decade, these largely centered on new organizations experimenting with new reforms. Methods for both investing and transitioning R&D into programs of record were demonstrated by organizations like AFWERX, Air Force Research Laboratory (AFRL), Army Futures Command, Defense Innovation Unit (DIU), Marine Corps Warfighting Laboratory, Special Operations Command (USSOCOM), and Strategic Capabilities Office (SCO). However, these methods were never formalized, shared, and integrated into a *repeatable, transparent* process capable of transitioning new DoD R&D entrants to recurring revenue *at scale*. This task must now be completed and urgently if the Department is to prevail in the "decisive decade" ahead. Delay is increasingly dangerous: keeping the U.S. technology ecosystem divided relative to China's - and future defense unicorns, as mythical as their namesake - is a losing strategy at the starting line. The Pentagon must return to its role of seeding world-changing technology, and to do this, it must fix the valley of death, now.

The Defense Innovation Board Task Force on Strategic Investment Capital assessed how to terraform the startup Valley of Death. Interviewing hundreds of startup companies, venture investors, current and former DoD leaders, and Combatant Commanders, it found that the

- **Investment Side of the Valley** needs reforms that make DoD a better investor and investment partner by (i) becoming more expeditionary and accommodating to external stakeholders, (ii) leveraging total addressable market potential, (iii) clarifying product-market fit,

(iv) tiering investments to create complete products (not just prototypes) and (v) making correspondence timely and predictable across the entire investment process. It must also (vi) train, staff, equip, and resource for investment success, not rely on small cadres of passionate government entrepreneurs to shoulder this must-win mission.

- **Middle of the Valley**, currently empty, needs an "oasis" of funding to bridge DoD's yearly portfolio of R&D investments into its two-often three-year program-specific budget cycles.
- **Procurement Side of the Valley** needs overhauling to create (i) capability opportunities more frequently, (ii) agility in both program portfolios and colors of money, and (iii) incentives that encourage disruptive practices, including working with startups. Though these are required more broadly for long-term competitiveness, they would also make the Procurement Side of the Valley more receptive for startups turning into scale-ups.

These reforms are essential to long-term military competition as part of a broader national one. As a cautionary example, the generative AI helping write this report - and potentially the world's next chapter - was created by a one-time startup not connected to DoD. Can DoD risk tomorrow's world-changers being on a separate innovation battlefield, or worse, an opposing side?

**Setting aside the details of this report, the overarching recommendation is to care about our industrial base competitiveness vis-à-vis China as much as our warfighting readiness.** The U.S. military flies airplanes anywhere in the world, sails ships into hostile seas, erects military cities in the desert, and oversees it all with satellites in space. If DoD wants to be an investment partner of choice, helping build a winning industrial base for the future - one capable of building a winning military - it can be. But it must **promote it from a priority to a duty: to support and defend U.S. innovation.** The staffing, resourcing, bureaucracy busting, and other must-do reforms would then follow. Amazing people now serving would take this innovation beachhead.

#### **INVESTMENT SIDE OF THE VALLEY: SBIR AND INNOVATION ORGANIZATIONS**

The near side of the valley of death is \$1.7 billion of annual Small Business Innovative Research (SBIR) and Small Business Technology Transfer Research (STTR) funding. This augments \$38.7 billion of laboratory R&D funding. Though capable of acting like DoD's venture fund, its return on investment - particularly transitioning capability into the hands of warfighters - is low.

A recent study by Amanda Bresler and Alex Bresler<sup>1</sup> highlighted the declining ROI of DoD's SBIR investment dollars nearing transition:

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<sup>1</sup>Presented at the Naval Postgraduate School's Acquisition Research Symposium in May 2023.

- Over the last decade, only 16 percent of DoD SBIR companies won Phase III transition contracts.
- And of these, 61 percent generated more in Phase I/II funding than they did in Phase III transition contract revenue: a negative ROI on those Phase I/II dollars.

Setting aside the disparity between investment and laboratory funding, with a yearly non-dilutive investment fund, and significant control of its own \$800-billion-per-year market, why is the Pentagon not succeeding?

The Bresler study points to one of the reasons: over the past decade the DoD has awarded a disproportionate share of its SBIR Phase I/II investment dollars into a small number of the same companies:

- The top 5 percent of companies with the most Phase I/II awards collectively received 49 percent of all Phase I/II funding awarded through the DoD SBIR program.
- The top 25 companies alone (0.53 percent of 4,703) received 18 percent of all Phase I/II funding - over \$2.3 billion - an average of over \$92 million in Phase I/II awards per company.
- And 24 of these 25 companies have been receiving SBIR awards from the DoD for more than 10 years, 20 of them for more than 20 years.

Of these long-time multi-SBIR award winners, the transition rate is low: only 4 of these top 25 SBIR companies generated more in Phase III contract revenue than they received in Phase I/II funding. This hurts new companies, warfighters, and taxpayers alike.

The Bresler study's conclusion echoes one of our own: *"The DoD SBIR program awards a disproportionate share of Phase I/II funding to a set of companies that, based on extensive past performance data, are unlikely to deliver capabilities to defense end-users. That the most active DoD SBIR companies are not necessarily those with the greatest potential for transition indicates that they are selected for Phase I/II awards based on other, unrelated criteria."*

Addressing the DoD SBIR program's well-documented over-investment in a small number of companies that do not transition scalable capability to warfighters calls for direct action on its own.

But based on our DIB Task Force's findings, we also identify a broader set of challenges that must be addressed immediately to meet the Secretary's intent of establishing *"a holistic and scalable approach ... to crowd-in private capital and scale capabilities ... to ensure our military remains unmatched"*:

- **Not Leveraging Total Addressable Market Potential.** Though private companies aim to address the biggest possible market, the DoD is unaccustomed to generating requirements, acquisition plans, budgets,

and regulations that weigh military needs alongside commercial ones for increased advantage. The Pentagon is simply more practiced in “.mil” procurements than “.com” partnerships. This kills dual-use synergy, defense purchasing power, and commercial trust.

- **Not Generating Product-Market Fit via its Investments.** Across DoD, SBIR/STTR and Laboratory R&D contracts do little to indicate future defense recurring revenue opportunities. Those opportunities, in the Program Objective Memorandum (POM), are built separately and without stakes in these early-stage R&D investments. Whereas early product-market fit is verified in the private sector based on revenue, SBIR/STTR and Laboratory R&D are effectively a defense “resort cash” spent on a customer-less R&D island, with no real value in the broader defense market. This makes the value of dual-use investments difficult for private investors to judge.
- **Not Systematically Tiering its Investments to Create Complete Products, Rather Mostly Prototypes.** Private investment increases as companies move from concept to prototype to product. However, DoD overspreads SBIR/STTR and Laboratory R&D, placing too many small prototyping bets that fall short of productizing. With prototypes ineligible for most of the defense budget’s “colors of money”, productization either gets shifted to private investors (who cannot judge product-market fit per above) or to larger companies via mergers and acquisitions. The vicious cycle then continues.
- **Not Reforming its Research Laboratories and Tolerating Competition with Industry.** Created in an age where defense invented most of its technology, the research labs have struggled adapting to technology built outside their walls. Mostly “peanut-butter-spreading” projects too thin for strategic impact, lab transitions, where they occur, remain mostly small and incremental, not disruptive and game-changing. Additionally, peanut-butter-spreading often overlaps lab projects with commercial technology areas, inducing competition with startups. Contrastingly, areas where the U.S. military is partnering to accelerate dual-use commercial technology, like electric and vertical-takeoff-and-landing aviation, are creating **military-civil synergy**, vice fusion, where competitive benefits of commercial markets are preserved under government acceleration.

Such synergistic public-private partnerships are disappointingly rare. (One on generative AI would be most welcome.) Though beyond the scope of this study, a major reform of the research laboratories should be undertaken with the goal of maintaining exclusive DoD R&D while maximally leveraging the private sector’s.

- **Not having timely and predictable correspondence across its investment process.** Many facets of DoD’s bureaucracy turn what ought to be a fast “yes” or “no” into a slow “maybe.” This is due to

*Understaffing and Undertraining:* Organizations are not staffed nor trained for investment as a core acquisition discipline like engineering, contracting, and program management are. As opposed to managing a single program, mentoring a portfolio of companies on defense missions, IT, clearances, and other DoD-isms is not a trained DoD skill. Result: investment remains a side hustle for the passionate few, which inadequately covers the mission.

*Uncertain Availability of Funds:* Investment funding often gets held or redirected by changing headquarters priorities, abandoning companies in the pipeline.

*Uncertain Decisions and Correspondence:* There is no "shot clock" for DoD investment decisions. In the private sector, companies get told "no" frequently, but more quickly and predictably. Without a shot clock in a predictable DoD investment process, how can companies count on DoD in their growth plans?

- **Not using modern development approaches broadly, especially agile software development, digital engineering, and open modular architectures.** These would allow startups to work on subcomponents of more-complex systems more easily, where security and regulations would otherwise be prohibitive. This is discussed in greater detail in the Procurement section.

As mentioned, DoD *did* make progress on new reforms with a handful of experimenting organizations. Here are the highlights:

**DIU.** Though small in scale, DIU became emblematic of DoD's outreach to Silicon Valley and has remained so from 2016 to today. It made quick inroads in technology hotspots where DoD otherwise lacked presence and provided a mechanism for bringing outside companies to work with the government. With the rise of Service investing in 2018, DIU showed agility pivoting into partnerships with Service investors, including co-investing in technologies like sustainable aircraft, small drones, and biometrics, often augmenting staff with extra contracting officers and program managers. Leveraging their off-premise sites, DIU instituted three important reforms:

- 1. Outside Presence.** Distributed local presence outside of DoD bases (via DIU and National Security Innovation Network offices) for easier engagements between startups and users.
- 2. Dual-Use Focus.** More flexible requirements and development plans to enable military and commercial dual-use synergy, especially with venture-back companies.
- 3. Non-Contractual Mechanisms.** Revitalizing Other Transactions Agreements as flexible means of engaging with commercial companies.

*DIU: The Good and the Bad.* DIU made important strides in areas not yet ready for Service customers, especially new supply chains and deep tech. One example, the Blue UAS project restored a U.S. supply chain for small drones, which may now be leveraged by Service users. Another in wearable biometrics matured technology later used by Services to manage COVID. But despite dropping the "x", DIU remained "xperimental" without a cogent DoD process for crossing the valley of death with a role clearly defined in it. Proposed Congressional legislation is now weighing to change that and provide DIU the resources it needs.

**AFWERX/SPACEWERX.** From 2017-2021, the U.S. Air Force and U.S. Space Force took strides reforming SBIR/STTR; some were later passed into legislation by Congress.

- 4. Rapid Contracts and Payments.** Combining open-topic solicitations, contracting sprints, pitch events, and cohort management as a more scalable means of cultivating portfolios of companies.
- 5. Public-Private Investment Matching.** Tiered SBIR/STTR investments with private capital matching to entice "pay-to-play" POM dollars into investment contracts. This provided a better measure of product-market fit via larger (up to \$60 million) "STRATFIs" for startups to attempt productization.
- 6. Investment Acquisition Authority.** Establishing a single investment arm with direct control of SBIR/STTR funding and direct reporting to the Service Acquisition Executive.

*Air Force and Space Force: The Good and the Bad.* This Department saw an uptick in value: five-to-one investment matching in 2021, over 1,500 new companies working in defense, and acceleration of new markets, like electric aviation. Its "Vanguard" process provided a budgetary mechanism for placing bigger R&D bets with AFRL, with one now transitioning to a program of record (i.e., "Skyborg" Collaborative Combat Aircraft). Formalizing AFWERX as the investment acquisition authority provided top cover to push boundaries. But AFWERX lacked sufficient staffing, equipping, and administration from the Air Force to sustainably scale it. This paradigm still exists today.

**NavalX.** The Navy formed NavalX in 2019, leveraging its worldwide naval presence (i.e., "Tech Bridges") to engage commercial companies. Though the Navy enjoys higher SBIR/STTR transition rates than those in the Bresler study, these mainly feed extant programs with non-dual-use technology. Such non-dual-use SBIR/STTR companies face unspoken competition from the Navy's unique Warfare Centers for the same scopes of work. The creation of NavalX is meant to disrupt this with dual-use entrants. However, NavalX lacked authorities and budget, compelling the Navy to reboot the organization this year. The Navy should make this a high priority.

*NavalX: The Good and Bad.* The Navy leveraged its global presence as an engagement resource but did not put investment processes, budget, nor significant personnel in place.

**Army Futures Command.** The U.S. Army created Futures Command in 2018 to drive commercial outreach. Growing to 24,000 personnel across 25 states and 15 countries in 2019, the Army alone tackled staffing and equipping for its innovation mission, showing earnestness externally with the scale of its "boots on the ground" and level of top cover under a four-star commander. Though fractured from the Army procurement systems, they created an essential reform missing in the other Services:

- 7. Training, Staffing, and Equipping for the Investment Mission.** The innovation mission is important, unique, and broad. This requires Command-level facilitating, not side-hustling inside existing programs.

**U.S. Special Operations Command (USSOCOM).** With its unique mission, USSOCOM was given direct acquisition authority for unique Special Operational Forces equipment. Of all DoD entities, USSOCOM embraced an important reform of user input and user experience/interface (UX/UI) considerations by connecting operators directly with developers as a core means for accomplishing missions.

- 8. User-Centricity.** Though systems may be more complex than user input and UX/UI considerations, embracing these like the private sector improves the professional experiences of operators while accelerating training learning curves.

Most importantly, USSOCOM understood, encouraged, and rewarded risk-takers. Whether mission risk, cybersecurity risk, or technology risk, USSOCOM made daily decisions that would take the DoD bureaucracy years. An agile organization was the result, one capable of moving at commercial speeds.

- 9. Risk-Taking Culture.** Innovators, including investors, must take risks to achieve rewards. Rather than judging them individually, judge their portfolio's return over time.

*USSOCOM: Strengths and Weaknesses.* The Command put users first, embraced advantage wherever it found it, took risks, and created stronger product-market fit. But its process would not scale to more complex systems.

**Marine Corps Warfighting Lab and OSD Strategic Capabilities Office (SCO).** Though not SBIR/STTR organizations, these two offices were established to get disruptive capabilities across the valley of death. The former is the designated Marine Corps "sherpa" for guiding non-traditional R&D concepts - as varied as AI to vertical takeoff and landing aircraft - into the POM. The SCO, now in its 10th year, has transitioned over half of its advanced warfighting prototypes - from Multi-Domain Operations to *Avatar/Skyborg* Collaborative Combat Aircraft to *Ghost Fleet* Uncrewed Surface Vessels - into Service programs of record, with ten operational

today. Transitioning into programs of record at these higher rates produced another key reform.

10. **Prioritize Big Bets and Provide Transition Flexibility.** As private investments get larger, they necessarily get fewer. With so much capital on the line, investors go all-in to ensure companies succeed. While having the equivalent of Seed and Series A investors that build portfolios of small investments is critical and needed in DoD, having Series D like investors that place big bets for crossing the valley to the POM is needed to finish the process. Such investors must also be POM sherpas.

For both of these organizations, POM transitions took longer than expected on average, with budget uncertainties often forcing them to fund promising capabilities for additional years when valley crossings failed. Even with strong Service support, stakeholders like each OSD Under Secretary, Director of Cost Analysis and Program Evaluation, Deputy Secretary of Defense, Secretary of Defense, White House Office of Management and Budget, and the myriad Members of the four Defense Congressional Committees all get a vote too. No investment process that culminates in valley crossings can easily fix this: it must contend with it.

*Marine Corps Warfighting Lab and OSD Strategic Capabilities Office (SCO): The Good and the Bad.* Both organizations took big disruptive bets and successfully transitioned them into the POM and into the field. But their inability to predict valley crossings forced them to divert resources to keep transitions alive at the cost of other bets.

In most cases, these ten highlighted reforms were carried out by the passionate few working extreme hours with extreme top cover. Training was not formal; staffing, sufficient; nor funding or correspondence, predictable. Though good results were achieved, many companies slipped through the cracks of this "pick-up game." For organizations like DIU and AFWERX, support significantly varied as a function of leadership, burning out those passionate few. As private investors told us, this instability will not make DoD a trusted investment partner long-term.

Combining these best practices with recommendations from our interviews and experience, the DIB recommends the following changes to terraform the Investment Side of the Valley:

**Recommendation 1:**

- Adopt all 10 previous best practices in each Service so the Investment Side of the Valley is more consistent and provisioning for productizing technology. Promote each Service investment lead to be a Program Executive Officer equivalent with commensurate staff, budget, and authority.
- Leverage DIU local presence as a one-stop cross-Service location to engage the DoD and conduct tech scouting.



- Implement investment as formal DoD acquisition discipline: train, staff, and equip for this new functional appropriately. Consider an Army Futures Command like construct to ensure this facilitating remains focused given its uniqueness and importance.
- Reform the research laboratories to accelerate commercial technologies while developing military-unique ones. In both cases, place routine big bets using "Vanguard" like programs.
- Effect policies that prevent redirecting already advertised investment funding and implement a "shot clock" for decisions and correspondence so companies may plan around the DoD.
- Adopt temporal and financial metrics that may be clearly understood and audited both inside and outside of DoD.

Beyond the Services, there are DIU and OSC within the Office of the Secretary of Defense (OSD). Aside from its agencies and field elements, OSD does not represent its own customer base in the defense market. But OSD's unique authorities and centralized convening power can accelerate the investment mission. Therefore, OSD's investment role should be strategic and complementary, focusing on areas where independent Services actions would fall short of DoD's mission needs. These include:

- Regional tech scouting using the DIU/NSIN network and conducting comprehensive market research to support DoD acquisition using commercial technology.
- Investment training, partnering Defense Acquisition University with DIU/OSC.
- Deep tech not yet ready for Service use cases.
- New supply chains.
- Financing and lines of credit.
- International markets and tech hubs.

This last role is not being performed today due to statutory restrictions on SBIR/STTR funding, requiring companies be majority-owned by U.S. citizens. OSD has existing roles and authorities for leveraging international systems, like security cooperation and foreign competitive testing. These should be expanded to include foreign technology and investment under DIU so that DoD may compete on the innovation battlefield globally.

This strategic role will be complementary to the Services, broaden DoD impact, and create a new basis to work with Allies and Partners. As such, strategic investments should have maximal authority to engage companies with debt, equity, grant, agreement, and contract options, leveraging appropriations and the financing program the Office of Strategic Capital is building. The task force commends the Secretary for OSC's creation and its bold vision of creating DoD's first lending program to seed, accelerate, and strengthen the competitive industrial base our nation needs. It is critical that DoD have every available option to fight for the future.

The task force noted the biggest risk to both DIU and OSC, and to a lesser extent SCO due its classified nature, is being headquarters organizations where changing top cover will change impact. When execution mistakes happen, the risk tolerance of the serving Secretaries will determine these organizations' survival. This organizational risk must be addressed.

Stepping back from Recommendation 1, nowhere are best practices being implemented simultaneously, and some have even regressed. The result: DoD talking a good investment game but not considering it a core mission.

**Recommendation 2:** Facilitate and empower DIU and OSC with diverse authorities (e.g., debt, equity, grants, agreements, and contracts) to make strategic investments in tech scouting, deep tech, industrial base financing, supply chains, and international markets on behalf of DoD.

Finally, as our interviews with companies and investors made clear, we must create better mechanisms for ongoing dialog between public and private officials in the dual-use investment community if we are to achieve the military-civil synergy needed to out-compete China's military-civilian fusion. Better communication will create better companies, capabilities, and markets for the competition.

**Recommendation 3:** Create a permanent subcommittee of the Defense Innovation Board, or new advisory board, to enable private investors to better understand military needs, and the DoD, the needs of private investment.

### **MIDDLE OF THE VALLEY: THE ABSENT "OASIS"**

Even if these Recommendations 1 through 3 were implemented across the DoD, most companies would still be marooned in the middle of the valley. The reason is statutory restrictions on SBIR/STTR limit how large investments may reach. The \$60 million Air Force "STRATFIs" each require a unique waiver from the Small Business Administration.<sup>2</sup> Though Congress should remove the need for this waiver, \$60 million will not productize many technologies needed by DoD, stranding companies at R&D dead-ends shy of procurement.

The other reason is the Investment Side funds portfolios, whereas the Procurement Side funds itemized programs and services. With defense budgets being built two, even three years ahead of funding availability, successful defense startups will face a major post-SBIR/STTR funding gap, even if they complete productization.

The PPBE process needs a major overhaul to compete against China's centralized budgeting advantages, which the PPBE Commission is

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<sup>2</sup> Waiver is required to pair \$15 million of SBIR with matching program funding and two-to-one private capital.

assessing. One component must be a funding mechanism that transitions successful startups from defense investment portfolios into specific programs without presupposing winners or undermining Congressional oversight. Such a mechanism would be a much-needed "Oasis" in the Valley of Death, addressing the misalignment of annual R&D vs. two-year procurement budgeting and insufficient productization funding.

To create it, the Services, DIU, et al should report their defense investments to Congress each year, giving overseers insight into the portfolio of startups eligible for next year's Oasis bridge funding, to include their programmatic plans. The remaining unknown would be which subset of companies would succeed during the following year of execution. This provides Congress *portfolio-level oversight* of transitioning investments, vice giving DoD a blank check.

The Oasis could be funded in several ways: (i) a separate appropriation, (ii) taxing Service programs, or (iii) changing End-of-Fiscal-Year (EoFY) budget rules. The third is the recommendation. However, it requires new legislation to implement. Because the DoD must carry a funding surplus into the EoFY (for contingency readiness), over \$15 billion is allocated - arguably poorly - during the last 48 hours of the fiscal year. Allowing Services to move a fixed amount into a transition account that refreshes and decolors expiring funds would pay for the Oasis with no additional taxpayer resources. Congress could even require notification before transferred funds are obligated. This would also reduce superfluous EoFY spending, a win for warfighters and taxpayers alike.



To avoid misuse, limitations should be set on how long and how much Oasis funding may be used to complete productization and/or bridge companies to future procurement or service contracts. (Else abuses like those in the Bressler report will occur.) But no matter what funding mechanism is chosen, without budgetary relief, the Middle of Valley will remain a graveyard for dual-use innovation.

**Recommendation 4:** Create transition "Oasis" funding that addresses the temporal and portfolio-versus-program misalignment of the Investment and Procurement Sides of the Valley while allowing startups to complete productization. Report investments yearly to Congress for portfolio-level oversight, including the Oasis itself.

#### **PROCUREMENT SIDE OF THE VALLEY: GOODS AND SERVICES.**

Overhauling the procurement system is needed for many reasons, not just working with startups. Fed by parochialism, decades of lowest-cost generational programs - where the lion's share is spent on sustainment

- and government support have consolidated specialization out of the Defense Industrial Base. Startups, many with access to non-defense recurring revenue, have a chance to help fill the void. But not if the new programmatic opportunities are generational, and recurring revenue, mostly in maintenance. Ultimately, new technology needs greater emphasis to grow a more diverse and dynamic industrial base.

Changing DoD's programmatic landscape is a long game, but it can and must be done, new program by new program. Thankfully, there are macro DoD changes that can make this a bit easier.

Reducing Unnecessary Headquarters Oversight: Having large staffs in the Pentagon, to include those in the Offices of the Under Secretaries of Defense for Acquisition and Sustainment, Research and Engineering, and the Services, whose job is checking the work of others for mistakes is antithetical to risk-taking. It presumes mistakes and learning from them should not exist in defense procurement, which strongly incentivizes the unacceptable status quo. Though there is a necessary role in policy making and compliance with it, current headquarters oversight is a candlesnuffer for innovation. Though beyond the scope of this DIB study, reforming what decisions come to the Pentagon, why, and how often to empower the field is needed for this study's recommendations to be implemented.

Tech Scouting and Market Research to Leverage External Opportunities: The core of a healthy innovation ecosystem is the objective, head-to-head competition of new technologies and products, under expectations that victors are rewarded with sales. Though enshrined in law and policy, market research is woefully under-resourced, making it a shallow compliance check in DoD procurement. Further exacerbated when programs are funded late to need, innovators must force their way into the DoD system, vice entering naturally via normal market behavior.

Treating IT as a Mission-Critical Warfighting System: Across DoD, IT systems and authority-to-operate practices are mostly antiquated beyond relevance. Technical debt, proprietary lock-in, and government-unique requirements stymie dual-use software and data companies alike. Adapting industry best practices - especially open, modular, scalable architectures - could create a militarized internet of things where dual-use software companies could deploy their capabilities. The generative AI helping write this report, recently valued at \$29 billion, would not be possible without such approaches. Without action at the Secretary's level, the U.S. military risks falling even further behind.

Adopting Industry 4.0: Joining software, hardware may now be designed, manufactured, and updated more continuously like software. Capable of replacing the full-rate production of generational platforms with lower-rate, continually upgraded systems, this commercial tech trend is ideal for military platforms vis-à-vis China. Having future programs work backwards from turn-key manufacturing technologies (e.g.,

"gigafactories") - not forward from isolated requirements - unlocks Industry 4.0's potential. The result would be more frequent opportunities for dual-use companies to cross the Valley. No matter how fertile the Investment Side of the Valley becomes, if Procurement opportunities remain generational, the Defense Industrial Base will continue consolidating.

Budgetary Flexibility: Locking programs into small program elements reduces flexibility and purchasing power, including working with startups. Additionally, colors of money are interpreted so conservatively that common sense is not followed, especially for Operations and Maintenance (O&M). Allowing a small percentage of R&D in an otherwise majority O&M program would open the door to companies whose products need modification to be applied. Many smaller activities could be justified under multiple colors of money, yet the fear of Anti-Deficiency Act (ADA) violations looms large in the field.

Incentives: Across the board, incentives are needed to work with startups, broaden color of money interpretations, adopt Industry 4.0 and modern software approaches, and in general, be disruptive. This includes both defense contracts and promotions.

Recommendation 5: Though needed for broader competitive reasons than working with commercial companies alone,

- Leverage the DIU/NSIN/NavalX network for tech scouting. Create incentives, including awards and promotions, for defense officials who adopt "close enough" commercial solutions in lieu of unique defense development.
- Fund cross-Service IT as a major acquisition program, taking risk on platform force structure, until DoD's IT is on par with industry's and ready for the Age of AI.
- Adopt Industry 4.0 and set capability expiration dates as a "shot clock" for new capability opportunities.
- Consolidate programs into portfolio program elements for greater purchasing power and flexibility, including working with startups.
- Create an DoD checklist for color of money use to shift ADA accountability to an approved checklist (vice the individual) to close the color-of-money gap, leverage overlaps in its definitions, and create greater opportunities for startups outside of R&D.
- Overhaul contract and promotion incentives regarding all of the above.
- Minimize Pentagon headquarters oversight and focus it on creating tools, not rules, to empower the field.

## CONCLUSION

You have now read the top-level recommendations DIB Task Force's study on Strategic Investment Capital. Our detailed recommendations and supporting assessments can be found in Appendix A, an additional recommendation in Appendix B, and a list of study participants and contributors in Appendix C.

**Now recall our overarching recommendation: to care about industrial base competitiveness as much as warfighting readiness.** Past Congresses, Administrations, and DoDs won a tech-driven Cold War that birthed the Information Age, with all its soft power advantages. With generative AI, Industry 4.0, and other technology unleashing the next industrial revolution, our nation needs DoD - and a calvary of future dual-use unicorns - on the innovation battlefield on which our security and prosperity depend.

The valley of death can and must be terraformed. The time to act is now.

## Appendix A

### Additional Recommendations

#### **A-1. Investment Side of the Valley: FIRST CONTACT**

Recent studies on the DoD innovation ecosystem (e.g., including RAND's *Strengthening the Defense Innovation Ecosystem* (RR-A1352-1, 2023), Atlantic Council's *Commission on Defense Innovation Adoption Interim Report* (April 2023)) echo many of the DIB's conclusions. Such studies are about the DoD for the DoD.

The DIB took the side of the prospective entrant, and structured its recommendations based on improving navigating the DoD's budget system. In our surveys, startups and non-traditional vendors made these observations about their first attempt(s) to engage with the DoD innovation ecosystem:

- *"There is no comprehensive entry point that facilitates navigation of the ecosystem."*
- *"Most solicitations appear 'wired' for particular companies with insider knowledge. Solutions appear preordained and not open to outsiders with innovative ways to solve old problems."*
- *"Timelines for proposal submissions are inconsistent and unreliable."*
- *"Timelines for responses to proposals are non-existent and often unacceptably long."*
- *"Communication is poor: it is impossible to reach someone who can provide guidance."*
- *"Proposal formats vary across different parts of DoD, creating unnecessary work in learning multiple formats instead of a small, consistent set."*
- *"Writing large, complex proposals is not worthwhile due to the low probability of winning and lack of constructive feedback. Pitch decks, pitch events, with higher win probability and less preparatory work are preferred."*
- *"Product compliance requirements are prohibitive. Few companies would invest out of their own pocket in advance of a large, committed purchase."*
- *"Being 'Selected but Not Funded' for a contract award does not tell companies whether to keep engaging for funding or move on."*
- *"Total timeline from entry in a Phase I SBIR to a large sale in Phase III is too long and mercurial."*
- *"Government contracts brands companies as a 'SBIR Mill,' slows them down, and drags them away from our commercial market and VC capital."*

We recommend the following actions to fix these problems/perceptions, including KPIs to provide metrics-driven accountability.

**1) Stand up a "SHERPA Office" (Supporting Homeland Entrepreneurs in Revolutionary Product Acquisition) within DIU which offers the following services:**

- a) Single entry-point for non-traditional vendors and startups that provides entry-to-exit guidance (i.e., from initial R&D to product delivery) to be staffed by cross-service, rotating SME/Tech Scouts with the following responsibilities:
  - i) Introduce vendors to potential end-users and customers.
  - ii) Facilitate matching of products to DoD needs, educating end-users on Minimum Viable Product mindset, the value of commercial overlap, and requirements abstraction.
  - iii) Assist vendors in finding appropriate funding (e.g. SBIR, DIU, In-Q-Tel, etc.)
  - iv) Assist operational programs and end-users in understanding and mechanizing contracts for purchase of commercial items.
  - v) Help non-traditional vendors get into Test and Evaluation events.
  - vi) Be evaluated by Key Performance Indicators (KPIs) such as response time, customer satisfaction, successful matches made, sales volume resulting from introductions, dollar value of custom development programs eliminated, external matching funding from VCs, acceleration of timeline to warfighter delivery, commercial sales, etc.
- b) Maintain DoD's central online portal for non-traditional innovators to navigate all innovation business opportunities that is more user friendly than FedBizOps. Improve the existing "Innovation Pathways" website for OSD to make it useful and actively supported.
- c) Maintain a DoD-wide alternative set of certification standards, testing activities, and waiver/acceptance criteria for commercial items based on commercial practices. Provide the following service to non-traditional vendors:
  - i) Guide and assist commercial vendors in obtaining necessary compliance certifications, with costs billable to DoD on future contracts and Independent Research and Development (IRAD). This activity could be outsourced to multiple independent vendors without conflicts of interest to foster competition and streamline compliance processes.
- d) Make Innovation a recognized profession or Area of Practice within the department, to include:
  - i) Recognizing, resourcing, and training to accredit necessary innovation skills.
  - ii) Managing portfolios or cohorts of companies with the KPI of seeking a return on investment for said portfolio,
  - iii) Establishing Innovation as a "seat at the table" while building the POM.

**2) Implement standing Open Topic solicitations instead of periodic, and measure the percentage of R&D allocated to Open Topics.**



- 3) **Implement a standardized, DoD-wide, "lightweight" proposal format that aligns with commercial practices (e.g., pitch decks, pitch competitions, and short white papers) that includes**
  - a) Equivalent or less effort than developing a VC pitch deck.
  - b) Simple submission process (e.g., uploading and registering).
  - c) Pricing modeled after commercial "proof-of-concept" firm fixed price contracts.
  - d) Expedient award timelines (e.g., under 4 weeks).
- 4) **Maintain a standard set of DoD-wide proposal formats so that individual organizations do not impose unique proposal requirements.**
- 5) **Eliminate "SBIR Mills" (i.e, leveraging SBIR as perpetual contracted labor rather than commercial product investment).**
  - a) Implement a lifetime limit on SBIR Phase I and II funding per company - including affiliates, spinouts, and subsidiaries - of \$100M.
  - b) Implement a ten year time limit for participation in the SBIR program from the first Phase I contract to submission of final Phase II proposal, with no limits on Phase IIIs.
  - c) Reduce maximum allowable headcount for submission of a Phase I proposal to under 200 employees, retaining the 500 person limit for Phase II proposal submissions.

#### **A-2. Middle of the Valley: FROM PROTOTYPE TO PRODUCTION**

After entering the ecosystem through a SBIR Phase I and/or II or other contract, several additional challenges were reported by the innovators the DIB surveyed.

- *"R&D sponsors are in completely separate organizations from end-users and are often disconnected."*
- *"Technical Points of Contact (TPOCs) do not have the time, capacity, or job mandate to shepherd introductions with end-users and purchasers. Even worse, they are often changed, restarting the relationships with non-traditional vendors."*
- *"Small contracts requiring some R&D to fit a maturing commercial technology to a DoD mission do not have a place in the POM, falling outside the purview of laboratories and field-level services contracts."*
- *"There is no formal 'SBIR Phase III' designed for the sale of finished products, including contract guidelines and instructions for transitioning from Phase II to III contracts."*
- *"Contracting officers and program managers are not aware that Phase III grants permission to award a sole-source contract for products matured under Phase I and II contracts."*
- *"DoD standards often diverge from commercial ones and can be expensive to achieve in advance of, and without guarantees for, purchase orders."*
- *"The requirements process does not account for opportunities."*

- *"There is no planning, nor budgeting, for production contracts immediately following the prototyping phase. 'Innovation' is effectively funded expecting failure."*

The DIB recommends the following actions to fix these challenges.

- 1) Require all Phase II, STRATFI, and Phase III SBIR proposals to include an end-user endorsement (e.g., AFWERX current practice) with the SHERPA office responsible for facilitating end-user engagements on a scheduled periodic basis.**
- 2) Use the following award criteria for Phase II, STRATFI, and Phase III awards:**
  - a) Potential to leverage outside capital (e.g., VC funding)
  - b) Commercialization potential
  - c) Level of purchaser and/or end-user funding
  - d) Mandatory presence of some degree of end-user customer funding.
  - e) First major milestones funded upon contract award as an advance.
  - f) KPIs: Ratios of outside capital contributing to DoD investment, ratio of DoD end-user customer purchase funds to SBIR funds.
- 3) Fund the first major milestone of all Phase II, STRATFI, and Phase III at contract award to aid company planning.**
- 4) Automatically award companies that have successfully productized under a Phase II or STRATFI contract, but have not received an OASIS contract, an unfunded Phase III contract, with the SHERPA office maintaining an online purchasing portal that facilitates any DoD purchaser or end-user to purchase the item or retain the service by MIPRing funds.**
  - a) The purchasing portal should be integrated into the improved "Innovation Pathways" portal or implemented as a new e-commerce site under GSA.
  - b) Require fast (e.g., less than 30 days) insertion of successful products into this e-catalog.
  - c) KPIs: Track the average number of days to list a commercial item in the purchasing portal, average vendor workload in hours, average number of products added annually, average number of items purchased each year, total dollar amount of purchases each year, and average time from item listing to warfighter delivery.
- 5) Establish an "OASIS" fund to bridge successful STRATFI companies (assuming cross-Service adoption of STRATFI awards) from R&D to recurring procurement/service contracts via a formalized Phase III process.**
  - a) Allocate a budget on par with the current SBIR program, with the top five to ten percent of Phase IIs receiving funding to scale to production.
  - b) Proposal evaluation criteria should strongly value (i) potential for, and a degree of, matching external funding; (ii)

- commercialization potential; and (iii) degree of matching DoD purchaser and/or end-user funding.
- c) Contract period of performance should be a minimum of three years, with extension clauses to manage POM uncertainty, and then transition to procurement/service contracts thereafter.
  - d) Requirements developed separately from JCIDS process to harness commercial opportunities instead of dictate specifications.
    - i) Requires Services, Joint Staff, and Agencies to create a more agile innovative requirements process.
  - e) Clauses for low-rate procurement or service retention prior to POM transition.
  - f) KPIs: Track (i) programs of record created, (ii) programs of record fielded, (iii) cost and time saved per fielding over DoD averages, (iv) benefits or any commercialization, (v) success rate of DoD non-traditional vendors compared others in similar markets, and (vi) number of new entrants to DoD's industrial base per year.
- 6) Designate an office (likely the Strategic Capabilities Office) to act as DoD's late-stage investor with investments sizes that allow full productization for DoD missions when non-traditional vendors succeed.**
- a) This office would manage the OASIS funding, working with STRATFI companies and the SHERPA team.
- 7) Companies that receive OASIS contracts or open Phase III purchase orders should be considered for low-interest rate, long-term business loans (via OSC) to support their productization endeavors. These loans should feature favorable terms, such as an initial period with no interest for a specified number of years, followed by a low-interest rate and a long-term repayment period (similar to Atlantic Council recommendation 5).**

### **A-3. Procurement Side of the Valley: PRODUCTION PHASE**

DoD's acquisition system must be changed one new program at a time, with DoD funding as the incentive to change. It must depart from generational purchaser models that specify end states, fund until achieved, upgrade every decade, and maintain for a generation. It must also view IP differently in this paradigm.

In our interviews and surveys, the following opinions were shared with the DIB:

- *"Statutorily required market research for availability of commercial items is lacking at best, disingenuous at worst. DoD program managers lack the necessary resources or motivation to perform it correctly. And DoD's funding model gives the current Defense Industrial Base strong incentives to custom-make and custom-sustain capabilities, vice leverage commercially available*

ones. There is no real verification or auditing process that such market search has been done satisfactorily and no reward system for saving taxpayer money and time-to-market for warfighters by discovering acceptable commercial alternatives."

- "When working with a prime integrator is the most expedient option for a non-traditional vendor to be part of a DoD program, there is no USG support negotiating terms, IP, interfaces, etc., often putting non-traditional vendors at a disadvantage."
- "When working with a prime integrator is the most expedient option, interfaces - to include those for software - are often proprietary because the USG's often generational approach to new programs incentivizes vendor lock-in."
- "For prime integrators, the contract 'small business set asides' are not actively managed nor valued by the USG, creating little incentive to be good at leveraging them."
- "When working with the USG directly is the most expedient option for a non-traditional vendor to be part of a DoD program, the USG often wants to own IP, curtailing commercialization potential."
- "Requirements often describe improvements to legacy capabilities, not options for disruptive new ones."
- "Program Element budget lines are too restrictive, limiting funding to the legacy system only, and are often further restricted within that. Broad language in portfolio-level Program Element would give greater purchasing agility and efficiency."

We recommend the following solutions to these challenges:

- 1) **Establish an independent "Office of Commercial Market Research" (could be part of DIU, SHERPA, DCAA) empowered to enforce the market research requirements of FASA, 10 USC 3453, and FAR Part 10, staffed with third-party industry experts who are incentivized to find commercial items that meet the lion's share of end-user needs.**
  - a) Conduct expeditionary tech scouting, maintain a database of commercial technologies and products, and provide outsourced market research services for PMs and contracting officers who lack the capacity to seek out commercial items.
  - b) Recommend program strategies that maximize participation of multiple vendors, use of open standards, and commercial content.
  - c) Audit market research performed by PMs or contracting officers on behalf of DoD.
  - d) Manage a new contract protest process for FAR Part 10 violations.
  - e) KPIs: Track the number of contract awards from the market research, dollars and time saved, and new entrants to the dual-use industrial base each year.
- 2) **Strictly enforce use of open interoperability standards. While mandated by law (i.e., National Technology Transfer and Advancement Act of 1995, OMB A-119), it is often circumvented. Recommend it as a legislative proposal to prohibit, by systems, proprietary interfaces for subsystems and software - establishing "plug-n-play" for**

**defense, where IP may be owned by "plugging" companies that do not claim ownership of the plug itself.**

- a) Verify that new programs are not developing new architectures when suitable commercial standards exist.
- b) Require open standards for all legacy system modernizations.
- c) Routinely audit compliance with open system architecture. Report violations, similar to Nunn-McCurdy violations.

**3) Reform the Requirements and Budgeting Processes (i.e., Atlantic Council Recommendations 1, 2 and 10):**

- a) For new requirements, perform market research based on high-level problem descriptions through the Office of Commercial Market Research.
- b) Create high-level objectives, vice requirements, for achieving missions.
- c) Reduce the number of Program Element lines while giving them broader descriptions for flexibility.
- d) Track overlap between DoD product-market fit and commercial feature sets and report annually to Congress, justifying deviations.
- e) Establish a flexible opportunities process, similar to JUON, JEON, or SOCOM's Major Force Program 11.

**A-4. ALIGNING INCENTIVES WITH DESIRED OUTCOMES**

Though this is the last set of detailed recommendations, it is without question the most important. All process changes will be foiled if the people executing them are not rewarded for desired outcomes. Currently, incentives are often opposite to preferred results.

Our study found that DoD programs have few to no incentives to do the following:

- *"Complete under budget and/or ahead of schedule by leveraging commercial technology."*
- *"Buy commercial items that have contributory venture capital or commercial sales that might subsidize future advances."*
- *"Increase the number of industrial base companies in their mission area."*
- *"Transition non-traditional vendors to encourage continued private investment."*
- *"Curtail competition by government laboratories."*
- *"Afford large defense sector returns so that VCs view the defense market more favorably."*
- *"Create dual-use 'defense unicorns' so that defense-friendly companies are often their market's leader, and defense-friendly private investments, often the highest return."*

The following recommendation can help remedy these incentive challenges:

- 1) Create career incentives for acquisition professionals so that they are rewarded for finding commercial items that are "close enough", pursuant to FAR 10.001(a)(3)(ii) and delivering the capability faster, at a lower cost, or with improved capabilities compared to the original plan.**
  - a) Implement individual cash bonuses for cost and time savings and allow programs to keep a percentage of savings.
  - b) Do not penalize programs that achieve cost saving one year by making it the new cost baseline for all future years.
  - c) Track the number of programs and total dollars and time saved from commercial items, reduction in delivery schedule, average percentage under budget and ahead of schedule achieved, and number of new industry base vendors.
  
- 2) Create strong proposal evaluation criteria and contract incentives for prime integrators that leverage open standards and commercial technology to include disproportionately higher fee structures.**
  - a) Provide a bonus for delivering ahead of schedule.
  - b) Provide a bonus for first-time defense use of commercial technology.
  - c) Allow the contractor to take small business set-aside credit, not only for the funds spent on purchasing the finished commercial items, but all the R&D funds and investments the vendor was previously awarded to create the product.
  - d) Track the "commercial substitution rate": percentage of the program budget using commercial items in lieu of custom development.
  
- 3) Reward innovation investors - such as government labs, SBIR, and DIU portfolio managers - for successfully transitioning companies and commercializing technology. Standardize success metrics across the DoD and provide bonuses and promotions based on exemplary performance using the following KPIs:**
  - a) Average time from the initial DoD contact to warfighter delivery.
  - b) Average DoD investment to deliver a capability to warfighters.
  - c) Average time from the initial DoD contact to the first commercial sale of said product supported by DoD investment outside of the DoD.
  - d) Average DoD investment to enable the first commercial sale of a dual-use product outside DoD.
  - e) Average ratio of non-DoD investment (e.g., VC, commercial sales) to DoD investment, considering both investment and procurement funding combined.
  - f) Average ratio of procurement dollars to total investment dollars (i.e., DoD plus private investment).
  - g) Average ratio of commercial sales outside of the DoD to the DoD investment.

- h) Number of competing vendors created through the adoption of open interoperability standards.
- i) Number of vendors created and technologies spun out from DoD labs due to successful commercialization.
- j) ROI in dual-use and defense sectors for private investors using VC standard performance metrics such as Total Value to Paid-In Capital (TVPI), Distributions to Paid-In Capital (DPI), and Internal Rate of Return (IRR).
- k) Total annual private investment in defense and dual use companies.

Thanks for reading!

## Appendix B

### Strategic Defense Innovation Agency (SDIA)

So, you have read this far and want to do something *big* to fix the Valley of Death and reform acquisition? Then this is the appendix for you.

As this DIB study concluded, we recognized the major disconnect between creating change in the public versus private sector is often-lacking competition. That is why many of this study's recommendations aim to create and align incentives around DoD investment funding so that different parts of the government compete for them, just as different companies do without.

In the POM process, Services and Agencies do compete with each other for DoD funding, but not with themselves inside their ordained mission areas. We strongly desired a means of creating competition on the Procurement Side of the Valley of Death as a means to drive required "long game" changes. The creation of a new competitive agency whose mission overlaps with the Services and existing Agencies was an idea worth capturing but will require further study.

Notionally, DoD, working with Congress, would:

- (1) Establish a new Presidentially Appointed, Senate Confirmed (PAS) agency director, akin to the National Reconnaissance Office (NRO) Director. Work with Congress to make this position easier to fill (e.g., restrictions) by outside experts. Report this position directly to the Secretary of Defense.
- (2) Make DIU (for sourcing and investing), OSC (for lending), and SCO (for productizing), and other "alternative pathways" organizations its branches, while growing headcount in each. Repurpose existing headquarters oversight billets as the means of growth to keep government headcount constant.
- (3) Exempt this agency, and the Services, from non-statutorily required oversight and budget restrictions to create a level playing field. Work with Congress to reduce statutorily required oversight and budget restrictions where prudent.
- (4) Compete this new agency against the Services for development through production of new capabilities.

Competition is the ultimate source of improvement. If competition with China is not enough to improve the DoD procurement system, then creating competition *within* it might. Congress could use this parallel procurement path as a means to incentivize Services to disrupt themselves under the looming risk of losing budget top-line.

Making the position a PAS would put it on par with the Service Acquisition Executives and NRO Director, while also providing a mechanism to get DIU, OSC, and SCO out of the Pentagon's headquarters,



facilitate them administratively, and stabilize them against leadership changes.

The DoD has disrupted its bureaucracy in the past when it created the Defense Advanced Research Projects Agency, NRO, and Missile Defense Agency to adapt to existential threats. It would be wise to consider doing so again to tip the scale in this decisive decade with China.

## **Appendix C**

### **Study Participants and Contributors**

The Taskforce would like to thank the hundreds of individuals who participated in and contributed to this study. Our recommendations were inspired by your candid input and thoughtful suggestions on how best to address the valley of death for startups and crowd-in more private capital to support innovators of dual-use defense technology.

We would like to thank the 310 startups and small businesses, 64 venture capital and private equity investors, and 56 established defense industry and prime contractors who provided invaluable private sector perspectives on their experience with this challenge.

We would also like to thank the dozens of current and former DoD SBIR and innovation organization leaders who shared their insights on what is working and what more needs to be done.

Finally, we would like to thank the many current and former warfighters who provided the most important perspective on what can and must be done to fix this issue so our military can stay ahead of our adversaries in this decisive decade -- strengthening US deterrence to prevent conflict, and ensuring overmatch in the event of it.

Particularly, we would like to thank Gen. Brian P. Fenton, Commander USSOCOM, and his staff, for their creative and inspiring feedback; the DIB staff for their support; and James Hickey, MITRE, for his excellent and expert support in preparing and improving this document.