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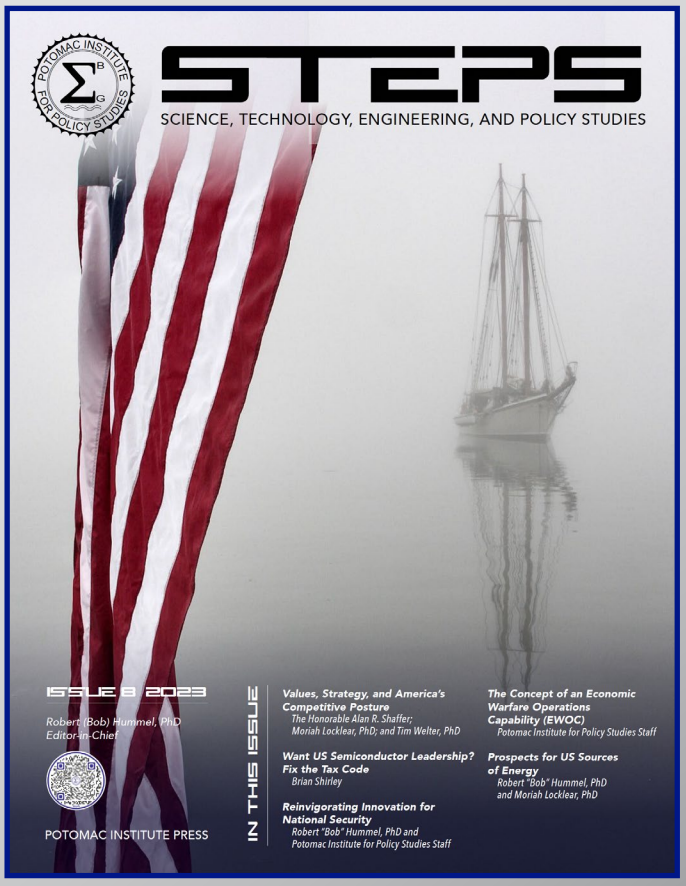

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Introducing the National Security Innovation Base (NSIB)

The United States has a long tradition of innovative research and development (R&D). Innovation has been particularly important for national security, with the development of advanced weapons systems, superior reconnaissance and surveillance systems, and sensors and detectors intended to help the military defend the nation. Many innovations for national security purposes spill over into benefits for the commercial sector. Sometimes, commercial innovations and products spill over into benefits for national security.

Lately, much has been discussed about the "national security innovation base." The term appears to derive from the 2017 US National Security Strategy[1] but was not formally defined there. Instead, the term has evolved and is generally considered a network of individuals, companies, and institutions that transforms ideas into capabilities to benefit US national security. The "national security innovation base" should not be confused with the intersecting but distinct concepts of "national security industrial base" or "defense industrial base."

There is concern that the US network of innovation for national security is not performing as well as in the past. The basis for this concern is two-fold: 1) innovators within the US are more intent on commercial products and less devoted to national security issues; and 2) other countries, particularly China, have learned to be innovative in their national security and military affairs and, in some cases, are outstripping US innovations.[2]

The fascination with Silicon Valley jobs and startups has economic roots. The promise of large salaries and anticipation of instant wealth has caused university graduates and talented researchers to migrate to companies specializing in commercial activities, which takes resources away from more direct support to national security objectives.

In military systems, both China and Russia have claimed new weapon systems that show innovative capabilities that outperform and counter US defenses. Particularly, the development of highly maneuverable hypersonic vehicles demonstrates innovative invention and advanced systems development that extend beyond technologies that the US can field.[3]

None of these developments imply that the US is incapable of innovation for national security. However, concerns exist over limited capacity (i.e., the availability of human and monetary resources) for continued national security innovation. But confidence remains in the ability of American ingenuity. The Department of Defense continues to take actions to increase the capacity by finding new sources and improving engagement with the innovation ecosystem—sometimes with surprising results. Congress, too, has supported initiatives such as the CHIPS and Science Act of 2022, aimed at reinvigorating US innovation capacity for both commercial and defense purposes.

So, it is unfortunate that certain laws and policies negate the benefits of these initiatives by "shooting the US in the foot" and thwarting the capacity of the national security innovation base (the NSIB). This article examines the main inhibitors.

The NSIB includes governmental agencies and organizations, public and private research centers, academia, the traditional defense industry, the broader commercial sector, financial institutions, and the innovation ecosystems of America's allies and partners abroad (whenever those entities directly or indirectly contribute to US national security). The NSIB includes the Department of Defense (DOD) agency DARPA (Defense Advanced Research Projects Agency), all its contractors and agents, and other DOD elements that fund and perform research. The NSIB is thus a large apparatus, fully capable of creating capabilities from innovative ideas and new technologies. At issue, however, is its capacity to bring new ideas to fielded capabilities.

Is the NSIB Capacity Sufficient?

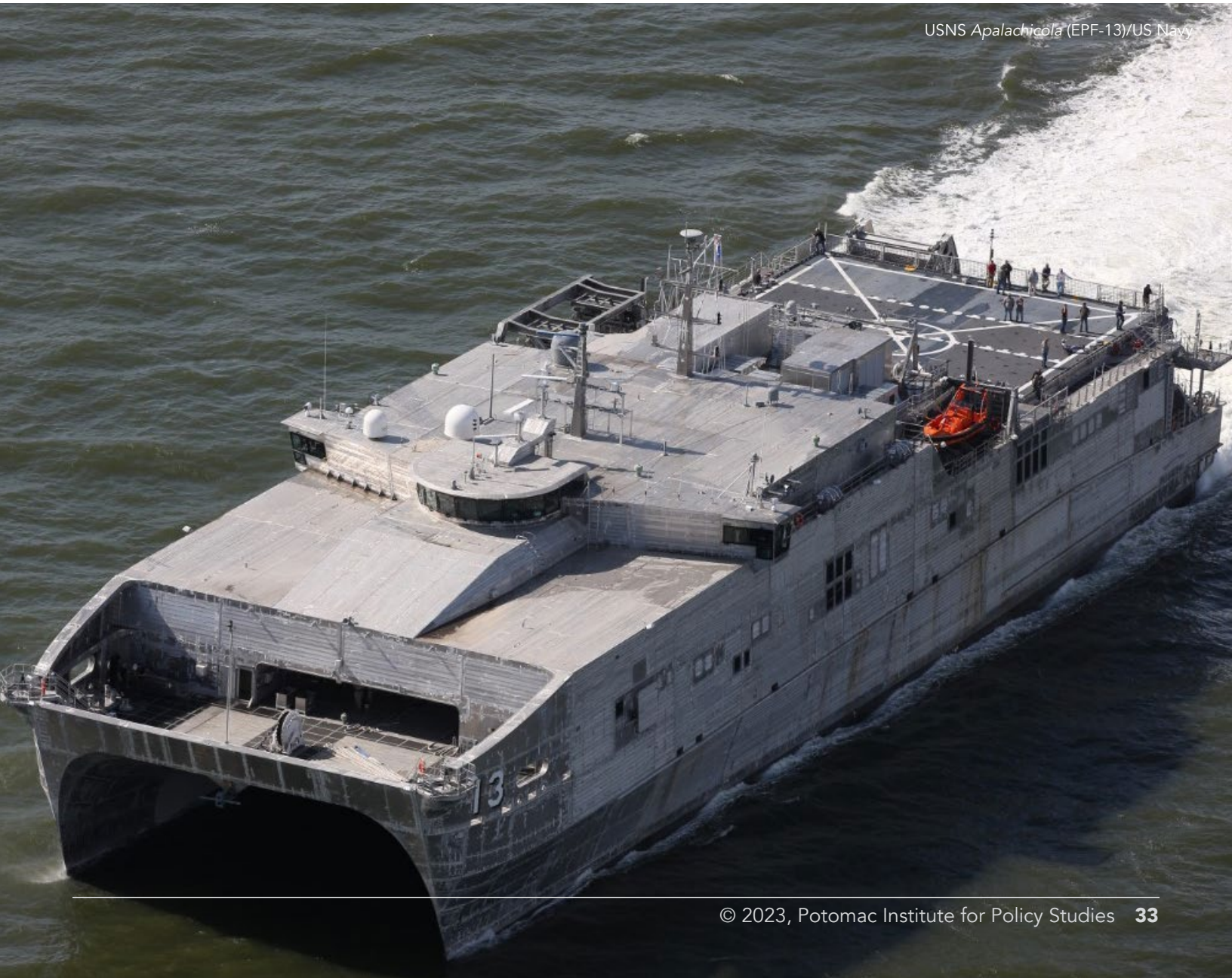
Not everyone agrees that there is a need for more innovation—why develop new weapons when we already have the finest equipped force in the world? The US is in fact deploying new weapon systems. The Army announced 24 new systems for deployment in 2023,[4] the Air Force has the B-21 bomber with an open systems architecture about to be fielded, and the Navy has taken delivery of the *Apalachicola*, a drone ship.[5] New space-based surveillance systems and airborne intelligence, surveillance, and reconnaissance (ISR) systems also silently testify to US innovation capacity. Many upgrades to existing systems managed by program executive offices, often with

classified capabilities, show further evidence of great innovation in the national security sector.

But concern remains, expressed in a variety of other sources. A recent report from the Information Technology and Innovation Foundation titled "Wakeup America: China is Overtaking the United States in Innovation Capacity,"[6] claims that by 2020, China's output of innovation in absolute terms (not per capita) was already 139% of the US innovation output. An article by the Alliance for American Manufacturing remains skeptical that recent laws such as the Inflation Reduction Act and the CHIPS and Science Act will succeed in their intent to reverse the US decline in innovation capacity.[7] The implication is that the United States can innovate for defense and commercial needs but is not innovating enough.

Thus, the debate over NSIB capacity sufficiency is inconclusive.

Section 889 of the William M. (Mac) Thornberry National Defense Authorization Act (NDAA) for Fiscal Year 2021 directs the DOD to assess the "economic forces and structures shaping the capacity of the national security innovation base (NSIB) and develop policies to address such forces and structures."[8] The assessment includes reviewing various elements "as they pertain to the innovative and manufacturing capacity of the national security innovation base." The authors of the legislation sought areas where Congressional action could help the NSIB, separate from policies of departments and agencies that the executive branch can enact.

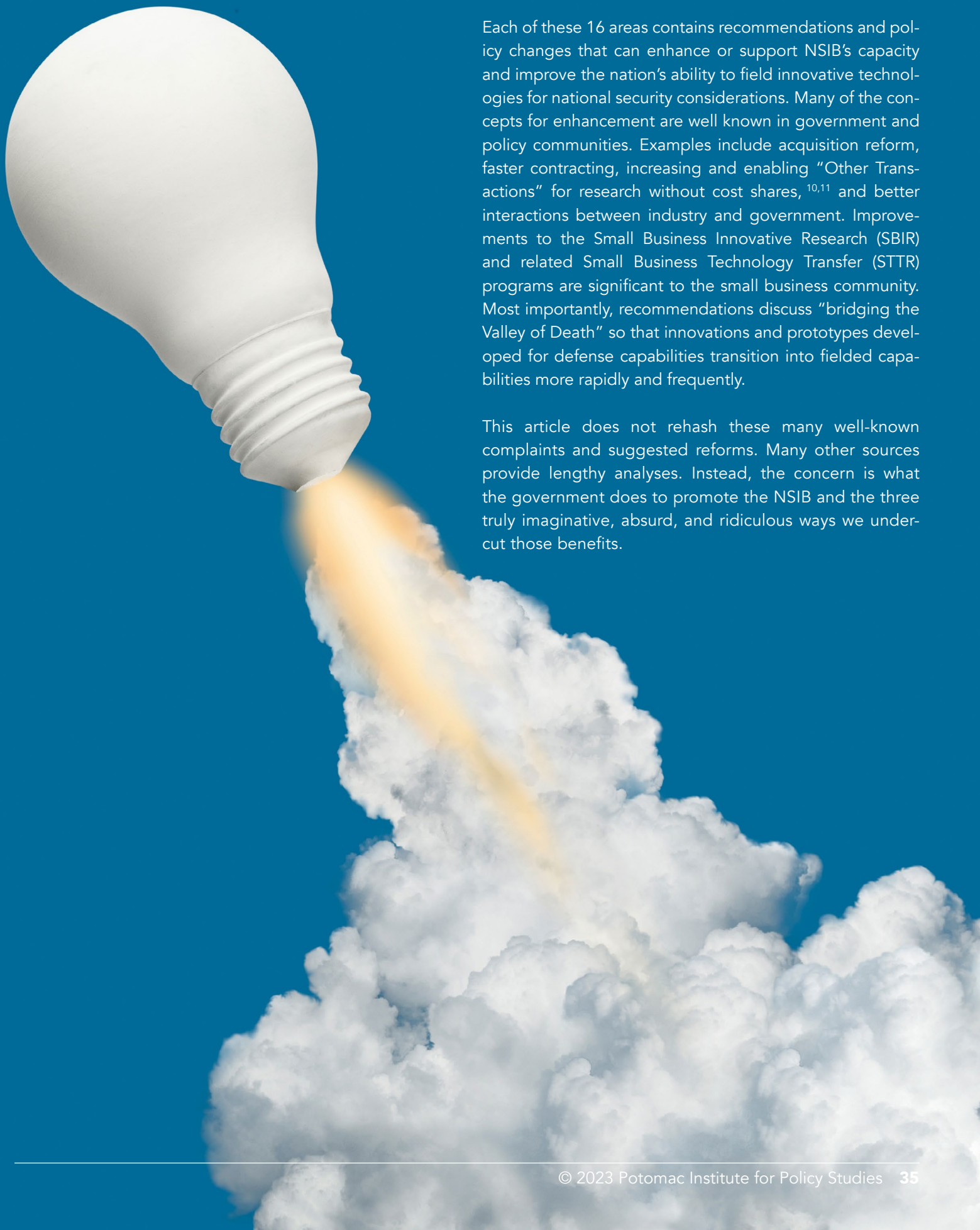


USNS *Apalachicola* (EPF-13)/US Navy

The Ronald Reagan Institute, the think tank that manages the Reagan Library, initiated a task force in 2019 to address US competitive advantages in technology and innovation, and subsequently presented findings and recommendations at their 2023 National Security Innovation Base Summit.[9] In 2022, the DOD commissioned the Potomac Institute for Policy Studies to research the topic areas outlined in Section 889, in light of NSIB needs. In March of 2023, the Potomac Institute for Policy Studies delivered a report on the 16 elements named in the legislation, as listed below.

1. A detailed description of the entities comprising the NSIB and how they currently interact.
2. Competition and antitrust policy.
3. Immigration policy, including the policies germane to the attraction and retention of skilled immigrants.
4. Education funding and policy.
5. Demand stabilization and social safety net policies.
6. The structure and incentives of financial markets and the effects of such on the access of businesses to credit.
7. Trade policy, including export control policy and trade remedies.
8. The tax code and its effect on investment, including the Federal R&D tax credit.
9. Regulatory policy, including with respect to land use, environmental impact, and construction and manufacturing activities.
10. Economic and manufacturing infrastructure.
11. Intellectual property policy.
12. Federally funded investments in the economy, including investments in R&D and advanced manufacturing.
13. Federally funded purchases of goods and services.
14. Federally funded investments to expand domestic manufacturing capabilities.
15. Coordination and collaboration with allies and partners.
16. Measures to protect technological advantages over adversaries and to counteract hostile or destabilizing activity by adversaries.

Image credit: Alex Taliesen



Each of these 16 areas contains recommendations and policy changes that can enhance or support NSIB's capacity and improve the nation's ability to field innovative technologies for national security considerations. Many of the concepts for enhancement are well known in government and policy communities. Examples include acquisition reform, faster contracting, increasing and enabling "Other Transactions" for research without cost shares, [10,11] and better interactions between industry and government. Improvements to the Small Business Innovative Research (SBIR) and related Small Business Technology Transfer (STTR) programs are significant to the small business community. Most importantly, recommendations discuss "bridging the Valley of Death" so that innovations and prototypes developed for defense capabilities transition into fielded capabilities more rapidly and frequently.

This article does not rehash these many well-known complaints and suggested reforms. Many other sources provide lengthy analyses. Instead, the concern is what the government does to promote the NSIB and the three truly imaginative, absurd, and ridiculous ways we undercut those benefits.

Investments in the NSIB

The government and society support the NSIB in many ways for the nation's benefit. In 2021, US R&D spending from all sources, government and non-government, was estimated at $792 billion.[12] US government funding for R&D amounted to $138 billion in 2020.[13] The US government tends to fund more in the innovation space, whereas non-government sources focus on development and product evolution. However, over the past two years, the big social media Silicon Valley companies and venture capital investments have added billions in R&D for artificial intelligence research. Much of this financing supported the development of fundamental large language models to drive text, imagery, and software generation.

Within government funding, the DOD is responsible for the largest share of R&D funding, amounting to $123 billion in 2022. Of that amount, $18.8 billion was in the 6.1 to 6.3 budget categories, often collectively characterized as "science and technology," which included a large portion of the DOD R&D innovation.[14] One analysis indicates that DOD funding of "early stage R&D" totaled $34 billion in 2022, with an expected increase to $40 billion in 2023.[15] The National Science Foundation, the National Institutes of Health, the Department of Energy, the Department of Agriculture, and other agencies fund the remaining government support for R&D.

The government supports the NSIB in ways that go beyond providing funds by encouraging small businesses to research topics in the national security space in the SBIR/STTR programs.[16] The DOD has other avenues to fund innovative R&D, such as AFWERX and SpaceWERX, the Defense Innovation Unit, and the latter's National Security Innovation Network.[17] More recent initiatives include the Rapid Defense Experimentation Reserve (RDER), with appropriated funding of $278 million in 2023,[18] and the Office of Strategic Capital, which has requested $115 million for FY 2024.[19] These units aim to accelerate the transfer of technologies to national security capabilities through attracting or delivering funding that resembles venture capital investments. As part of the Science, Mathematics, and Research for Transformation (SMART) scholarship-for-service program, the US government offers free tuition and stipends to selected, qualified students for science, technology, engineering, and mathematics (STEM) post-secondary study in exchange for a commitment to work for a DOD institution an equivalent number of years.[20] The SMART program is thus a scholarship and workforce development program for the NSIB. In these and other ways, the government is engaged in efforts that boost innovation for national security purposes, leveraging the talents and capabilities of the nation and its institutions.

In addition, recent legislation has directed new R&D funding in particular industry sectors based on national interests. The CHIPS portion of the CHIPS and Science Act of

2022 appropriates about $5 billion per year for the next five years in microelectronics research, and additional funds to increase domestic manufacturing. The Science portion of the Act authorizes $174 billion over five years for science, technology, and workforce development. This funding dramatically increases the National Science Foundation (NSF) budget through a Technology, Innovation, and Partnerships (TIP) directorate that focuses on the transition of technologies for commercial use. The Inflation Reduction Act of 2022 improves the R&D tax credit for startup businesses and incentivizes specific sectors of manufacturing that should increase demand for R&D in those sectors. The NSIB will certainly benefit.

Do Not be Innovatively Stupid

With all this effort and funding for innovation in national security systems, it would not make sense that the government has policies and laws that directly and needlessly inhibit the NSIB.

But we do.

We undo many of the US programs and advantages in support of NSIB by thwarting innovation in three key ways:

1) Taxing R&D.

2) Throwing away talent.

3) Discouraging STEM talent development.

Do Not Tax R&D

A common assumption is that R&D gets preferential tax treatment, through deductions (26 CFR § 1.174, called Section 174) and credits (26 U.S. Code § 41, called Section 41). The truth is complicated, reflecting the complexity of the law and the common confusion between Section 174 and Section 41. The culture reflected in the tax code is one that treats R&D suspiciously, viewing R&D like entertainment and not essential to making a profit. This attitude is harmful to the nation's security and wellbeing.

Section 174 provides for the deductibility of "research and experimental expenditures," which are defined in excruciating detail in Section 1.174-2, including a discussion about "expenses incurred in the taxpayer's trade or business which represent R&D costs" and a discussion of the discovery of information "that would eliminate uncertainty concerning the development or improvement of a product."[21] Certain expenses are excluded, such as quality control testing, efficiency surveys, management studies, and consumer surveys,[22] which are essential aspects of commercial product development. For defense applications, these activities could also be beneficial to defense R&D transition but are discouraged by their tax status.

To further help explain research and experimental expenditures, Section 174 gives ten examples with further cases concerning "expenditures with respect to land and other property."[23] Further complicating the situation, Section 41 provides for a 20% tax credit for incremental increases in "qualified research expenses" (QREs) over a base amount. For certain kinds of QREs, Section 41 allows for partial credits that are not necessarily incremental over a base level. The definition of QREs relates to "qualified research," which is defined according to a four-part test and certain exclusions to each business component.[24] Although related, QREs are defined separately from the Section 174 definition of research and experimental expenditures that provide for the deductibility of expenditures.

The upshot is that for-profit companies often have legions of lawyers and accountants to ensure their research is deductible. As well, for-profit companies are often discouraged from conducting unsponsored research, lest the expenses be taken from after-tax profit (capital accounts). Further, an entire consulting industry is devoted to assisting companies in taking advantage of Section 41 tax credits,[25] which provides a hidden burden on successful small businesses and startups.

Add to this the change that occurred in the Tax Cut and Jobs Act of 2017. This Act amended Section 174 to require that deductible research and experimental expenditures be depreciated over at least five years starting in 2022, as opposed to being expensed as a deduction in the year in which they occur. The change effectively imposes a tax on two years' worth of R&D in for-profit businesses that previously expensed their R&D costs. For example, a business would have to count as profit 80% of 2022 R&D expenses (even though it was already spent), and pay taxes on that "phantom profit." Additionally, the business will have to pay taxes on phantom profits at 60% of FY 2023 R&D expenses, 40% of FY 2024 R&D expenses, and 20% of

FY 2025 R&D expenses. This added tax (which, if R&D expenses are held constant, amounts to two years' worth) is an ideal way to discourage R&D. For some businesses, the tax due (21% of profit) will be greater than revenue over expenses, thus bankrupting the company. Even if this provision is repealed,[26] the message to US businesses is that R&D is not valued as a cost of doing business but rather as a depreciable asset.

Tax treatment of R&D in the US is a prime example of the "death of common sense," as articulated by Philip Howard in his book decrying "how law is suffocating America."[27] Identifying legitimate and reasonable R&D expenses should not require detailed legal specifications. Legitimate R&D by for-profit companies should be considered a cost of doing business and deductible as a business expense necessary and reasonable for competing in the global goods and services marketplace and beneficial to national security.

Do Not Throw Away Talent

The demand for talent in STEM is global. The US is in a growing global competition for talent and employees who can contribute to commercial and defense capabilities. In 2019, the US STEM workforce consisted of over 36 million workers, of whom about 8.6 million have post-secondary degrees and were considered scientists and engineers.[28] As well, roughly one-fifth (19%) of all STEM workers in the US were foreign born and nearly half (45%) of the STEM workers with doctoral degrees were foreign born.[29] International students make up over 70% of the graduate students in computer and information science, electrical engineering, and petroleum engineering and over 50% in many other STEM fields.[30] According to the American Immigration Council, "professional STEM workers" in the US amounted to 10.8 million in 2019,[31] of whom 23% were foreign born.

The number of professional STEM individuals that the US is expected to need will increase by more than 10% from 2020 to 2030 above and beyond replacing retirements.[32] This demand can only be met with increased numbers of foreign-born individuals recruited to professional STEM occupations in the US.[33]

International students on F or J visas are non-immigrants, meaning they have promised and are expected to leave the US eventually. International students who receive PhDs in the US tend to manage to stay for long periods of time—a recent report states that 77% of international STEM PhD graduates from 2000 to 2015 are still living in the US,[34] indicating long-term stay rates among PhD graduates. Transitioning from non-immigrant visa status to legal permanent residency involves a sequence of visa transitions including optional practical training (OPT), H1-B visa candidacy and award, and green card and eventually US citizenship application.[35] The process can take decades, during which time the foreign national is subject to international traffic in arms (ITAR) technical information restrictions and other

impediments. Moreover, the individual is ineligible for a US security clearance until after receiving citizenship.

Through the years, there have been proposals for a special STEM visa,[36] adjustments to the H1-B visa numbers, and modification of the OPT program. There are also a limited number of "employment-based" (EB) visas for extraordinary talent that will not displace US workers. The problem remains that the nation and the educational system, particularly graduate programs at research universities, rely on a stream of international students, but visa policies treat these students as temporary.

These proposals and policies are viewed as immigration issues, when the real issue is export control. In most cases, the foreign person is already here, has been educated and trained, and is the subject of investment by the US. By encouraging them to leave through continued temporary visa status, we encourage the export of knowledge and talent to foreign countries that are often in competition with the US.

There is a very real concern about theft of intellectual property and technology, and foreign agents sent to collect information at universities, startups, and companies in the US. However, vetting should be done prior to the investment in their participation or education in the US and should be based on the intentions of the candidate. Instead, for those students and graduates who are in the US for their own educational purposes, we should want to capture and retain them, and utilize their talents for economic and defense benefit in the most efficient manner. The long route of temporary visas together with the ITAR restrictions on information sharing is anathematic to proper export control and efficient use of resources. Proper export control means that we do not return graduates to further develop technologies to compete with US business and defense industry. Efficient use of resources means that we give these individuals the means to contribute with knowledge in technical areas of importance to national security, once they are vetted to ensure that their intentions are not on the side of adversaries.

Do Not Discourage STEM Talent Development

Getting a STEM degree and maintaining STEM skills is a daunting task. In the US, a degree from a private university, in a STEM field, generally takes at least five years of study (despite the notion of a four-year college degree) and generally requires incurring substantial debt (or an ability to pay hundreds of thousands of dollars).[37] Undergraduate tuition, fees, and housing is currently $82,730 per year.[38] Scholarships that "meet need" without substantial borrowing through loans are rare, limited in number, and ineffective in removing the deterrence of all candidates except for the independently wealthy. Minorities and females are underrepresented in STEM degree programs, reflecting evidence of their discouragement from pursuing STEM

education in high school years and suggesting that help and intervention is appropriate as early as possible along the education ladder.[39]

The DOD SMART program made 482 awards in 2022.[40] This is an excellent way to encourage and support STEM talent development to benefit the NSIB, but the NSIB is likely to need thousands of entrants per year to satisfy the workforce needs. An expansion of the SMART program would be welcome. However, there also must be ways to reduce the impediments that discourage minorities, women, and those without sufficient independent resources from pursuing STEM degrees and further STEM training—for the overall benefit of the NSIB and economic benefit of the nation. The current US advantage of excellent private universities and research institutions is, in part, squandered by economic factors and education funding policies.

Summary

The ability of the US to produce innovations for defense and economic purposes remains strong. However, competition with the rest of the world dictates that the US cannot afford to be foolish in maintaining its technological edge through innovation. This article has identified three areas in which US policies are indeed stupid.

First, the tax policy is not conducive to supporting research and development, except at not-for-profit institutions that do not worry about being taxed on R&D expenditures. But for-profit companies have a lot to offer in innovation for national security purposes. Tax policy should encourage for-profit company participation in the NSIB and not discourage R&D.

Then, international students are an essential aspect of the US education system, particularly in STEM fields, and their talents should be captured for the benefit of the US economy and the NSIB. Instead, today, out of fear of exporting technologies, we enforce the barriers between the NSIB and talent among international students that we have educated. By suspecting all, we encourage the export of their knowledge and abilities through the uncertainties of temporary visas. While international students using our institutions to collect knowledge for the benefit of adversaries should be prevented, this is not a good reason to discard a large pool of talent that could be persuaded to stay and work for US national security.

At the same time, we need to find ways to encourage the development of STEM talent to benefit the NSIB and maintain those talents through careers. We need measures to level the inducements to the study of STEM topics compared to other fields, by adjusting costs. Today, we unnecessarily discourage STEM education. To the extent that STEM education remains a draw, too often that draw is to lucrative commercial endeavors whose benefit to US national security is limited. The NSIB needs to compete for the development of talent that drives careers to benefit US national security and productive economic industries.

The US has a tremendous advantage in its ability to innovate, especially for national security purposes. It behooves the nation to undo the unnecessary impediments to using those advantages.

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