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"Science and technology are fundamental to ***U.S. competitiveness***. America's pre-eminence in research and innovation has long been the ***envy of the world*** and a critical source of our ***national strength***...We must ensure that adequate incentives are in place that will not only ***maintain our pre-eminence*** in initiating ideas and know-how, but also our lead in setting the pace at which these are translated into new products and processes."

President Reagan || Message to the Congress on a "Quest for Excellence," || January 27, 1987

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Introduction

In 2023, the Ronald Reagan Institute's Center for Peace Through Strength published the first-ever report card to assess **the National Security Innovation Base (NSIB).** The concept of the NSIB had gained prominence since its emergence in the 2017 U.S. National Security Strategy, but until **the NSIB Report Card**, there was no way to measure the collective impact of this critical yet largely uncoordinated ecosystem.

The NSIB includes a range of actors, including our national security agencies and organizations, various research centers and laboratories, universities and academia, traditional defense "primes," commercial sector disruptors, venture capital, and the innovative systems of American allies and partners. The NSIB Report Card aims to measure the health, effectiveness, and resilience of that ecosystem and propose recommendations for improvement.

With the continued erosion of America's military, economic, and technological advantage vis-à-vis its pacing competitor, the People's Republic of China, there is an urgent and glaring need to address deficiencies in the NSIB ecosystem. The United States continues to excel as a global leader in innovation with a vibrant and dynamic private sector. Yet the weaknesses identified in this report card persist as areas of grave vulnerability that degrade our competitiveness and risk leading to U.S. military inferiority. While new U.S. government initiatives from the last year are a step in the right direction, they lack the funds and programs of record to back them up. Chronic budgetary and appropriations dysfunction undermine any improvements in the demand signal.

America has all the ingredients necessary to secure its military, economic, and technological superiority: a free and open democratic system, an industrious and innovative private sector, and a world-class military. But it faces serious domestic and foreign challenges to its competitive advantage that will require concerted effort and coordination to strengthen points of fragility in the NSIB, mitigate areas of vulnerability, and harness the sum of its parts.

This report card is an attempt to identify those strengths and weaknesses and chart that path. As knowledge partners, McKinsey & Company provided the fact base to support this assessment. Eric Snelgrove served as a subject matter expert supporting the report card's findings. The Reagan Institute convened policy experts and key stakeholders to form an experienced Advisory Board comprised of bipartisan, cross-sector national security leaders. The analysis was also informed by a series of interviews with subject matter experts spanning the public and private sectors. We hope this report card serves as an innovative policy tool that is useful to actors across the NSIB ecosystem.

Methodology

Structured, Repeatable Approach

1. Identify the set of indicators that are most diagnostic for assessing the health of the NSIB
2. Formulate key assessment questions and criteria to evaluate each indicator
3. Develop set of key metrics to measure each criterion
4. Assign grading for criteria and indicators based on comprehensive fact base
5. Generate recommendations for improvement
6. Update indicators, fact base, and grades on an ongoing basis

Grading Rubric

A	Best-in-class performance globally that lives up to U.S. potential; critical source of American distinctiveness
B	Multiple key areas of strength, with some room for growth
C	Vulnerabilities and/or inconsistencies identified, with flat-to-declining trendline
D	Ongoing major vulnerabilities that are significantly undermining health of the NSIB
F	Catastrophic area of weakness that will have major implications for American technical, military, and/or economic leadership, if unaddressed

Trendline Performance evolution against March 2023 NSIB Report Card

Improving | Neutral/flat | Deteriorating

NSIB Report Card grades represent a holistic baseline assessment that incorporates the quantitative and qualitative analysis underlying each indicator while also (where appropriate) benchmarking performance against U.S. potential and/or the performance of other countries. Annual reports measure improvement and/or deterioration from the prior year's report card – as well as lack of substantive change, which may translate into a lower grade relative to the prior year.

Interpretation and Key Takeaways

Despite "green shoots" of progress, decline in defense modernization and lack of overall improvement in customer clarity illustrates inability to translate innovation into capabilities

- Promising action on several key inputs and demand signals (launch of novel acquisition pilots, growing pool of private capital, and resource deployment against several key tech areas)
- However, limited evidence pointing to a step change in America's ability to fund, scale, and deploy innovative capabilities to the warfighter
- No new programs of record that address National Defense Strategy/NSIB priority areas

Major warning signs in critical factors necessary to drive innovation hinder progress against technology and national security priorities

- Consensus has emerged about need to fix NSIB pain points like lack of budget visibility, arduous talent onboarding requirements, and subtier risk
- Still, critical barriers like Congressional inaction, talent base vulnerabilities, and manufacturing and supply chain fragility have become more acute

While America still leads in innovation, disconnect persists between progress in digital technologies and scaled implementation

- 2023 was a breakout year for American leadership in artificial intelligence
- But gap is growing between frontier technology and applications to address physical world NSIB challenges like supply chain fragility and defense production scaling

National security innovation is at an inflection point, with an urgent need to transition prototypes and experiments to at-scale fielding of new technologies and business models

- Next phase of NSIB investment will require consolidating progress, embedding innovation resources and processes across the ecosystem and all capabilities rather than as a side project or exception to the norm
- Investors, policymakers, and private sector partners should demand and demonstrate clear success metrics against stated objectives (autonomous system fielding rates, non-R&D/SBIR funding for nontraditional players, and reversal of talent pipeline and retention trends)

Definitions of Key Indicators

"Outputs" of a Strong NSIB Ecosystem	1 **Defense Modernization**	Translation of innovation into national security capabilities, in part by quickly adapting to new capabilities and models for acquisition
	2 **Innovation Leadership**	Overall quality of U.S. research and commercialization in priority technologies and status as center of global knowledge networks
	3 **Pull-Through for Broader National Priorities**	"Multiplier" effect of NSIB on broader economy and government effectiveness
"Inputs" Driving U.S. National Security Innovation	4 **Customer Clarity**	Demand signal for customer (government) innovation priorities, including funding and acquisition pathways to match the aspiration
	5 **Innovation Capital**	Holistic set of public and private financial capital – along with non-financial assets and infrastructure – available to resource the NSIB
	6 **Private Sector Innovator Base**	Broad-based, dynamic, and globally competitive/resilient ecosystem of traditional defense firms, startups, and commercial hyperscalers engaged in NSIB-relevant efforts
	7 **Public and Civil Innovation Base**	Defense/national labs, other FFRDCs/UARCs, and academic institutions developing (and protecting) national security-oriented research
	8 **Government Alignment**	Degree of convergence between U.S. federal, state, and local efforts on NSIB priorities (e.g., national security infrastructure and workforce development)
	9 **International Alliances and Partnerships**	Level of linkage between U.S. and international partners (e.g., IP rights, data sharing)
	10 **Talent Base**	Pipeline of domestic and foreign-born talent trained and working in NSIB-relevant fields

Grading Summary

	Indicator	2023 Grade	2024 Grade	Trend	Grading Rationale
Outputs	**1. Defense Modernization**	C	D	↓	Limited material progress on fusing innovation into fielded capabilities over the last year. Use of commercial tech is trending upwards for select portfolios (e.g., space), but the lack of new programs of record addressing NSIB priorities underscores the lack of scaled progress. Failure to act on innovation priorities and pull through technologies at scale is materially affecting overall readiness levels and the ability to fight and win against a pacing competitor.
Outputs	**2. Innovation Leadership**	A-	A-	→	The U.S. continues to lead research citations and patent filings. However, China's strategies to counter U.S. restrictions targeting its domestic semiconductor and broader advanced computing industries are evolving and will require continued response and adaptation to preserve innovation leadership. China is closing the gap on select emerging technology areas like 5G/6G, where PRC patent activity and regulatory mobilization has exceeded the pace of research and rollout in the U.S.
Outputs	**3. Pull-Through for Broader National Priorities**	B-	B	↑	U.S. defense spending continues to generate a spending multiple with industry contributing 1.65% to nominal GDP and CHIPS funding driving a surge in capital investment to increase U.S. semiconductor manufacturing. While some early 2000s/2010s defense tech entrants have achieved scale and billion-dollar valuations, the link between early-stage defense grants or awards and emerging private sector leaders remains opaque.
Inputs	**4. Customer Clarity**	D	D	→	Major U.S. innovation customers (e.g., DoD, Intelligence Community) have announced a few key organizational changes and new initiatives that could accelerate progress on defense modernization objectives. However, these "green shoots" of progress have largely been negated by Congressional failure to pass a budget, which is limiting progress and the strength of the demand signal to industry and investors. 2024 will likely be a litmus test for novel pathways (e.g., Replicator) to match rhetoric and action.
Inputs	**5. Innovation Capital**	B-	B	↑	Significant investment pools remain available to NSIB initiatives. New defense tech funds, oversubscribed industry engagement days, and a flurry of corporate VC investments by traditional players attest to sustained interest among private investors. As capital markets contract, however, disruptors and primes will need to demonstrate a return on investment. NSIB agencies must demonstrate a clear commitment to scaling innovation awards beyond a fraction of the overall budget and for landmark large acquisition programs.

Grading Summary

Inputs

Indicator	2023 Grade	2024 Grade	Trend	Grading Rationale
6. Private Sector Innovator Base	B	B	→	New entrants to the NSIB signal a shift in attitudes towards working with government to advance the national security mission, while concentrated DoD bets are helping to scale nontraditional players. Broader subtier supply chain risks persist: lack of visibility and direct funding programs limit new entrants, and legacy suppliers faced shortages, sustained reliance on Chinese inputs, and signs of financial distress.
7. Public/Civil Innovation Base	B-	C+	↓	The public and civil innovation base remains an important accelerant for national security innovation and defense modernization in the U.S. However, there are increasing signs that this sector is not operating at its full potential. Insufficient oversight of R&D return on investment, opaque FFRDC contracting, and accelerating IP theft threaten these critical national assets.
8. Government Alignment	C	C+	↑	NSIB agencies convened a geographically diverse set of consortia focused on innovation and workforce development, and CHIPS/IRA activity represents one of the largest industrial policy mobilization efforts within the past decade. 2024 will require clear progress against workforce development and supply chain objectives. The flurry of state legislature activity around AI highlighted broad interest in—but gaps in state-federal coordination for—AI and emerging technology policy frameworks.
9. International Alliances and Partnerships	C-	C	↑	The U.S. continues to lead in global arms provisions, capturing share from adversaries facing tighter restrictions. NSIB agencies highlighted early progress in key partnerships (e.g., AUKUS) and increased international cooperation on export restrictions. 2024 will require leveling up co-development to demonstrate scaled technology cooperation and address persistent IP and cyber risks.
10. Talent Base	D+	D	↓	2023 saw few major milestones to address the persistent talent attraction, retention, and development challenges across the NSIB workforce despite widespread bipartisan consensus on talent risks. The industry continues to face a graying talent pool and demographic trends that foreshadow persistent talent pipeline challenges like inefficient skills matching and manual, burdensome vetting processes.

Overall grade: D

Trend vs. 2023: ↓

1. Defense Modernization

Translation of innovation into national security capabilities, in part by quickly adapting to new capabilities and models for acquisition

Criteria

1.1: NSIB innovations are converted into U.S. national security capabilities. — D

1.2: U.S. effectively adapts to new capabilities and models for acquisition. — D

Summary

Limited material progress on fusing innovation into fielded capabilities over last year. Use of commercial tech is trending upwards for select portfolios (e.g., space), but the lack of new programs of record addressing NSIB priorities underscores the lack of scaled progress. Failure to act on innovation priorities and pull through technologies at scale is materially affecting overall readiness levels and ability to fight and win against a pacing competitor.

At a glance...

2x	**Share of commercial contracts in DoD space acquisition** since 2018
12%	**Increase in AFWERX awards** from 2022-2023
~5%	**FY22 increase in multi-year contracts, air and missile defense** vs. -3%, ordnance & missiles

Tailwinds

+ **Increased use of vehicles to accelerate the transition to production:** OTAs increased 46% from 2022-2023 vs. 30% from 2018-end of 2023, sustaining a Covid-era spike in use.[1]

+ **DoD commercial acquisition remains steady over time but grows in select portfolios:** Commercial space acquisition more than doubled since 2018, with a 7% increase of share seen from 2018-2019,[2] demonstrating ability to leverage innovative private tech.

Headwinds

– **No new programs of record announced** that address National Defense Strategy/NSIB priority areas.

– **Novel procurement pathways grow but legacy program challenges persist**: AFWERX estimates awards increased ~6% in 2022 vs. 2023,[3] MDAP cycle times increased 7% 2020-22 according to a 2023 GAO report.[4]

– **Uneven distribution of multiyear awards across defense portfolios may reflect a "failure of imagination":** In 2022, MY awards accounted for 14.9% of air and missile defense contracts vs. 3.2% of ordnance and missiles;[5] MY procurement reflects the artillery-focused threat environment of today and may not prepare the NSIB for future threats.

Criteria Details

Criteria	Datapoints since last report card
1.1: NSIB innovations are converted into U.S. national security capabilities.	⊕ **DoD commercial acquisition remains steady over time but is growing share more quickly in select pockets, like space:** Commercial space acquisition continues to increase steadily as a share of total DoD contracts and has more than doubled since 2018, with a 7% increase in share seen from 2018-2019[2] ⊖ **Novel procurement pathways grow but large legacy program challenges persist:** • AFWERX awards continue to increase (AFWERX estimates 1,700 SBIR awards in 2023 vs. 1,600 in 2022)[3] • MDAP cycle times increased 7% 2020-22 according to a 2023 GAO report[4]
1.2: U.S. effectively adapts to new capabilities and models for acquisition.	⊕ **Increased use of vehicles to accelerate transition to production:** OTAs increased 46% from 2022-2023 vs. 30% from 2018-end of 2023, sustaining a Covid-era spike in use[1] ⊖ **The increase in multiyear contract awards has not been evenly distributed across defense portfolios:** • In 2022, MY awards accounted for 14.9% of air and missile defense contracts vs. 3.2% of ordnance and missiles[5] • Multiyear procurement reflects the artillery-focused threat environment of today and may not be preparing the NSIB for other future threat environments ⊖ **Government is failing to transition most research/pilot SBIRs to production:** • The top 25 SBIR awardees, some of whom won >$100M, generated less than $500K in subsequent DoD Phase III awards[6] • This indicates that the DoD may not be capturing full ROI on SBIR awards and continues to award companies that do not transition tech

Overall grade: A-

Trend vs. 2023: →

2. Innovation Leadership

Overall quality of U.S. research and commercialization in priority technologies and status as a center of global knowledge networks

Criteria

2.1: U.S. leads knowledge output based on key indicators (e.g., patent volume/quality). America defines global tech standards and governance frameworks. **B+**

2.2: U.S. is a net knowledge exporter (e.g., global citations, research university rankings). **A**

Summary

The U.S. continues to lead research citations and patent filings. However, China's strategies to counter U.S. restrictions targeting its domestic semiconductor and broader advanced computing industries are evolving and will require continued response and adaptation to preserve innovation leadership.

China is closing the gap on select emerging technology areas like 5G/6G, where PRC patent activity and regulatory mobilization have exceeded the pace of research and rollout in the U.S.

At a glance...

15% **Increase in U.S. authorship of leading AI papers** (top 100, 2020-22)

36% **U.S. share of global quantum filings in Q3 2023,** up 6% from Q2

33% **Expected increase in Chinese semiconductor output** over 2023-2027 vs. 13% in the U.S.

Tailwinds

+ **U.S. leadership in AI companies and research continues:** Among the 100 most cited AI papers, the U.S. continues to lead with 78 of the top cited papers in 2022 (15% increase from 68 in 2020), 3x the closest country, China;[1] OpenAI's GPT and Meta's Llama models demonstrated exponential growth over previous performance metrics.[2]

+ **The U.S. leads global tech standards-setting** in international fora, including the ITU, 3GPP.

Headwinds

– **China is pushing back against semiconductor restrictions** with new export controls on semiconductor commodities and cyber and anti-trust laws to block U.S. semi companies;[3] China is also expected to expand capacity for mature nodes (>14nm) by 34%, vs. 13% for the U.S. (all nodes) 2023-2027.[4]

– **The U.S. is trailing China in 5G/6G patents and spectrum assignments:** China currently holds 40% of 6G patents while the U.S. holds 35%;[5] as of mid-2023, China had assigned nearly 2x the volume of mid-band spectrum to wireless operators vs. the U.S.[6]

Criteria Details

Criteria	Datapoints since last report card
2.1: U.S. leads knowledge output based on key indicators (e.g., patent volume/quality). America defines global tech standards and governance frameworks.	⊕ **U.S. share of global quantum-related patent filings continues to grow,** reaching 36% in Q3 2023, up 6% from Q2 and 24% higher than the closest country, China[7] ⊕ **The U.S. continues to lead global tech standards-setting** in international fora, including the ITU, 3GPP, and by building a robust set of standards for its major global tech firms (e.g., U.S. technical standards for commercial space activity is reflected in many national space standards); China is actively working to close this gap, demonstrating the need for continued U.S. vigilance and leadership (e.g., U.S. and allies blocking of major PRC spectrum allocation at ITU in December 2023)[8] ⊖ **The U.S. is trailing China in 5G and 6G-related patents and in mid-band spectrum allocations—the backbone of 5G/6G operations:** • Nikkei Asia reports China holds 40% of 6G patents while the U.S. holds 35%[5] • As of mid-2023, China had assigned nearly 2x the volume of mid-band spectrum to wireless operators vs. the U.S., enabling China to deploy the largest 5G network[6] • Per CTIA, the U.S. ranks 13th of 15 leading global markets in terms of available and licensed 5G/6G spectrum (mid-band), inhibiting ability to achieve key DoD goals in advanced communications[9] ⊖ **China is stepping up retaliation for semiconductor restrictions:** The PRC has created new export controls on key semiconductor commodities and is using cyber and anti-trust laws to block U.S. semi companies (e.g., blocking mergers of PRC companies with U.S. companies, establishing new export controls on gallium and germanium).[3] China is also expected to expand capacity for mature nodes (>14nm) by 34%, vs. 13% for the U.S.(all nodes) 2023-2027[4]
2.2: U.S. is a net knowledge exporter (e.g., global citations, research university rankings).	⊕ **U.S. continues to establish new benchmarks for AI research and companies:** • Among the 100 most cited AI papers, the U.S. continues to lead with 78 of the top cited papers in 2022 (15% increase from 68 in 2020), 3x the closest country, China (27 of the top 100 cited AI papers in 2022)[1] • OpenAI's GPT and Meta's Llama models demonstrated exponential growth over previous parameter size and training dataset thresholds[2] • After doubling over 2014-2021, China's chip imports dropped for the past two consecutive years, falling 15% 2022-2023, but China continued to announce milestones for domestic AI development enabled by export-compliant chips (slower, more expensive, less energy-efficient than leading edge variants) like multimodal model Yi-VL-34B[10]

Overall grade: B

Trend vs. 2023: ↑

3. Pull-Through for Broader National Priorities

"Multiplier" effect of NSIB on broader economy and government effectiveness

Criteria

3.1: NSIB innovation improves American economic and competitiveness outcomes. **B+**

3.2: NSIB innovation advances government efficiency/ effectiveness across non-defense priorities. **C**

Summary

U.S. defense spending continues to generate a spending multiple with the industry contributing 1.65% to nominal GDP and CHIPS funding driving a surge in capital investment to increase U.S. semiconductor manufacturing.

While some early 2000s/2010s defense tech entrants have achieved scale, the link between early-stage defense grants or awards and emerging private sector leaders remains opaque.

At a glance...

7% **Growth in A&D contribution to U.S. GDP,** though overall share stayed flat 2021 to 2022

$80B **Semiconductor capex projects tied to CHIPS investment** broke ground in 2023

$219B **DoD "later-stage" RDT&E on critical tech areas** (i.e., BA 3-8) 2018-2023

Tailwinds

+ **A&D maintains a consistent share of GDP:** A&D's contribution to GDP rose 7% from 2021 to 2022 to $418B, or 1.65% of nominal U.S. GDP (consistent with 1.68% in 2021).[1]
+ **DoD RDT&E funding is mirroring, and may be spurring, VC funding for critical technologies:** A correlation between DoD RDT&E dollars (BA 3+) and private sector funding indicates DoD R&D focus may in part spur private sector capital deployment in high-priority technologies.[2]
+ **CHIPS legislative and financial support is driving a surge of U.S. semiconductor investment:** ~40 companies pledged $250B in private investment for U.S. semiconductors and electronics manufacturing; construction broke ground in 16 different states for ~20 of those companies in 2023, representing $80B+ in capex.[3]

Headwinds

– **Impact on private sector U.S. innovation base growth is unclear:** Coordinated reporting does not yet exist to aggregate the impact of early-stage national security funding (e.g., AFWERX/DIU SBIR grants, IQT investments, NSIN fellowships) on growth and publicly held companies.

Criteria Details

Criteria	Datapoints since last report card
3.1: NSIB innovation improves American economic and competitiveness outcomes.	⊕ **A&D maintains a consistent share of GDP:** A&D's contribution to GDP rose 7% from 2021 to 2022 to $418B, or 1.65% of nominal U.S. GDP (consistent with 1.68% in 2021), and the Aerospace Industries Association reports A&D accounts for 1.47% of the U.S. workforce with salaries 55% higher than the national average[1] ⊕ **Long-term analysis continues to suggest U.S. defense spending carries a positive multiple:** A RAND literature review found multiples between 0.6 and 1.2 (a $1 increase in U.S. defense spending leading to a $0.60 or $1.20 increase in U.S. GDP), though the range below 1 suggests defense spending may crowd out private investment (while maintaining a net positive effect)[4] ⊕ **CHIPS legislative and financial support is driving a surge of U.S. semiconductor investment:** ~40 companies pledged $250B in private investment for U.S. semiconductors and electronics manufacturing; construction broke ground in 16 different states for ~20 of those companies in 2023, representing $80B+ in capex[3] ⊕ **DoD RDT&E funding is mirroring, and may be spurring, VC funding for critical technologies:** A correlation between DoD RDT&E dollars (BA 3+) and private sector funding indicates DoD R&D focus may in part spur private sector capital deployment in high-priority technologies[5] ⊖ **Impact on private sector U.S. innovation base growth is unclear:** Coordinated reporting does not yet exist to aggregate the impact of early-stage national security funding (e.g., AFWERX/DIU SBIR grants, IQT investments, NSIN fellowships) on growth and publicly held companies
3.2: NSIB innovation advances government efficiency/ effectiveness across non-defense priorities.	⊕ **DOD and Small Business Administration (SBA) announced a joint initiative to increase private capital investment in critical technology areas:** The Small Business Investment Company Critical Technologies (SBICCT) Initiative aims to leverage DoD technical expertise to increase private sector investment in component-level technologies and production processes, a step towards operationalizing the SBA-DoD partnership announced in December 2022[6] ⊖ **Inaugural DoD National Defense Industrial Strategy cites interagency coordination as a goal to streamline, level-up impact on NSIB, but identifies multiple areas with overlapping programs and authority:** NDIS identifies training and apprenticeship programs, cybersecurity deterrence and response, and supply chain visibility as areas for additional cooperation[7]

Overall grade: D

Trend vs. 2023: →

4. Customer Clarity

Demand signal for customer (government) innovation priorities, including funding and acquisition pathways to match the aspiration

Criteria

4.1: U.S. government clearly communicates critical technology priorities needed to support national security missions.	B-
4.2: U.S. government provides sufficient and stable funding to acquire and scale critical technology solutions while making needed tradeoffs.	F-
4.3: Acquisition pathways that operate at the speed of relevance are available and well-utilized.	C-

Summary

Major U.S. innovation customers (e.g., DoD, Intelligence Community) have announced a few key organizational changes and new initiatives that could accelerate progress on defense modernization objectives.

However, these "green shoots" of progress have largely been negated by Congressional failure to pass a budget, which is limiting progress and the strength of demand signal to industry and investors.

2024 will be a litmus test for novel pathways (e.g., Replicator) to match rhetoric and action.

At a glance...

75%	**Share of permanently confirmed NSIB-critical DoD officials**
1	**Year of progress lost on CCA due to FY24 budget delays**
10x	**Discrepancy between House and Senate FY24 proposed funding for DIU**

Tailwinds

- **Positive DoD announcements to coordinate and streamline innovation activities:** Moves and announcements such as elevation of the Defense Innovation Unit within DoD hierarchy, Replicator engagement days and Tranche I selection signaled a clear commitment to scaling existing innovation pathways and rolling out new initiatives.

Headwinds

- **Lack of Congressional action and funding is constraining progress on major initiatives:** Failure to approve an FY24 budget has resulted in significant development delays for priority programs (e.g., Collaborative Combat Aircraft)[1] and resource reprioritization among NSIB agencies.
- **Novel acquisition pathways face a 2024 inflection point and continue to operate largely as exceptions to the traditional process:** Initiatives to field critical technologies at speed,[2] such as Task Force 59 and the Replicator program, remain early-stage with critical funding and procurement milestones to be proven in 2024 for Feb 2025 fielding window.[3]
- **Unclear Congressional commitment to scale critical tech scaling programs, based on funding levels:** Budgets for innovation priorities did not materially change in FY24 NDAA.

Criteria Details

Criteria	Datapoints since last report card
4.1: U.S. government clearly communicates critical technology priorities needed to support national security missions.	⊕ **DoD leadership took action to signal commitment to innovation:** • Share of permanently confirmed NSIB-critical DoD officials grew from 65% in 2022 to 75% in 2023 • DIU elevated to direct reporting to SecDef in April 2023, signaling sustained innovation focus and potential for increased coordination at highest levels of the DoD[4] ⊖ **Few NSIB-critical services/agencies have released or enhanced publicly-available tech roadmaps** in last year, and some fail to mention specific technologies, creating unclear demand signals for private sector vendors[5]
4.2: U.S. government provides sufficient and stable funding to acquire and scale critical technology solutions while making needed tradeoffs.	⊖ **Mixed Congressional support for innovative acquisition and critical tech scaling programs:** House and Senate support for DIU and the Office of Strategic Capital diverged; FY24 NDAA included budget for OSC but kept DIU funding flat despite a $1B House-proposed increase[1] ⊖ **Government is failing to transition most research/pilot SBIRs to production:** • The top 25 SBIR awardees, some of whom won >$100M, generated less than $500K in subsequent DoD Phase III awards[6] • This indicates that the DoD is not capturing full ROI on SBIR awards and continues to award companies that do not transition tech
4.3: Acquisition pathways that operate at the speed of relevance are available and well-utilized.	⊖ **Discrete contract opportunities remain aligned to legacy tech; novel acquisition pathways show potential but lack operational proof points:** Initiatives to field critical technologies at speed,[2] such as Task Force 59 and the Replicator program, remain early-stage with critical funding and procurement milestones to be proven in 2024 for Feb 2025 fielding window;[3] demonstrate how operators must function outside of the traditional acquisition process to acquire innovative tech at pace ⊖ **Ongoing FY24 budget delays create critical defense tech development delays:** Congress has failed to approve an FY24 budget, leaving DoD spending operating under a continuing resolution; priority defense programs face critical setbacks (e.g., JADC2 and the Collaborative Combat Aircraft program delays, NASA Jet Propulsion Laboratory 8% workforce reduction)[7]

Overall grade: B

Trend vs. 2023: ↑

5. Innovation Capital

Holistic set of public and private financial capital – along with non-financial assets & infrastructure – available to resource the NSIB

Criteria

5.1: Economy-wide R&D investment is sufficient to drive desired national security outcomes. **A-**

5.2: Ample capital exists across sources for incremental and "breakthrough" R&D. **B**

5.3: Sufficient capital and other resourcing (e.g., infrastructure) is available to scale companies with national security applications. **C**

Summary

Significant investment pools remain available to NSIB initiatives. New defense tech funds, oversubscribed industry engagement days, and a flurry of corporate VC (CVC) investments by traditional players attest to sustained interest among private investors.

As capital markets contract, however, disruptors and primes will need to demonstrate a return on investment. NSIB agencies must demonstrate a clear commitment to scaling innovation awards beyond a fraction of the overall budget and for landmark large acquisition programs.

At a glance…

-35%	**Change in defense tech VC funding** from 2022 to 2023
15%	**Growth (p.a.) in CVC deals across the five defense primes*,** 2018-23
<1%	**Share of defense funding for defense tech vs. traditional vendors** over 2018-23

Tailwinds

- **Defense primes are partnering and investing in innovative players at a faster pace:** CVC activity was up 15% p.a. (2018-23) with the number of deals across five defense prime CVC arms* increasing from 18 to 36 between 2018-23.[1]
- **U.S. defense tech VC investment outpaces industry trends:** VC investment in U.S. defense tech firms grew 10% p.a. even as investment in U.S. companies overall declined 3% annually from 2018-2023.[1]

Headwinds

- **Private capital is contracting:** Defense tech VC shrank 35% 2022-2023 amidst an industry-wide 32% decline,[1] emphasizing the need for national security agencies to shore up funding for growth companies.
- **The DoD is not betting on innovators at scale:** VC-backed defense company awards grew faster than defense obligations overall (23% p.a. vs. -2% for all awards 2018-2023),[2] but represent <1% of defense obligations in 2023,[2] a marginal share shift from large legacy suppliers.
- **Defense R&D funding flattens:** FY 2024 DoD RDT&E increased to $145B, representing a <1% increase and real (inflation-adjusted) decrease year over year.[3]

* Boeing, General Dynamics, Lockheed Martin, Northrop Grumman, Raytheon; number of deals is count of deals in which any prime participated; includes all CVC deals.

Criteria Details

Criteria	Datapoints since last report card
5.1: Economy-wide R&D investment is sufficient to drive desired national security outcomes.	⊕ **U.S. remains the largest R&D spender but has mixed performance on R&D intensity metrics:** The U.S. placed 13th for public R&D intensity in 2019 (last globally-reported OECD data)[4] and is expected to fall based on 2021 federal R&D spending trend; U.S. rose from 5th to 4th in private R&D intensity from 2019 to 2020 and may rise further due to 2022 R&D tax incentives (e.g., Inflation Reduction Act)[5] ⊕ **FY 2024 DoD RDT&E increased to $145B, representing a <1% increase and real decrease versus 2023:** Within "innovation" budget activities (6.1-4, 6.8), $59B is invested in FY 2024 – flat versus 2023;[3] among U.S. academic institutions R&D spend increased to $98B in 2022, an 8% increase over 2021; federal funding accounted for nearly $5B of the increase[6]
5.2: Ample capital exists across sources for incremental and "breakthrough" R&D.	⊕ **Defense tech VC appetite is high:** VC investment in U.S. defense tech firms grew 10% p.a. even as investment in U.S. companies overall declined 3% annually from 2018-2023[1] ⊖ **Private capital is slowing:** Defense tech VC shrank 35% 2022-2023 amidst an industry-wide 32% decline,[1] emphasizing the need for national security agencies to shore up funding for growth companies
5.3: Sufficient capital and other resourcing (e.g., infrastructure) is available to scale companies with national security applications.	⊕ **Defense primes are partnering and investing in innovative players at a faster pace:** CVC activity was up 15% p.a. (2018-23) with the number of deals across major defense primes (Boeing, General Dynamics, Lockheed Martin, Northrop Grumman, Raytheon) increasing from 18 to 36 between 2018-23;[1] multiple integrators announced partnerships with disruptors including Boeing/Shield AI MOU (partnership to explore autonomous capabilities and AI for defense programs), Austal USA/Saildrone (manufacturing agreement), Lockheed Martin/Terran Orbital (collaboration on nanosatellite design, development, production)[7] ⊖ **Defense awards for innovative NSIB players remain a fraction of defense spending overall:** VC-backed defense company awards grew faster than overall defense obligations (23% p.a. vs. -2% for all awards 2018-2023)[7] and faster than the pace in private VC funding (10% CAGR 2018-2023),[5] but represent <1% of defense obligations in 2023,[2] a marginal share shift from legacy players ⊖ **Critical non-financial barriers facing disruptors remain** (e.g., classification, test infrastructure) – and emerging DoD support programs do little to address these non-financial challenges[7]

Overall grade: B

Trend vs. 2023: →

6. Private Sector Innovator Base

Broad-based, dynamic, and globally competitive/resilient ecosystem of traditional defense firms, startups, and commercial hyperscalers engaged in NSIB-relevant efforts

Criteria

6.1: There exists sufficient breadth and depth in the NSIB to spur innovative outcomes. **A-**

6.2: The NSIB has sufficient economic dynamism to respond to shocks and global competition. **C+**

Summary

New entrants to the NSIB signal a shift in attitudes towards working with government to advance the national security mission, while concentrated DoD bets are helping to scale nontraditional players.

Broader subtier supply chain risks persist: lack of visibility and direct funding programs limit new entrants and legacy suppliers faced shortages, sustained reliance on Chinese inputs, and signs of financial distress.

At a glance…

17% **Annual growth in defense tech vendors awarded >$10M,** 2018-2023

-12% **Decline in number of SMB vendors awarded DoD contracts,** 2022-2023

70% **Publicly held A&D component suppliers showing financial distress** in a 2023 sample*

Tailwinds

+ **Nearshoring and supply chain diversification takes shape:** U.S. imports from China declined 5.8% 2017-2023 as imports from locations like Europe, Vietnam and Mexico rose; over 2022-23 U.S. greenfield investment into China fell 70 percent from 2015–19 average.[1]
+ **Large public awards are helping to scale U.S. "unicorns:"** The top 10 defense tech players captured 68% of 2023 defense obligations to nontraditional players, with 28 awarded >$10M vs 13 vendors in 2018 (17% p.a. growth),[2] signaling sustained commitment to scaling a smaller set of nontraditional players with large awards.

Headwinds

— **DoD awards suggest the overall vendor pool and SMB vendor base is narrowing:** The number of vendors with DoD contract obligations declined 9% from 2022-23 vs. 5% p.a. 2018-2023; the number of SMB vendors shrank 11% from 2022-23 vs. 6% p.a. 2018-2023.[2, 3]

— **Sustained subtier supply chain risks:** Over 70% of publicly held subtier companies showed signs of financial stress;[2] U.S. remains reliant on China for 7/7 of electronics commodity materials, and 2023 DoD report echoes 2022 concern about low prime visibility into their subtier.[4]

* N=Over 100 publicly held components suppliers across the aerospace value chain

Criteria Details

Criteria	Datapoints since last report card
6.1: There exists sufficient breadth and depth in the NSIB to spur innovative outcomes.	⊕ **Big bets on nontraditional players are growing:** The top 10 defense tech players captured 68% of 2023 defense obligations to nontraditional players, with 28 awarded >$10M vs 13 vendors in 2018 (17% p.a. growth);[2] successful competition outcomes and investor support may be incentivizing new entrants, as defense tech seed funding rounds grew 20% annually over the past ~two decades (2000-2022), with a notable spike in companies raising seed funding over 2016-2021[2, 3] ⊕ **Large public awards are helping to scale U.S. "unicorns":** The combined private valuation/market cap of the top 5 defense tech vendors (SpaceX, Palantir, Anduril, Dataminr, and Blue Origin) reached an estimated $240B (top 5 based on 2018-2023 defense contracts)[1] ⊖ **Overall and SMB vendor base is narrowing:** The number of vendors with DoD contract obligations declined 9% from 2022-23 vs. 5% p.a. 2018-2023; the number of SMB vendors shrunk 11% from 2022-23 vs. 6% p.a. 2018-2023[2, 3] ⊖ **Limited support for subtier new entrants amidst signs of financial stress for legacy players:** Continued acquisition focus on integrators and platforms limit new component suppliers from direct DoD funding, and 70% of publicly held suppliers showed declining revenue and moderate-high financial risk[4]
6.2: The NSIB has sufficient economic dynamism to respond to shocks and global competition.	⊕ **Defense production rose to an all-time high:** U.S. defense and space equipment output, measured by the Federal Reserve's monthly industrial production (IP) index, recovered from a 2019-20 dip to a record high in June 2023;[5] artillery production doubled (Nov 22-23) with the release of additional multiyear funding from Congress that supported facility automation and expansion[6] ⊕ **Nearshoring and supply chain diversification takes shape:** U.S. imports from China declined 5.8% 2017-2023 as imports from locations like Europe, Vietnam, and Mexico rose; over 2022-23 U.S. greenfield investment into China fell 70% from 2015–19 average[1] ⊕ **Increasing dual market diversification:** Top 10 U.S. defense contract awardees derived 66% of their 2022 revenues from defense, a 10% decline from 2021;[1] Chinese defense revenues held steady in 2021 and 2022 at 27%[7] ⊖ **Sustained subtier supply chain risks:** U.S. remains reliant on China for seven key electronics commodity materials, and 2023 DoD report echoes 2022 concern about low prime visibility into their subtier[8] ⊖ **U.S. domestic munitions production capability is increasing but still fails to match battlefield demand:** Global contracts to boost production doubled the U.S. Army's 155mm production from Nov 22-23,[8] but target ramp up rates for 2024 lag Ukrainian monthly consumption by 66-75%[9] ⊖ **New tax law and shifting acquisition policies hinder A&D firm dynamism:** a revision of R&D tax code decreases A&D companies cash flows,[10] and DoD preference for firm fixed price contracts increases risk and losses for A&D companies (e.g., up to $1.2B losses for Northrop Grumman on B-21 program)[11]

Overall grade: C+

Trend vs. 2023: ↓

7. Public/Civil Innovation Base

Defense/national labs, other FFRDCs/UARCs and academic institutions developing (and protecting) national security-oriented research

Criteria

7.1: There is sufficient funding for public sources of innovation (e.g., government labs, FFRDCs) and research alignment to national security priorities. **B**

7.2: Defense/civil labs catalyze scalable NSIB advances, and the research is adequately protected. **C**

Summary

The public and civil innovation base remains an important accelerant for national security innovation and defense modernization in the U.S. However, there are increasing signs that this sector is not operating at its full potential. Insufficient oversight of R&D return on investment, opaque FFRDC contracting, and accelerating IP theft threaten these critical national assets.

At a glance...

0.9% **Growth in public/ civil R&D funding** 2021-22, a slowdown vs. 2017-22 growth of 1.9% p.a.

5% **Annual growth of active licenses for federally-developed technologies** 2016-22

$600B **Value of intellectual property/ technology stolen by the CCP,** 2023[11]

Tailwinds

+ **Federal tech licenses increase:** The number of active licenses for federally-developed tech has grown at a rate of 5% p.a. from 2016-2022, an improvement relative to declining growth over 2015-19.[1]
+ **IP protection policies proliferate throughout the USG:** 2023 legislative action included the Protecting American Intellectual Property Act,[2] DOJ resources to deter cyber threats in the DIB,[3] IP theft recommendations in the House,[4] and NSF requirements for foreign talent.[5]

Headwinds

− **Lack of visibility into FFRDC contracts stymies accountability and competition:** FFRDC contracts are awarded on a sole-source, non-competitive basis, which inhibits public scrutiny and private sector competition.
− **Overall public/civil R&D funding growth slows:** In 2022, federal, nonfederal, FFRDCs, and academia deployed ~$140B in R&D, a 0.9% increase over 2021 compared to a 1.9% CAGR between 2017-22.[6]
− **Foreign IP theft continues:** House Select Committee on the CCP report attributes $600B in IP/technology theft to China over the past year.[7]

* Using constant 2017 dollars

Criteria Details

Criteria	Datapoints since last report card
7.1: There is sufficient funding for public sources of innovation (e.g., government labs, FFRDCs) and research alignment to national security priorities.	⊕ **R&D is a high priority among investment options in the U.S.:** The ratio of total national R&D expenditures to GDP increased to 3.44% in 2022, compared to 3.34% in 2021[8] ⊖ **Overall public/civil R&D funding growth slows:** In 2022, federal, nonfederal, FFRDCs, and academia deployed ~$140B in R&D, a 0.9% increase over 2021 compared to a 2.8% CAGR between 2017-21; within public/civil R&D, only federal R&D fund deployment increased (5.8% growth 2021-22 vs. 3.9% p.a. 2017-21) while nonfederal, FFRDC, and academia R&D deployment declined 5.1%, 2.7%, and 0.4% respectively[6] ⊖ **The USD(R&E) Strategic Vision and Critical Technology Areas aligns R&D goals, but inefficiencies exist in the R&D process:** RAND report cites multiple barriers like lack of incentives to encourage stakeholders (e.g., innovation organizations, requirements and capability developers, end users, program managers and program executive officers, and procurement and decision authorities) to overcome gaps between various innovation entities, thereby hindering adoption of technologies stuck in the "valley of death"[9]
5.3: Sufficient capital and other resourcing (e.g., infrastructure) is available to scale companies with national security applications.	⊕ **Federal license trends ticked up:** The number of active licenses for federally-developed technologies has grown at a rate of 5% p.a. from 2016-2022, an improvement relative to declining growth over 2015-19[1] ⊕ **Bipartisan IP protection policy momentum increased:** 2023 legislative action included the Protecting American Intellectual Property Act,[2] DOJ resources to deter cyber threats targeting the DIB,[3] IP theft recommendations from House Select Committee on the CCP,[4] and NSF requirements targeting foreign talent recruitment[5] ⊖ **IP threats from China reach an "unprecedented" level:** • In October 2023, the Five Eyes countries' intelligence chiefs testified jointly before the Senate on the "unprecedented" rise of IP theft and use of artificial intelligence for hacking and spying[10] • House Select Committee on the CCP report attributes $600B in IP/technology theft to China over the past year[7]

Overall grade: C+

Trend vs. 2023: ↑

8. Government Alignment

Degree of convergence between U.S. federal, state, and local efforts on NSIB priorities (e.g., national security infrastructure and workforce development)

Criteria

8.1: Federal, state, and local governments coordinate to support innovation priorities. **C+**

Summary

NSIB agencies convened a geographically diverse set of consortia focused on innovation and workforce development, and CHIPS/IRA activity represents one of the largest industrial policy mobilization efforts within the past decade.

2024 will require clear progress against workforce development and supply chain objectives. The flurry of state legislature activity around AI highlighted broad interest in, but gaps in state-federal coordination for, AI and emerging technology policy frameworks.

At a glance...

$760M+	**Direct funding for state consortia for NSIB innovation and workforce development**
30+	**States with designated CHIPS consortia and tech hubs**
4x	**Increase in proposed state legislation to address AI**

Tailwinds

+ **NSIB consortia proliferated across the U.S.:** The Department of Commerce and DoD expanded multi-state consortia, like the CHIPS-related Microelectronic Commons regional innovation hubs ($238M) and tech hubs (31 states, $500M)[1] and Defense Manufacturing Communities (six consortia across 5 states, $30M).[2]

Headwinds

— **State funding to promote NSIB development remains limited:** Department of Commerce and DoD funding (e.g., Office of Local Defense Community Cooperation and Industrial Base Analysis and Sustainment (IBAS) Program) continue to drive 67%-100% of reported consortia funding; 15 states provide SBIR matching funds with no reported increase in state SBIR support over the most recent report.[3]

— **State consortia impact remains unclear:** Most 2023-designated innovation and manufacturing centers of excellence/hubs are not yet operational; only 1 of 8 DoD 'Microelectronics Commons' Hubs has announced a CEO.[4]

— **State legislatures scale up AI bill introductions but lack coordination:** 31 states introduced a combined 190+ AI-related bills in 2023 vs. ~40 in 2022, but legislation included overlapping efforts to stand up working groups/studies and unique regulatory frameworks.[5]

Criteria Details

Criteria	Datapoints since last report card
8.1: Federal, state, and local governments coordinate to support innovation priorities.	⊕ **NSIB consortia funded by multiple agencies expanded across the U.S.:** The Department of Commerce and DoD announced and funded public-private consortia across multiple programs: • CHIPS-related Microelectronic Commons regional innovation hubs ($238M) and tech hubs (31 states, $500M)[1] • Defense Manufacturing Communities (six consortia across 5 states, $30M)[2] • ~96 APEX accelerators (pre-existing but rebranded from Procurement Technical Assistance Centers)[6] ⊖ **State funding for NSIB objectives remains limited:** Federal funding programs administered by the CHIPS office and DoD (e.g., OLDCC and IBAS) continue to supply the majority of consortia funding; 15 states provide SBIR matching funds with no reported increase in state SBIR support versus the most recent government report[3] ⊖ **State consortia are not yet operational and will need to demonstrate impact in 2024:** While the CHIPS office made progress against consortia designation and funding, most state hubs are not yet operational; only 1 of 8 regional innovation hubs has announced a CEO[4] ⊖ **AI state legislative activity explodes, but legislation is overlapping and decentralized:** 31 states introduced a combined 190+ AI-related bills in 2023 vs. ~40 in 2022, but legislation included overlapping efforts to stand up working groups/studies and unique regulatory frameworks[5]

Overall grade: C

Trend vs. 2023: ↑

9. International Alliances and Partnerships

Level of linkage between U.S. and international partners (e.g., IP rights, data sharing)

Criteria

9.1: There are strong linkages between the U.S. and allies/partners in priority technology areas. **C+**

9.2: U.S. balances protection of national security and IP while fostering innovation. **C-**

Summary

U.S. continues to lead in global arms provisions, capturing share from adversaries facing export restrictions.

NSIB agencies announced demonstrated early progress in key partnerships (e.g., AUKUS) and increased international cooperation on export restrictions.

2024 will require leveling up co-development to demonstrate scaled technology cooperation and address persistent IP and cyber risks.

At a glance...

83% **Increase in U.S. defense exports** (vs. ~15% global increase) 2021-22

1% **Increase in U.S. international tech research collaboration,** 2018-2022

6% **Annual growth in CFIUS covered transaction reviews** 2018-2022

Tailwinds

+ **International defense tech flows privilege the U.S. and its allies as Chinese and Russian exports decline:** U.S. global share of defense exports rose from 22% to 32% amidst tightened trade restrictions aimed at adversaries; France, Germany, and Poland grew rapidly while China's share held constant; Russia fell from the top exporter in 2013 to fourth highest in 2022.[1]
+ **U.S. tech collaboration deepens via DIANA, AUKUS, and Quad allies,** but more time is needed to see if partnerships translate into fielded capabilities.
+ **Critical technology restrictions tightened and early signs indicate positive impact,** e.g., 5% increase in CFIUS reviews, allied expansion of export controls, and slowing of Chinese progress on AI chip manufacturing.[2]

Headwinds

– **U.S. struggles to balance IP protection with collaboration:** U.S. international research collaboration slowed to 1% per year 2018-2022 vs. 3% over the past 10 years,[3] as Chinese IP theft remains at "unprecedented" scale per Five Eyes leaders.[4]

Criteria Details

Criteria	Datapoints since last report card
9.1: There are strong linkages between the U.S. and allies/partners in priority technology areas.	⊕ **U.S. international defense hardware influence expanded:** U.S. defense exports jumped 83% 2021-22, bumping U.S. global share from 22% to 32% amidst tightened trade restrictions aimed at adversaries; partners and allies like France, Germany, and Poland grew rapidly while China's share held constant, and Russia fell from the top exporter in 2013 to fourth highest in 2022[1] ⊕ **Promising early technology collaboration signals:** Landmark alliances announced tangible progress against tech development objectives (e.g., AUKUS Pillar II shared software/sensing algorithm collaboration, QUAD quantum talent partnership, NATO DIANA defense tech accelerator); consistent reporting will be required to assess ability to scale progress and track operational impact (e.g., transition of startups from DIANA to fielded capabilities and member state funding/awards)[5] ⊕ **U.S. providers are increasingly entering cross-border production agreements, while major technology development and data sharing agreements show early progress:** Multiple U.S. primes have announced international JVs/agreements (e.g., Javelin Joint Venture-PGZ javelin missile production, Lockheed Martin-Australia GMLRS production), but collaboration is focused on production rather than technology development[6] ⊕ **Critical technology restrictions tightened:** Restriction on Chinese technology investment and development had a tangible impact (e.g., 5% increase in CFIUS reviews, allied expansion of export controls) and China failed to make breakthrough progress on AI chip manufacturing[2] ⊖ **U.S. tech exports remained constant as a share of GDP (0.28%),** with no clear change in U.S. shares of other tech and data flows; international co-authorship on U.S. papers continues to increase marginally[3]
9.2: U.S. balances protection of national security and IP while fostering innovation.	⊖ **U.S. faces challenges balancing research security with collaboration:** U.S. international research collaboration slowed to 1% p.a 2018-2022 vs. 3% over the past 10 years; 2023 GAO found key elements of the U.S. National Cybersecurity Strategy missing and no National Cyber Director is in place[7] ⊖ **Chinese IP theft remains at "unprecedented" scale** per Five Eyes intelligence leaders, including a suspected case of pirated EDA tools enhancing Huawei's August 2023 smartphone chips[4]

Overall grade: D

Trend vs. 2023: ↓

10. Talent Base

Pipeline of domestic and foreign-born talent trained and working in NSIB-relevant fields

Criteria

10.1: U.S. attracts, retains, and develops domestic NSIB talent (e.g., availability, quality, diversity), particularly in STEM and skilled trades. **D+**

10.2: U.S. leads in attracting and retaining a robust pipeline of foreign talent with in-demand skills needed for national security missions. **D**

Summary

2023 saw few major milestones to address the persistent talent attraction, retention, and development challenges across the NSIB workforce despite widespread bipartisan consensus on talent risks.

The industry continues to face a graying talent pool and demographic trends that foreshadow persistent talent pipeline challenges, like inefficient skills matching and manual, burdensome vetting processes.

At a glance…

8% Percentage point **increase of A&D workers* ages 50+** 2014-22

40% Domestic **defense spending in states with a declining overall population** 2022-23

24% **Open jobs as a % of total workforce at top A&D primes**** compared to 7% for tech*** 2023

Tailwinds

+ **A&D talent base grows, reversing pandemic-era trends:** The A&D workforce grew 4.9% between 2021-22 exceeding pre-pandemic numbers after contracting 2019-2021 (3.9% decline).[1]
+ **"Workforce readiness" prioritized in the first National Defense Industrial Strategy,** elevating talent to one of top four focus areas in the DoD.[2]

Headwinds

— **A retirement bubble is on the horizon:** The NSIB manufacturing and engineering industry is graying, with 31% in or nearing the retirement-eligible window compared to 16% in the tech industry**** and 24% overall in the U.S. (2022).[3]

— **Talent pool shrinks in major defense states:** Talent availability is declining in 21 states that traditionally attract large defense dollars.[4, 5]

— **Traditional NSIB jobs are taking longer to fill:** the average job posting duration increased 25% 2022-23 vs. 7% per year 2018-2023; while the number of open jobs at A&D primes has decreased, it remains ~3x higher than top tech companies.[6]

— **The manufacturing industry's share of H-1B visa approvals has decreased:** Approvals fell to 7.1% in 2023 compared to 11.22% in 2018.[7]

* Industries classified as A&D: Aerospace products and parts manufacturing; ship and boat building; engine, turbine, and power transmission equipment manufacturing; computer and peripheral equipment manufacturing; navigational, measuring, electromedical, and control instruments manufacturing; electronic component and product manufacturing | ** Boeing, Lockheed Martin, Northrop Grumman, Raytheon | *** Amazon, Apple, Google, Microsoft | **** Telecom, media, and technology (TMT) industries classified as Tech: software publishers; data processing, hosting, and related services, computer systems design and related services

Criteria Details

Criteria	Datapoints since last report card
10.1: U.S. attracts, retains, and develops domestic NSIB talent (e.g., availability, quality, diversity), particularly in STEM and skilled trades.	⊕ **The A&D workforce grew 4.9% between 2021-22, reversing pandemic-era trends**: The A&D talent base in 2022 exceeded pre-pandemic numbers after contracting 2019-2021 (3.9% decline)[1] ⊕ **The first National Defense Industrial Strategy listed "workforce readiness" as one of four top strategic priorities:** The strategy increased awareness and proposed nine actions to address A&D workforce challenges[2] ⊕ **A&D industry salaries in the U.S. are 55% above the national average:** The average A&D salary is $108,900 (2022)[1] ⊕ **Automation in A&D manufacturing helps alleviate labor shortages:** e.g., Army's artillery production ramp-up enabled in part by automated manufacturing techniques in its Scranton[4] ⊖ **The A&D talent challenge is deepened by a broader U.S. shortage of skilled craft labor:** A 2023 survey by the Associate General Contractors of America found 85% of 1400 surveyed contractors had open craft positions, with 88% reporting difficulty in filling these vacancies[5] ⊖ **A retirement bubble is on the horizon:** The A&D industry is graying, with 31% in or nearing the retirement-eligible window compared to 16% in the tech industry and 24% in the U.S. (2022)[3, 8] ⊖ **Talent availability is declining in 21 states that traditionally attract large defense dollars:** These areas may face the most acute A&D labor pool challenges (2022-23)[6, 9] ⊖ **A&D jobs are taking longer to fill:** Open jobs at top A&D primes decreased from 31% to 24% 2018-23 (% of total workforce) but remain ~3x higher than among top tech companies (7% of total workforce); the average job posting duration increased 25% 2022-23 vs. 7% p.a. 2018-202310; on January 8, 2024 DARPA opened an RFP for the development of alternative workforce models, futures, and talent[11] ⊖ **The A&D industry is losing workers to non-A&D private sector companies:** Only 43% of employees that leave a job in the A&D industry stay in A&D (private sector A&D company, academia, labs, public sector) compared to 55+% of outgoing employees from a sample of public labs* (2019-23)[7, 12] ⊖ **DoD onboarding of top talent faces lengthy delays:** e.g., onboarding of PhDs into the Pentagon still takes 6-9 months[12]
10.2: U.S. leads in attracting and retaining a robust pipeline of foreign talent with in-demand skills needed for national security missions.	⊖ **Industry share of initial H-1B visa approvals has decreased for the larger manufacturing industry:** Approvals fell to 7.1% in 2023 compared to 11.22% in 2018[13]

* Sandia National Laboratory, Pacific Northwest National Laboratory, Lawrence Livermore National Laboratory, U.S. Naval Research Laboratory, NASA

Signature Recommendations

1. ***DoD and Congress must fully fund Replicator in FY25 and provide sustained and predictable funding across the FYDP.*** While the announcement and establishment of new programs, such as Replicator and Collaborative Combat Aircraft, serve as important initial signals to industry, consistent and stable funding over the Future Years Defense Program (FYDP) is critical to communicating to industry the sustained investment and prioritization of these programs. The DoD needs to more effectively communicate the vision of Replicator and ensure adequate and sustained funding across critical capability areas as a precursor to the required capital investments necessary to meet the scale and impact sought for these programs.

2. ***The DoD should establish a pilot program for shared access to commercial classified infrastructure in order to alleviate the significant facility security burden and limitations placed on NSIB actors, accelerate technology development, and increase competition across the DIB.*** Recent surveys of the NSIB have highlighted that dealing with classified information may be the greatest challenge companies face in accessing opportunities to work with the federal government. NSIB disruptors face significant delays in the development, fielding, and scaling of their technologies as a result.

3. ***Congress and the DoD must prioritize the development and maturation of novel manufacturing processes that enable the flexible and affordable production of munitions and other military capabilities to meet global demand, strengthen domestic supply chains, and develop the workforce of the future.*** Multiple ongoing conflicts and increased demand for U.S. weapons systems have highlighted the limitations and fragility of traditional DIB manufacturing capabilities. The DoD and Department of Commerce have an opportunity to build upon the increased collaboration between state, federal, and private actors as a result of the CHIPS Act, Microelectronic Commons, and NSF Innovation Hubs, and focus these relationships on other critical capabilities, workforce development programs, and public-private partnerships to address NSIB supply chain issues and labor shortages.

Signature Recommendations

4. ***Congress must establish a National Security Innovation Base Green Card Recapture Program.*** Congress could maximize the benefits of our immigration system, prevent bureaucratic waste, and boost access to the STEM talent and skilled trades required to propel our innovation ecosystem and bolster the defense industrial base. This program would "recapture" previously unused green cards, including over 100K following COVID that are unused, making them available to individuals with the skills sought after by the NSIB. Green card recapture would simply ensure that green cards that Congress had allocated in previous years end up being used, per Congressional intent, and are not permanently lost.

5. ***Congress should authorize a Civic Duty Leave program, similar to the National Guard and Reserves, that provides employment protections for individuals to take a sabbatical from an organization to serve in government and then return to their prior employment without suffering any significant professional or financial harms.*** In academia and nonprofits, the Intergovernmental Personnel Act (IPA) provides a decades-long precedent for affording these opportunities to employees for up to four years. In 2018, Congress authorized Public-Private Talent Exchanges (PPTE) to give DoD authority for IPA-like exchanges with industry, however these programs have not been effectively utilized or scaled.

6. ***The DoD must reform its approach to commercial intellectual property rights, specifically for software.*** While it is critical that the DoD is able to own and access its data, vague intellectual property rights language, specifically for software, creates confusion between the DoD and companies, slowing award time and limiting the overall vendor pool, particularly for commercial companies. The DoD should prioritize interoperability, not ownership, while adhering to commercial preference as required by Federal Acquisition Regulations and permitting commercial software vendors to retain their IP rights.

Footnotes (1/4)

1. Defense Modernization

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