U.S. Department *of* Defense

# INVESTMENT STRATEGY
## FOR THE OFFICE OF STRATEGIC CAPITAL

*Fiscal Year 2025*

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# Foreword

At this moment of global challenge, the Department of Defense must seek novel and effective ways to keep the United States secure. America's powerful combination of free minds, free enterprise, and free people give us an enormous advantage. We also have major strengths in our access to vital supply chains, our leadership across key industries, and our rapid development of critical technologies.

Private markets continue to finance most investments in these areas. So we must continue to work with private firms to promote investment opportunities that make America more secure.

The Office of Strategic Capital (OSC), which I established in December 2022, is a crucial tool for expanding America's enduring competitive advantages. Since its founding, OSC has responded swiftly to our country's needs. Last year, strong congressional support for the office provided the Department with new authorities and appropriations to execute the OSC mission. Meanwhile, its Small Business Investment Company Critical Technologies Initiative, a novel partnership with the Small Business Administration launched in September 2023, has been rapidly attracting investment to the Department of Defense's 14 Critical Technology Areas by working directly with investors. In September 2024, OSC announced the first financial product to directly partner with companies: an equipment-finance product that will scale up production across a range of critical technologies and assets.

I am pleased to introduce the second Investment Strategy for the Office of Strategic Capital. This strategy integrates these new authorities, defines arenas of strategic competition, develops a framework to optimize capital allocations, and identifies areas of particular interest for OSC investments. OSC will execute this strategy by working closely with partners across the federal government, in the private sector, and abroad. It will do so in a way consistent with America's deep commitment to market competition—a wellspring of U.S. strength. Our approach here stands in stark contrast to that of foreign autocrats who seek to coerce and control investors and companies. Together, we can build a strong foundation for ongoing technological leadership, economic strength, and American security.

Lloyd J. Austin III
Secretary of Defense

Contents

# Executive Summary

The Secretary of Defense founded the Office of Strategic Capital (OSC) in December 2022 to attract and scale private capital into technologies critical to United States national security. To execute this mission, OSC has launched a series of financial products to invest in areas important to national security.

OSC's inaugural offering, launched in the Autumn of 2023, was the Small Business Investment Company Critical Technology Initiative (SBICCT Initiative), a partnership with the Small Business Administration (SBA) to extend credit to funds investing within the Department's fourteen Critical Technology Areas. The inaugural FY2024 Investment Strategy provided the framework to identify industry segments of particular interest for the initiative.

In December 2023, Congress formally authorized OSC, expanded the office's mission, and authorized OSC to provide loans, loan guarantees, and technical assistance to companies, funds, and other entities within 31 "Covered Technology Categories" listed in statute. Following passage of the Further Consolidated Appropriations Act, 2024, OSC has launched its second financial product less than six months after receiving appropriations – a direct lending program to fund the construction, expansion, or modernization of commercial equipment in the United States.

The FY2025 Investment Strategy identifies and prioritizes investment areas for the OSC's newly authorized credit-based financial products. Investments will be prioritized based on their national security impacts, defined as those that provide the United States and/or its allies and partners with robust competitive advantage relative to strategic competitors.

The document provides a framework that categorizes national security impacts, corresponding to key arenas of strategic competition:

1. Near-term control over chokepoints in economic networks;
2. Medium-term leadership within key industries; and
3. Long-term development of critical technologies.

OSC has leveraged best practices from the commercial sector and academic literature, including a mix of quantitative and qualitative methods, to identify a subset of covered technology categories whereby investment can create the greatest national security impact. Illustrated below, the OSC will place particular focus for its credit-based financial products on this subset of the covered technology categories.

**Industry Segments of Particular Interest Within OSC's Covered Technology Categories**

*These industry segments comprise a subset of Covered Technologies Categories where OSC will place particular focus for its credit-based financial products. Applications for funding across all 31 Covered Technology Categories will be considered.*

- Advanced Bulk Materials
- Advanced Manufacturing
- Autonomous Mobile Robots
- Battery Storage
- Biochemicals
- Bioenergetics
- Biomass
- Hydrogen Generation and Storage
- Microelectronics Assembly, Testing, and Packaging
- Microelectronics Manufacturing Equipment
- Microelectronics Materials
- Nanomaterials and Metamaterials
- Sensor Hardware
- Spacecraft
- Synthetic Biology

Finally, the FY2025 Investment Strategy concludes by outlining OSC's portfolio-of-investments approach across the different competition arenas and timeframes.

The Commission on the National Defense Strategy report, released in August of 2024, underscored the enormity of the challenge the United States faces in the coming decades. The FY2025 Investment Strategy will serve as the guiding force for OSC's efforts in FY2025 and beyond, providing strategic direction to OSC investments to ensure the office executes on its expansive mission while enabling transparency for our stakeholders. DoD invites investors and companies to participate in the program activities described in this document.

# Overview of the Office of Strategic Capital

As the 2024 National Defense Strategy Commission Report notes, the United States, along with its allies and partners, currently face the "most challenging and most dangerous international security environment since World War II."[1] China and to some extent Russia "fus[e] military, diplomatic, and industrial strength to expand power worldwide and coerce its neighbors" through "integrated global initiatives" that harness "blended economic and military efforts," excelling at "using economic policy for national security ends."[2] Such efforts range from investing in critical technology to "ownership of seaports," establishing "significant control over much of the world's existing supply of critical minerals," and targeting investment in "strategically located countries."[3] Consequently, global capital markets have become contested spaces for competitive advantage in national security.

The combination of today's challenges and opportunities requires a comprehensive response. As part of that response, in December 2022, the Secretary of Defense launched the Office of Strategic Capital (OSC) to attract and scale private capital to technologies critical to the national security of the United States. Through the combination of distinct financial products, such as direct loans and loan guarantees, OSC partners directly with investors to enable capital investment into companies and assets that increase the competitiveness of the United States and its partners and allies' collective industrial base. OSC investment therefore directly supports the National Defense Strategy by building enduring advantages across the defense ecosystem.

To effectively employ OSC's financial products, the OSC Investment Strategy identifies and prioritizes areas of OSC investment. The inaugural FY2024 Investment Strategy developed a framework detailing the office's approach to prioritizing investment opportunities for OSC's first financial product – the SBICCT Initiative, a partnership with the Small Business Administration (SBA).[4] Launched in the autumn of 2023, the SBICCT Initiative provides credit to investment funds deploying capital across the Department of Defense's 14 Critical Technology Areas.

As illustrated in Figure 1 below, the FY2025 Investment Strategy expands on the work in the FY2024 strategy to incorporate the statutory developments from the National Defense Authorization Act for Fiscal Year 2024.

In December 2023, Congress authorized OSC in statute and defined OSC's mission in three core duties, summarized as follows:

1. To develop, integrate, and implement capital investment strategies proven in the commercial sector
2. To identify and prioritize promising critical technologies and assets that require capital assistance and have the potential to benefit the Department of Defense; and
3. To make investments in such technologies and assets.

In a significant first for the Department of Defense under Title 10, United States Code, Congress authorized OSC to provide loans, loan guarantees, and technical assistance to a range of entities—including companies, investment funds, governments, and port authorities—within 31 "covered technology categories" defined by statute.[5] Congress also appropriated funds for the purpose of providing loans and loan guarantees to eligible entities, authorizing $984M of lending limit for this pilot effort.

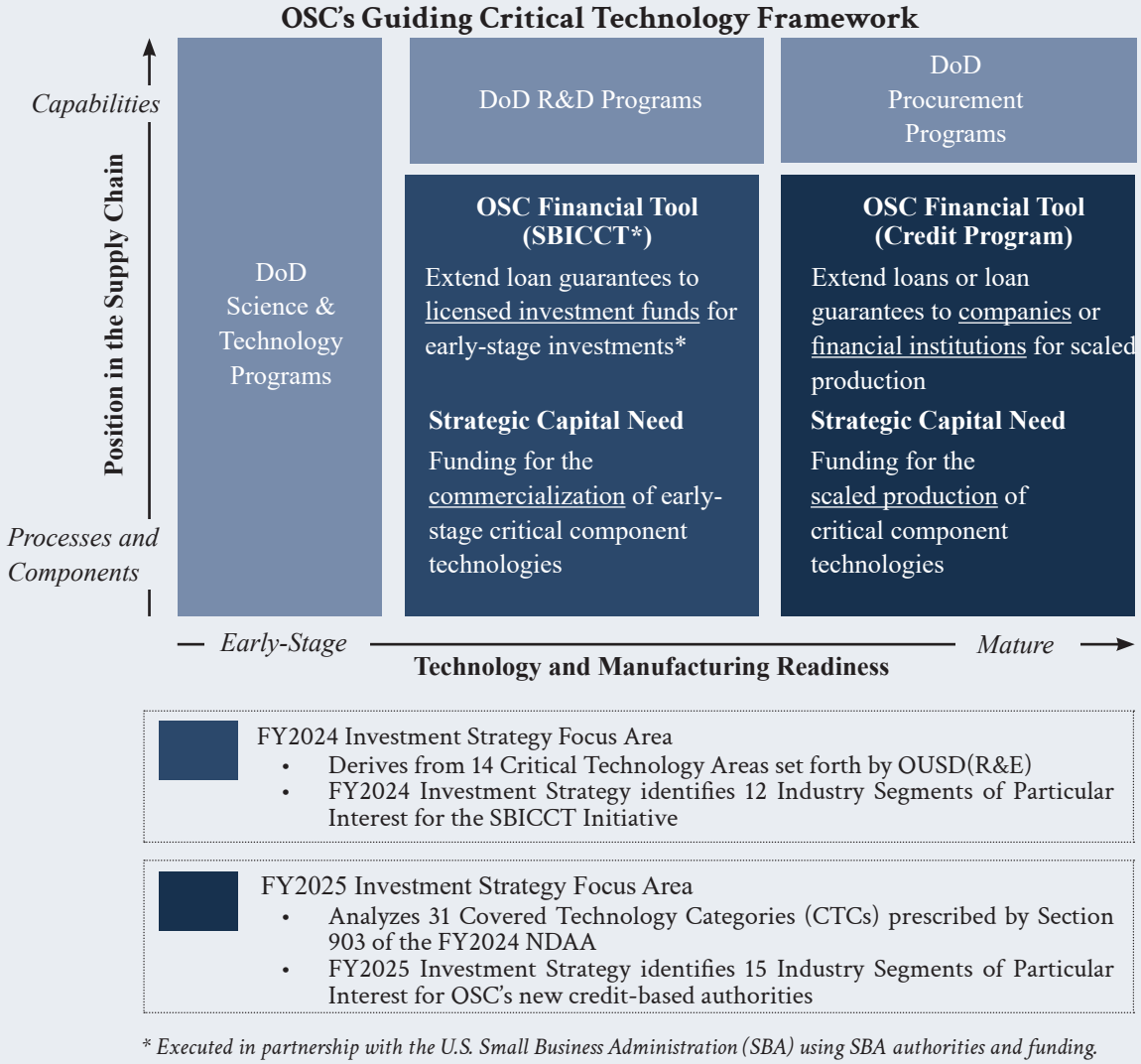
Announced in September of 2024, OSC is currently executing its second financial product – a direct lending offering for equipment finance – and plans to provide its first loans beginning in 2025. Equipment finance complements the SBICCT Initiative with the SBA by providing pathways for growth from commercialization to production. The SBICCT Initiative and equipment finance lending can begin to increase investment that seeks to scale critical technology industries from "seed to GDP."

The FY2025 Investment Strategy identifies and prioritizes investment areas for OSC's newly authorized credit-based financial

products. Through the application of an extended framework and methodology described more fully below, OSC seeks to maximize national security impacts. In combination, the focus of the FY2025 Investment Strategy, coupled with financial products to implement the strategy, will efficiently promote the national and economic security of the United States and its allies and partners.

## Fig. 1: The FY2025 Investment Strategy Focuses on New Credit Authorities

*The FY2024 Investment Strategy focused on the SBICCT Initiative; the FY2025 Investment Strategy focuses on OSC's new authorities for loans and loan guarantees*




** Executed in partnership with the U.S. Small Business Administration (SBA) using SBA authorities and funding.*

# Prioritization Approach

The FY2024 Investment Strategy identified industries of particular interest within the Department of Defense's fourteen Critical Technology Areas as part of OSC's contribution to SBA investments made under the SBICCT Initiative. The conclusions reached under the FY2024 Investment Strategy regarding industries of particular interest remain unchanged. Since that time, OSC received credit authority and appropriations from Congress to establish its own credit program. The FY2025 Investment Strategy addresses how to prioritize investment under its new authority.

The analytical challenge presented by OSC's statutory mandate, which calls upon the office to analyze and then prioritize investment within a massive swath of economic activity, requires a multi-year effort to develop the research and assessment capabilities commensurate with that task. The methods presented here are therefore the first versions of what will be a constantly expanding and improving toolkit.

OSC's approach for maximizing the effectiveness of its investments extends the FY2024 Investment Strategy's approach in two key ways. First, the methodology categorizes investment priorities by their national security impact; national security is a broad concept. With national security impact as a lodestar, the updated framework categorizes potential impacts into a coherent portfolio from which to make investment allocation decisions.

Second, the approach utilizes a suite of analytical tools for assessing how those national and economic security impacts can best be achieved. These analytical tools are sourced from commercial best practices and enriched by United States Government data and insights, consistent with OSC's statutory mandate, which requires the office to "develop, integrate, and implement capital investment strategies proven in the commercial sector."[6] When aligned to arenas of strategic competition, they assist in the allocation of OSC's available credit to investment opportunities.

The FY2025 Investment Strategy provides and employs its methodology to identify and prioritize investment areas across all of OSC's credit products, thereby illuminating a path for future growth to follow. For this fiscal year, particular focus has been paid to OSC's newly granted credit authority; however, the FY2025 Investment Strategy also includes the work performed in FY2024 for continuity. Future years will continue to expand on additional investment opportunities projected to be most suitable for OSC's newly authorized financial products.

## Defining National Security Impact

Private sector investment can rely upon a simple benchmark for assessing investment opportunities: Risk-adjusted estimated financial returns. Investing for what might be termed "national security returns" requires a different yardstick.

> ***National Security Impacts*** are those that provide the United States and/or its allies and partners with a *robust competitive advantage* to its strategic competitors.

Here, national security impacts are those that provide the U.S. and/or one or more of its allies and partners with a robust competitive advantage over its strategic competitors in one or more contested arenas and in or across relevant timeframes. For example, national security impacts may include enhancing resilience and reducing vulnerabilities to potential threats or shocks, minimizing or preventing disruption risk to the production of key military and industrial capabilities or components, and accelerating the long-term development and commercialization of next generation critical technology. Assessing that

competitive advantage will, of course, be highly context specific, just like financial valuation typically is in private sector investment, where both quantitative and qualitative methods are combined. To provide analytical scaffolding for that context-specific decision-making, the framework below breaks out common arenas and timeframes in which strategic competition unfolds.

## Identifying National Security Impacts in the Economic Domain

A coordinated and resourced approach that draws on all elements of national power is required to ensure U.S. national security in an increasingly competitive strategic environment. Effectively achieving that coordination given the sheer scale of the problem set that the U.S. faces is an acute challenge.

OSC approaches its contributions to solving that challenge with a framework that describes the landscape of national security impacts across competitive arenas and near-, medium-, and long-term timeframes,[7] a methodology to identify and prioritize investments within and across those arenas and timeframes, and a portfolio approach to enable deliberate weighting of national security impacts across the timeframes and arenas. Such an approach makes it possible for OSC to then weigh trade-offs between potential investment opportunities, to shape new financial products, and to conduct dedicated market research based on their estimated national security impact.

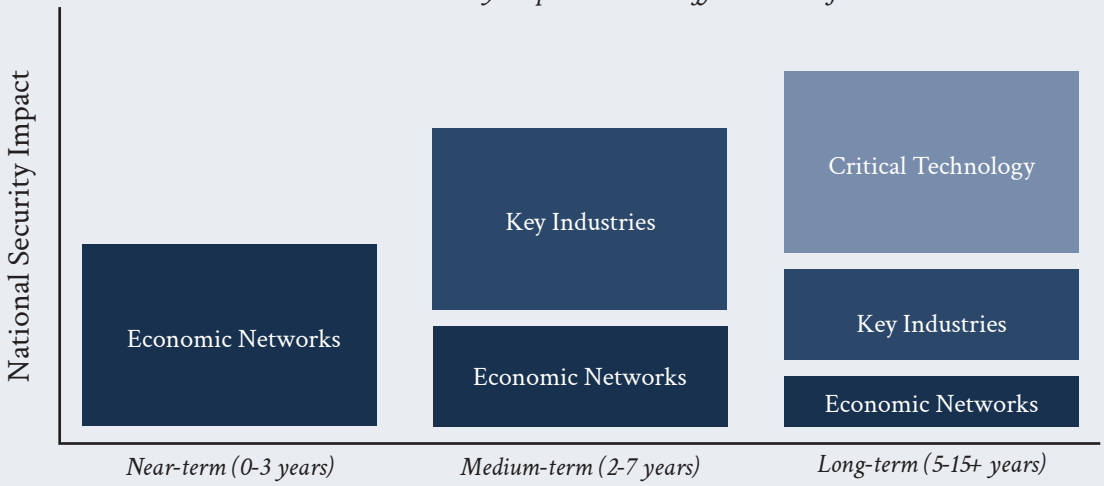
Figure 2 below provides a simplified illustration of the central arenas of strategic competition in the economic domain, organized by their impact on national security and the timeframe on which those impacts are typically felt. The goal of the framework is to anchor an investment decision in an assessment of trade-offs between opportunities on a dynamic basis.

The figure illustrates a few key concepts.[8]

1. Competition unfolds across multiple

**Fig. 2: Three Core Arenas of Strategic Competition Over Time**

*Investments made across arenas today may generate national security impacts across different timeframes.*




Timeframes: When National Security Impact Will Be Realized

economic arenas. The tactics and effects of strategic behavior differ in material respects across three modal forms of economic activity—including economic networks, key industries, and critical technology.

2. Strategic competition plays out over several timeframes, yet investment decisions must be made today. Near-term crises must be balanced against long-term needs.
3. National security impacts often interact with one another over time. It is possible, as depicted in the diagram, that they accrue as time passes—an effective near-term disruption of a supply chain can allow a competitor to dominate a key industry in the medium-term, which in turn may allow that competitor to win the race to achieve a technological advance critical to durable national security.[9]

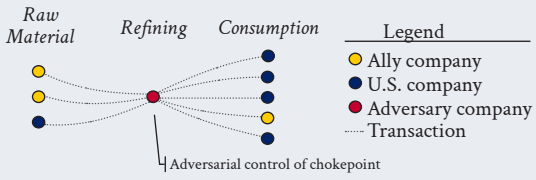
### Fig. 3: What Is an Economic Network?

A market is a collection—or network—of participants connected by the transactions they engage in one with another.[10] Connections are rarely evenly distributed, with some participants highly connected and others less so.

A highly connected participant may become a uniquely important trading partner for others—a node on which the rest of the network relies. The centrality that the highly connected actor enjoys gives it market power, which may allow it to abuse or even cut off access to those relying upon it.

Consider the following example of a refiner controlled by a competitor in a mineral market:

***Simple Economic Network in a Mineral Market***




While supply chains provide an intuitive example of chokepoints in economic networks, similar dependencies also arise in capital markets and the licensing of critical intellectual property.

Strategic competition in the economic domain is complex and multifaceted, and those three key concepts by no means address all of that complexity in its entirety. They are offered, rather, to establish a broad framework with representative examples that allow for continued refinement.

## The Arenas of Strategic Competition

Strategic competition occurs across three broad arenas: economic networks, key industries, and critical technology, which vary in form, importance, and impact over time. Each of the three core arenas, anchored to its most representative timeframe, is described below.

### *Near-Term (0-3 years): Capturing Chokepoints in Economic Networks*

Decades of globalization have led to broad and deep economic interconnections across international borders in a variety of markets, including those relevant to national security. That web of commercial relationships—that include capital flows, value chains, shared intellectual property, and even board memberships and stockholder rights—provides competitors with a near-term opportunity: To leverage these economic interconnections to disrupt or exploit access or reliance on financing, essential components or materials, and critical technology for the purpose of influencing a stakeholder's capabilities, industrial production, or other key economic activities to their competitive advantage. Identifying and, in turn, effectively addressing those vulnerabilities is thus essential to U.S. national security. Here, the potential impact of OSC's financial products includes minimizing or preventing dependencies and chokepoints by diversifying sources of supply, capital, technology, and expertise.

***Key industries*** *are those that produce capabilities essential to national security beyond mere control of elements of an economic network. For example, a key industry in the autonomous mobile robots Critical Technology Category is* ***undersea autonomous robots****, which have a range of applications, including vessel repair.*

***Medium-Term (2-7 years): Dominating Key Industries***

A competitor's ability to dominate a key industry that produces capabilities essential to national security—beyond the mere control of a chokepoint in an economic network—provides that competitor with a robust competitive advantage. Our competitors seek to dominate many of these industries, sometimes using illegal or covert means and methods that are unfamiliar to the United States and the international rules-based order. Here, the potential impact of OSC's financial products includes scaling domestic and allied production through company focused investment programs which lower the cost of capital.

***Long-Term (5-15+ years): Winning Critical Tech Races***

In the long-term, winning the race to develop next generation critical technology is crucial for achieving and maintaining an enduring advantage. Strategic competition in this arena requires not only development of novel technologies, but also the commercialization of those technologies into thriving and sustainable enterprises. Falling behind along this dimension places the United States in the position of technological laggard behind competitors with capabilities that may eclipse those available to the Department of Defense. Here, the potential impact of OSC's financial products includes the acceleration of growth of nascent industries through fund-focused investment programs, such as the SBICCT Initiative, which lower the cost of capital to invest in technology areas that require patient capital.

Through its existing and future financial products, OSC will seek to generate national security impacts across the arenas of competition through a deliberate portfolio allocation approach.

## Example One: Chokepoint Vulnerabilities in Economic Networks

*A strategic competitor's deniability of key inputs at the manufacturing production-line level*

In-country interviews at a U.S. ally revealed that certain civilian manufacturing companies are fully reliant on highly refined inputs from a strategic competitor, which requires export licenses for those inputs on a company-by-company basis. The strategic competitor exercises such precise control over these export licenses that the competitor can shut down specific production lines at the reliant companies, which it does periodically. As an interviewee described:

*"The export licenses are not restored [until an official from the U.S. ally] personally visits [the strategic adversary] and requests that exports be resumed to the reliant companies. We have to ask permission to turn on a specific production line."*

Without a second source for the refined inputs, manufacturing companies at the U.S. ally have no other recourse, giving the strategic competitor's highly targeted control deep within the industrial base of that country.

## Analytical Tools to Assess National Security Impacts

To identify industry segments of particular interest for investment across national security impacts, OSC has developed a set of analytical tools that align to commercial best practices. Those tools, summarized on the following pages, include both quantitative and qualitative methods. On the quantitative side, OSC applies state of the art analytical tools from economics, corporate finance, network analysis, and industrial organization to achieve the scale needed to meet the broad mandate Congress has given the office. On the qualitative side, OSC develops deep familiarity with current market dynamics, regularly issuing requests for information from industry participants, holding roundtables with investors and operating companies, and conducting extensive structured interviews with market actors in key global financial centers—including, New York, Silicon Valley, Boston, Dallas, London, Dubai, Tokyo, Singapore, and Sydney—and contested markets in South East Asia, South America, and Africa. In short, OSC undertakes both "lab work" (i.e., quantitative analysis) and "field work" (i.e., qualitative analysis) when assessing competitive dynamics.

***Mapping Economic Networks to Minimize Chokepoints***

The analytical effort to map global dependencies in value chains, capital flows, and intellectual property licensing relationships vulnerable to adversarial disruption is panoramic in scale, and yet an effective assessment, and investment allocation, requires pinpoint accuracy. To achieve that combination of scale and accuracy, OSC leverages proven quantitative methods for systematically analyzing complex economic networks.

Specifically, value chains, capital flows, and IP licensing relationships are systematically mapped and measured using network analysis, allowing OSC to objectively identify and assess key dependencies—or "chokepoints"—susceptible to disruption. Mapping those networks with high fidelity provides not only the precision needed for accurate detection and remediation of critical vulnerabilities but also provides a basis for deploying advanced methods to simulate the diffusion of disruptions across markets as conflict escalates.

***Analyzing Adversarial Efforts to Dominate Key Industries***

To assess Key Industries, OSC began its analysis with the industries found in its

### Example Two: Competitors' Efforts to Dominate Key Industries

*The People's Republic of China's concerted push into Microelectronic Assembly, Testing, and Packaging*

Analysis of research and development trends in microelectronics revealed a significant divergence between the U.S. and its strategic competitors in the sub-sector of semiconductor assembly, testing, and packaging (ATP) over the last ten years. Concentrated focus, particularly by the PRC, resulted in more frequent patenting and publication of research findings in certain technologies within the ATP space. That, in turn, led to a greater number of ATP-related start-ups over that time period, with 24 founded in the PRC and only 10 in the United States.

2.4x

More ATP startups founded in PRC than U.S. last 10 years

*"China's push into this space has been aggressive, and they are here with open wallets."*

*- Microelectronics executive describing PRC investment in ATP within the region.*

statutory Covered Technology Categories that are permissible for OSC investment programs. Next, primary analysis studies market growth, company performance, and trends in capital investment to anticipate industries' trajectories.

Integrating this analysis, OSC anticipates where investments made today may produce market leading companies in approximately five to ten years. Closely tracking growth stage financing trends, coupled with methods from industrial organization to analyze market dynamics and corporate finance to gauge company performance, form the backbone of OSC's approach.

***Accelerating the Commercialization of Critical Technology***

The technology areas and industries of particular interest identified in the FY2024 Investment Strategy remain the focus for OSC contributions to the SBICCT Initiative. For priorities under the new OSC credit program for FY2025, OSC began its analysis with the industries found in its statutory Covered Technology Categories that are permissible for OSC investment programs. While credit programs are typically focused on more mature industries, OSC may use its new credit authority to provide loans and loan guarantees for companies and assets that enable critical technology in complementary ways, such as helping to finance biomanufacturing facility that enables multiple biotech startups to rapidly develop prototypes. OSC continues to develop new qualitative and quantitative methods to identify such discrete approaches to accelerating critical technology.

## Example Three: Competition for Emerging Technology Leadership

*Projecting U.S. and Competitors' Development Trajectories to Identify Opportunities in Synthetic Biology*

Synthetic biology, one of OSC's 31 Covered Technology Categories, is a multidisciplinary scientific field focused on constructing, modifying, and inventing new biological systems that are not found in nature. The field's potential national security impacts range from advancing the onshoring of critical chemical manufacturing, developing mobile energy solutions, and defending against malicious use of synthetic biology technology.

Estimating emerging technology leadership in synthetic biology involved a three-step process, combining technical subject matter experts, machine learning methods, and financial analysis.

| *Step One* | | *Step Two* | | *Result* |
|---|---|---|---|---|
| *Produce a roadmap of key milestones over next 20 years, sourced from industry research association* | + | *Analyze patent and publication data using machine learning techniques to compare research trends in the U.S. and strategic competitors* | = | *Key milestones where competitors' current progress is materially greater than US are identified* |

Market analysis revealed a dramatic recent increase in a strategic competitors' investment in synthetic biology overall. Further analysis identified significant early-stage investment in a specific PRC startup that is working on a particular milestone identified as an area where the United States is lagging in the OSC trend analysis.

**3.8x**

Year-over-year increase in early-stage investments in PRC-based synthetic biology companies in last ten years

# Prioritizing National Security Impacts

## Developing an Investment Portfolio for National Security Impact

OSC seeks to generate competitive advantage and national security impacts for the United States and our allies and partners across both the timeframes and arenas of strategic competition. OSC's credit-based financial products will generate national security impacts in economic networks and key industries. In addition, the SBICCT Initiative enables OSC to contribute to developing long term advantages in critical technology. As OSC develops novel financial products and deploys capital over time, it will apply a portfolio approach to deliberately allocate its resources across the arenas and timeframes of strategic competition.[11]

While OSC's resources appropriated for its credit authority are leveraged through its financial product for equipment finance, the equipment finance product serves as the primary lending pilot for OSC. As such, while OSC has several industry segments of particular interest for investment (listed below), companies across all covered technology categories and their assets are eligible to apply. OSC will continue to engage the market through both external engagement and through notices of funding availability.

## Prioritizing Investments Across and Within Covered Technology Categories

Ongoing market research has illuminated a range of investment opportunities – both domestic and international – likely to produce meaningful national security impacts across nearly all of the 31 Covered Technology Categories. Given the breadth and depth of the economic activity within OSC's statutory mandate, and considering both the ambitions and successes of our competitors within that large economic landscape, it is unsurprising that there are many urgent opportunities for deploying strategic capital.

Because OSC's initiatives are proportionally small compared to that broad remit, every OSC investment must generate the maximum national security impact possible.[12] The framework introduced above provides guidelines for undertaking that highly contextual analysis, while also belying claims that formulaic approaches to investment prioritization and execution can be followed. Just like investment decision-making in the private sector, profit-driven context is a combination of art and science, so it is in this setting where national security impacts are pursued.

The following list constitutes the industry segments of particular interest within the 31 Covered Technology Categories for OSC's loan and loan guarantee authorities. In FY2025, the office will pursue these areas with its initial loan offering product: equipment finance. While the below list does not enumerate the investment priorities in detail, OSC's Investments Division will communicate additional detail about specific industry segments of particular interest and funding opportunities on an ongoing basis through its website: https://www.cto.mil/osc/credit-program/. This list of industry segments of particular interest is provided alongside the list of industry segments of particular interest for the SBICCT Initiative from the FY2024 Investment Strategy for comparison purposes in Appendix B.

## Industry Segments of Particular Interest Within OSC's Covered Technology Categories

*The following industry segments are included within the statutorily provided list of 31 Covered Technology Categories that fall within OSC's credit authority*

- Advanced Bulk Materials: *Advanced bulk materials include dielectrics, polymers, and composites that improve electronic, structural, and mechanical functionalities.*
- Advanced Manufacturing: *Processes that leverage automation, computation, sensing, and networking to achieve to increase the quality and productivity of manufacturing.*
- Autonomous Mobile Robots: *Robots and vehicles that use an integrated artificial intelligence system to sense their surroundings, navigate to a destination, and complete a task with a high degree of autonomy.*
- Battery Storage: *The process of storing chemical energy using chemical reactions to convert and store energy within batteries, such as lithium ion, lead acid, and other technologies.*
- Biochemicals: *Chemicals, fuels, and chemical components that are derived from renewable sources.*
- Bioenergetics: *Utilization of biological processes and principles related to energy conversion, storage, and transfer for high potency applications.*
- Biomass: *Organic material that can be processed for other end uses (e.g., energy generation).*
- Hydrogen Generation and Storage: *Storing chemical energy as hydrogen, produced via natural gas pathways or electrolysis.*
- Microelectronics Assembly, Testing, and Packaging (ATP): *The process to assemble, package, and inspect fully manufactured microelectronic chips enabled by advanced tools, machines, and technology.*
- Microelectronics Manufacturing Equipment: *Equipment used in a clean room for the fabrication of semiconductor chips, equipment used to test the semiconductor manufacturing equipment, and auxiliary fixtures in place to support a semiconductor fabrication facility.*
- Microelectronics Materials: *Critical components, raw materials, and rare earth elements utilized in microelectronic manufacturing.*
- Nanomaterials and Metamaterials: *Materials with any dimension between 1 and 100 nm that can have different physical and chemical properties to their bulk-form counterparts.*
- Sensor Hardware: *Physical devices that capture and measure physical inputs such as light, temperature, humidity, motion, and more to be converted into data for interpretation by a human or machine.*
- Spacecraft: *Vehicles deployed in outer space for a wide range of commercial, scientific, and defense applications, such as satellites, space probes, and space laboratories.*
- Synthetic Biology: *Use of technology to design, modify, or create novel biological systems that do not exist in the natural world.*

*Those industry segments comprise a subset of Covered Technologies Categories where OSC will place particular focus for its credit-based financial products. Applications for funding across all 31 Covered Technology Categories will be considered.*

# Conclusion

Today's strategic competition requires commitment and collaboration across the economies and citizenries of the U.S. and its allies and partners. Economic investment is a key element of national power that should be incentivized to support national security.

OSC seeks to attract private capital to national security priorities to generate competitive advantage for the U.S. and its allies and partners. Once identified, national security impacts must be prioritized within integrated strategies for maintaining and enhancing competitive advantage. One-off or unconcerted investments will fail to reap synergies otherwise available when investment is coordinated, both within OSC's portfolio and with the adjacent efforts of interagency partners and the private sector.

If you have questions or thoughts relating to these issues and/or OSC's mission, please send correspondence to Strategy@osc.mil.

# Endnotes

1 Final Report, The Commission on the National Defense Strategy for the United States, July 2024, https://www.armed-services.senate.gov/imo/media/doc/nds_commission_final_report.pdf (accessed Aug 15, 2024) (NDS Comm'n Report), at ix.

2 *Id.* at 7.

3 *See* FY2024 Investment Strategy of the Office of Strategic Capital, https://www.defense.gov/News/Releases/Release/Article/3233377/secretary-of-defense-establishes-office-of-strategic-capital/ (accessed Aug. 15, 2024) (FY2024 Investment Strategy).

*See* Press Release, Department of Defense and Small Business Administration Roll Out the Small Business Investment Company Critical Technologies (SBICCT) Initiative, https://www.defense.gov/News/Releases/Release/Article/3543777/department-of-defense-and-small-business-administration-roll-out-the-small-busi/ (accessed Aug. 15, 2024).

*4* NDS Comm'n Report at 7.

5 Fiscal Year 2024 National Defense Authorization Act, Section 903.

6 *Id.*

7 Rough definitions of these three timeframes are analogous to those found in Joint Chiefs of Staff, Implementing Joint Force Development and Design (3 December 2019).

8 We note that each arena applies across each timeframe to a certain extent but chose to emphasize two concepts: (1) visualize the primary arena of impact across each timeframe, and (2) show that each arena has a primary timeframe when those impacts will manifest. While a deeper analysis of this framework is warranted in another medium, it is displayed here in a way that will best fit the purpose of identifying and prioritizing investments for national security impact.

9 *See* NDS Comm'n Report at footnote 3: "3 The NDS refers to China as a strategic competitor and Russia as a threat. The Commission throughout this report uses these terms and adversary interchangeably but does not mean to imply that the United States seeks an adversarial relationship or to engage in military conflict with any other nation."

10 *See, e.g.*, Harrison White, *Markets from Networks: Socioeconomic Models of Production* (2002).

11 Office of Strategic Capital, U.S. Department of Defense, Notice of Funding Availability - Covered Technology Categories - Equipment Financing, https://www.federalregister.gov/documents/2024/09/27/2024-22229/notice-of-funding-availability-covered-technology-categories-equipment-financing

12 The National Defense Industrial Strategy is an additional tool that contributes to addressing this problem set. See https://www.businessdefense.gov/NDIS.html

# Appendix A: OSC Credit Program Initial Offering: Equipment Finance

The OSC Credit Program assesses capital market needs and develops financial instruments to encourage private investment in industries that are both commercially viable and necessary for the geopolitical challenges of the 21st century. The Credit Program employs loans and loan guarantees as an enticement for private capital to invest in potentially overlooked segments of the market that support the development of critical technologies and ensure the availability of vital components. Where private capital alone may require higher interest rates or comparably rapid repayment, the Credit Program can offer competitive rates with substantially longer repayment timelines, thereby providing companies the time and space they need to move new products to market.

OSC expects to continue to respond to market demand by offering more complex forms of Financial Products directly and by partnering with lenders in 2025 and beyond.

**Critical Technologies listed here are only for the Credit Program Equipment Finance loans.**
Please note that all statutorily defined 31 Covered Technologies are encouraged to apply.

In September 2024, OSC announced its first Credit Program offering, consisting of $984 million in available equipment finance loans. The two-part loan application submission window opens on January 2nd, 2025. Loans will be from $10 million to $150 million and will finance the "construction, expansion, or modernization of commercial equipment in the United States." The most up-to-date information is available on www.osc.mil.

**Industry segments of particular interest among the 31 Covered Technology Categories are indicated below with asterisks.**

- Advanced Bulk Materials*
- Advanced Manufacturing*
- Autonomous Mobile Robots*
- Battery Storage*
- Biochemicals*
- Bioenergetics*
- Biomass*
- Cybersecurity
- Data Fabric
- Decision Science
- Edge Computing
- External Communication
- Hydrogen Generation and Storage*
- Mesh Networks
- Microelectronics Assembly, Testing, and Packaging*
- Microelectronics Design and Development
- Microelectronics Fabrication
- Microelectronics Manufacturing Equipment*
- Microelectronics Materials*
- Nanomaterials and Metamaterials*
- Open RAN
- Optical Communications
- Sensor Hardware*
- Solar
- Space Launch
- Spacecraft*
- Space-Enabled Services and Equipment
- Synthetic Biology*
- Quantum Computing
- Quantum Security
- Quantum Sensing

# Appendix B: Industry Segments of Particular Interest for the SBICCT Initiative

Within the critical technologies defined under U.S. Code 10 U.S.C. § 4801(6), the Department of Defense Under Secretary of Research and Engineering has identified fourteen Critical Technology Areas vital to U.S. national security interests, which technologies are listed in the Investment Policy Statement of the SBICCT Initiative and are listed on the OSC website (collectively the "CTAs").

**While all CTAs are in the scope of the SBICCT Initiative, the Secretary of Defense directed OSC to identify industry segments within the CTAs for potential investment that are of particular interest to the DoD.**

There are currently twelve industry segments within the CTAs that are of particular interest to DoD and that are described in more detail in the FY2024 OSC Investment Strategy. These industry segments are intended to be focused enough to increase investment in key industries and supply chains, but broad enough to enable SBICCT Initiative Licensees to take a portfolio approach to critical technology segments. In addition, the focus on these industry segments aligns with the first principles of the SBICCT Initiative described in Section 3.1 of the Investment Policy Statement of the SBICCT Initiative. These industry segments (and related CTAs) in the FY2024 OSC Investment Strategy are as follows:

- **Nanomaterials and Metamaterials (*Advanced Materials*).** Materials with any dimension between 1 and 100 nm that can have different physical and chemical properties to their bulk-form counterparts.
- **Bioenergetics (*Biotechnology*).** Utilization of biological processes and principles related to energy conversion, storage, and transfer for high potency applications.
- **Synthetic Biology (*Biotechnology*).** Use of technology to design, modify, or create novel biological systems that do not exist in the natural world.
- **Open RAN (*FutureG and 5G*).** Open Radio Access Network (ORAN) is an ongoing shift in mobile network architectures that enables service providers the use of non-proprietary subcomponents from a variety of vendors.
- **Sensor Hardware (*Integrated Sensing and Cyber*).** Physical devices that capture and measure physical inputs such as light, temperature, humidity, motion, and more to be converted into data for interpretation by a human or machine.
- **Assembly, Testing, and Packaging (*Microelectronics*).** The process to assemble, package, and inspect fully manufactured microelectronic chips enabled by advanced tools, machines, and technology.
- **Materials (*Microelectronics*).** Critical components, raw materials, and rare earth elements utilized in microelectronic manufacturing.
- **Quantum Computing (*Quantum Science*).** Quantum computing harnesses the principles of quantum mechanics, utilizing qubits, which can be implemented using atoms, to enable exponential computational speed-up compared to classical computers.
- **Quantum Security (*Quantum Science*).** Quantum security refers to developing and implementing cryptographic methods and protocols that are resistant to attacks by quantum computers.
- **Quantum Sensing (*Quantum Science*).** Quantum sensing leverages the principles and properties of quantum mechanics to develop sensors capable of making exceptionally accurate and sensitive measurements.
- **Battery Storage (*Renewable Energy Generation and Storage*).** The process of storing chemical energy using chemical reactions to convert and store energy within batteries, such as lithium ion, lead acid, and other technologies.
- **Space Enabled Services and Equipment (*Space Technology*).** Services related to satellite and other spacecraft launch and operation, such as satellite communications, geospatial intelligence, global navigation satellite systems, in-space refueling and servicing, and rapid global delivery of cargo via space launch, as well as associated ground equipment such as terminals and receivers.

For additional information regarding the SBICCT Initiative, please visit both OSC's and the SBA's website.

# Appendix C: Methodology

This appendix describes certain key variables OSC considers when assessing the potential national security impacts that it seeks to achieve with its investments. This list expands upon the FY2024 Investment Strategy but is not exhaustive of future analytical needs. For comments on the methodology or analysis, please reach out to strategy@osc.mil.

## Levels of analysis

The FY2025 Investment Strategy analysis focuses on assessments of the competitive dynamics of the 31 Covered Technology Categories that were introduced for OSC's newly authorized credit authority in Section 903(a) of the FY2024 National Defense Authorization Act. The analysis relies on a bottom-up approach to assess relevant industries, where company-level characteristics and behavior is aggregated to the industry-level in order to ensure a granular and comprehensive understanding of each Covered Technology Category.

## Core Variables

Assessing strategic competition across economic timeframes and arenas involves a variety of methods, as outlined above. Consistent with its statutory mandate to use strategies "proven in the commercial sector," OSC seeks to employ best practices and, if necessary, to provide impetus for methodological development when current practice does not fully respond to need.

The core variables discussed here are used to study economic activity across all Covered Technology Categories, providing a relatively uniform yardstick to assess strategic priorities. They are not, however, the only variables OSC considers. Industry-specific metrics are also used, since much economic activity is nuanced and specific to its particular market setting. For brevity's sake, this secondary category of variables is not discussed here.

As noted above, these variables are assessed using both quantitative and qualitative methods. The former allows OSC to identify macro-level trends in the company-level data across the massive breadth of economic activity within its statutory remit. The latter gives OSC fine-grained understanding of industry nuanced and complements quantitative methods when data are scarce.

The common measures used across industries, where reliable data is available, that follow are organized by topic. Note that most of the measures are comparative, focusing on the dynamics between the United States and its strategic competitors. In those cases, the comparison is between the companies and/or investment funds of the United States and its partners and allies, on one hand, and companies and/or investment funds of the strategic competitors of the United States, on the other.

### *Aggregate Market Dynamics*

**Historical Growth Rate.** To provide a sense of industry maturity and context to understand specific measures of comparative economic performance, the compound annual growth rates for sectors are estimated on a 10-year basis.

**Comparative Current Market Share**. The comparative market shares, calculated based on companies' annual turnover in the relevant market, provides a current snapshot of U.S. strength and vulnerability in key industries.

**Comparative Market Share Trend**. The 10-year trend in the market shares of U.S. and strategic competitors' companies informs both one's understanding of the current status quo and estimates of future market share changes.

### *Cost of Capital Metrics*

**Comparative Cost of Debt**. Particularly to gauge opportunities for OSC's credit

authority, companies' comparative cost of debt is calculated from data for companies operating in a given industry.

**Comparative Cost of Equity**. To understand the potential attraction of equity financing, and to allow for combination with cost of debt to calculate the weighted average cost of capital, companies' comparative cost of equity is also calculated.

### *Funding Availability*

**Comparative Early-Stage Investment Activity**. This metric compares venture capital investment by funds in the United States and its strategic competitors in a given industry for the last five years, providing a sense of the relative availability of early-stage financing. Comparison focuses on both the number of funds and the amount of capital provided, and on the national affiliations of the companies receiving the capital.

**Comparative Private Equity Investment Activity**. This metric compares private equity investment by funds in the United States and its strategic competitors, providing insight into the relative availability of capital to more mature companies. Again, comparison focuses on both the number of funds and the amount of capital provided, and on the national affiliations of the companies receiving the capital.

**Comparative M&A Trends**. To complement the analysis of private equity investment activity, a broader analysis of M&A trends provides additional insight on sources of capital, particularly from strategic acquirors. Comparison focuses upon both buyside and sell-side activity in order to understand who is acquiring and who is being acquired.

### *Early-Stage Company Performance*

**Comparative Aggregate Startup Activity**. To shed light on both long-term critical technology trends and nascent efforts to dominate key industries, startup activity is compared. Comparison focuses upon U.S. and competitors' startup activity as a percentage of total global startup activity over the last five years.

**Comparative Startup Growth Rate**. To shed light on early-stage companies' ability to scale, the growth rate of U.S. and strategic competitors' startups are compared over the last five years.

**Comparative Startup Profitability**. As another measure of growth stage companies' relative ability to scale, the profitability of growth stage companies are compared over the last five years.

### *Research and Development Trends*

**Comparative Patenting Activity**. To estimate trends in the development of critical technology, patent prosecution activity in all jurisdictions for which data is available is compared for the last ten years.

**Comparative Forward Citation Activity**. As a more accurate and robust measure of technological progress, forward citation metrics for filed patents are compared over the last ten years.

### *Economic Network Dependencies*

**U.S. Reliance on Trade Flows from Competitor Economies**. To assess reliance on strategic competitors for commodities and other inputs regularly captured in publicly available data, trade flows in each Covered Technology Category are analyzed to identify the provenance of intermediate goods flowing into the United States and its allies and partners.

**Supply Chain Vulnerabilities and Chokepoints**. For a more granular picture of supply chain dependencies in each Covered Technology Category, transaction-level data among companies is collected, transformed into a network graph, and standard measures from network analysis to quantitatively assess supplier centrality and diffusion dynamics are employed.

**Capital Flow Vulnerabilities and Chokepoints**. Similar analysis is undertaken for capital flows as for supply chains. Here, transaction level data on lending relationships, the acquisition of equity stakes, and other financial transactions is transformed into a network graph, which is then analyzed quantitatively to identify and compare central sources of capital upon which U.S. operating companies rely.

**Other Aspects of Foreign Ownership, Influence, and Control**. Transactions between operating companies within a supply chain, or between capital providers and companies, are not the only aspects by which strategic competitors can affect economic networks. Board interlocks, affiliations with state institutions and educational institutions, and other social networks can also be sources of influence and control. These relationships are also analyzed and compared to reveal vulnerabilities in the industrial base of the United States and its allies and partners.