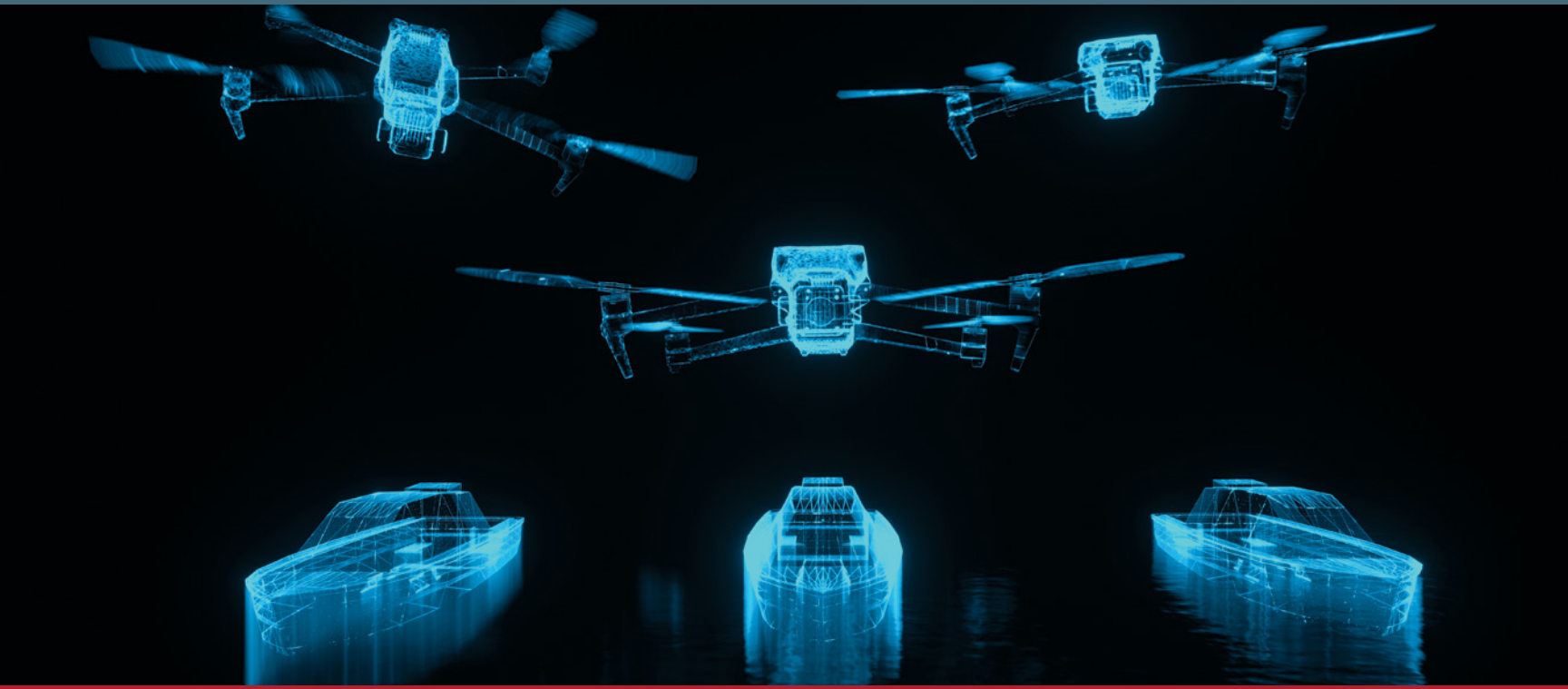
The Defense Tech Playbook

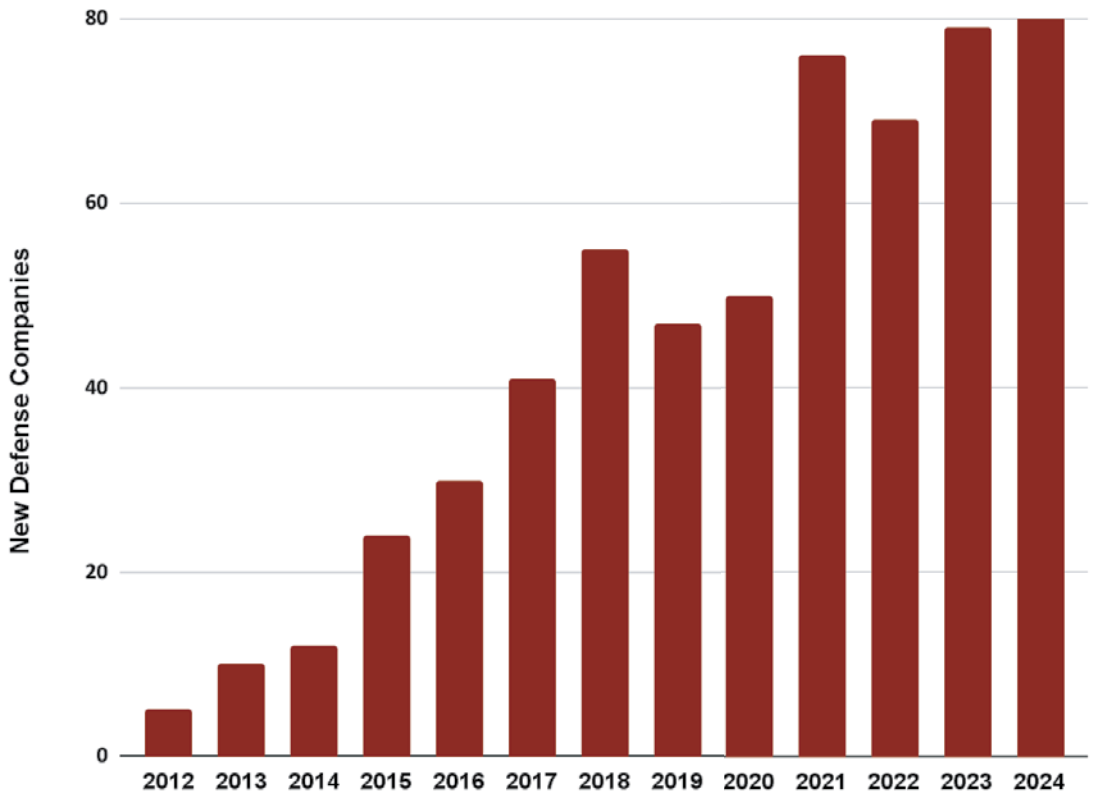
A Strategic Planning Resource for Venture-Backed Startups Building for the US Defense Community

Dan Berkenstock and Helen Phillips



A PUBLICATION OF THE HOOVER INSTITUTION

The number of new venture-backed defense tech companies is growing . . .



The number of new defense tech companies created per year, as measured by the number of annual Series A investments in the aerospace and defense vertical. Source: PitchBook Data Inc.

Venture-backed startups are an integral component in the effort to **rapidly increase capabilities** for the US defense community.

Accelerating this trend requires understanding the **differences** between building for **defense** and for **typical enterprise customers**.

This playbook will be most applicable to your business if . . .

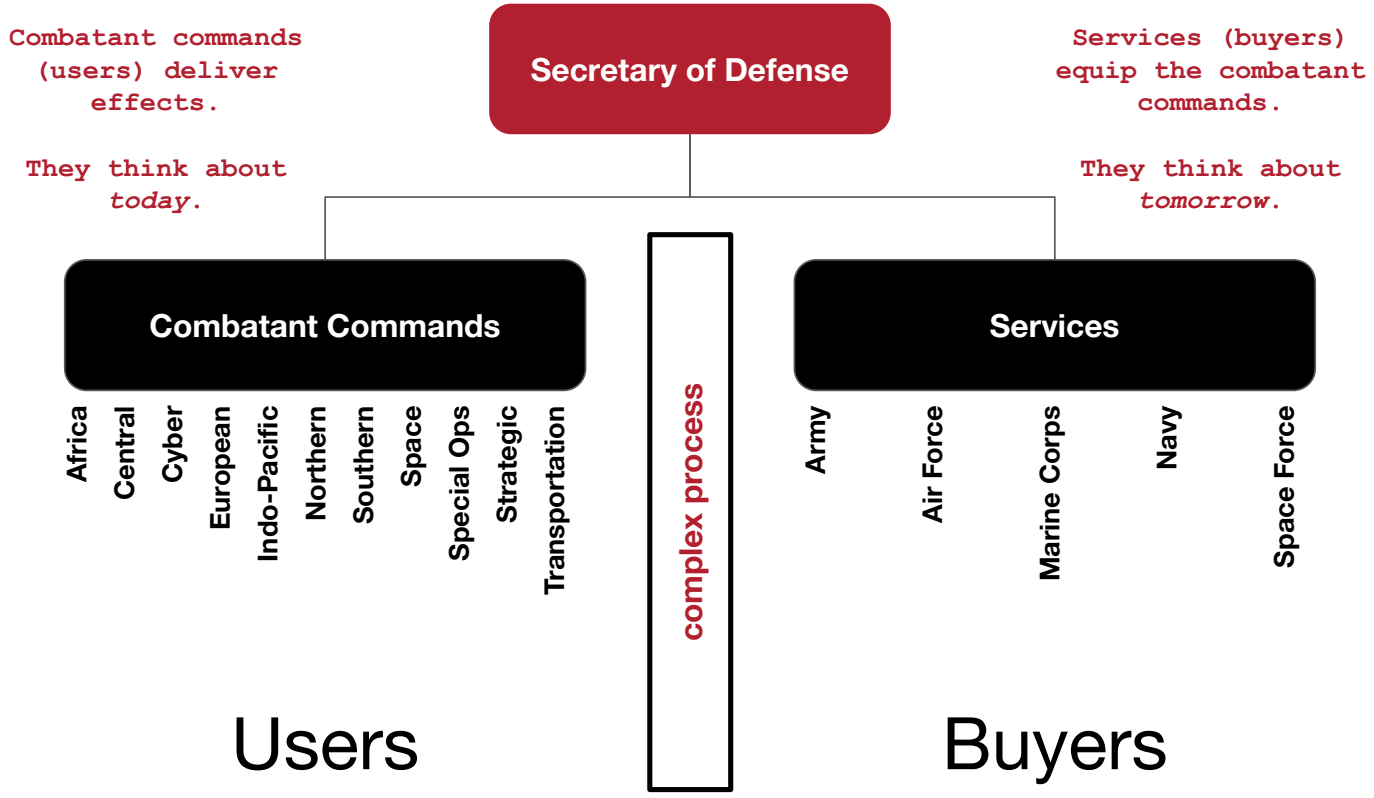
- You are a **builder with a defense-focused** concept that includes developing, deploying, and delivering **hardware**.
- You expect to **raise venture capital** to develop and grow your business.
- You anticipate the **US Department of Defense (DoD)** will be your **primary source of revenue**.
- You believe that you have validated that your concept **addresses an important mission need** or **provides a valuable new capability**.

The defense tech challenge

The Department of Defense, with a budget of nearly $1T, is staffed by almost 3.5M personnel. Over the past 75 years, its acquisition processes have been developed to minimize exposure to the type of risk that characterizes venture-backed startup culture.

This creates three core challenges to building a defense tech business . . .

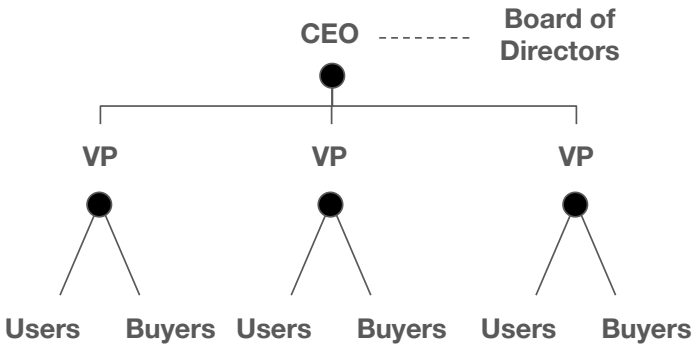
1. DoD users and buyers are in separate and distant organizations.



This separation creates a process that slows new DoD adoption.

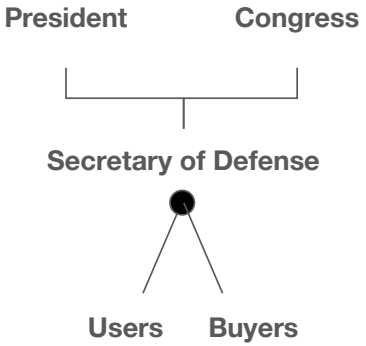
2. The DoD doesn't set its own purchasing processes or budget.

Enterprise Customer



Commercial enterprise customers may organize users and buyers into separate departments, but decisions all roll up to business leaders with final responsibility and authority.

Department of Defense



In the DoD, the users and buyers don't have an integrated leader below the secretary. In addition, the secretary doesn't determine DoD budgets. Instead, they create a proposal, which is reviewed and revised by the president and Congress.

This approach limits DoD's flexibility to work with new companies.

3. The planning and budget process is 4+ years from new concept to contract.

Year 1				Year 2			
Q1	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Each service reviews and updates their conceptual design of future approaches to use of force, resulting in updates to the DoD's Future Years Defense Program (FYDP). **A service sees utility in your product here.**			Each service develops a budget request supporting the FYDP over the next year, resulting in their annual Program Objective Memorandum (POM).			DoD leadership arbitrates the individual POMs, leading to the secretary's Program Decision Memorandum (PDM) to the White House for review and integration into the president's proposed budget.	
Year 3				**Year 4**			
Q1	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
The president submits a proposed budget to Congress.	Congress reviews, refines, and amends the president's proposed budget, ultimately passing appropriations bills.		New programs are assigned to program executive officers (PEOs), who award and manage acquisition contracts under the guidance of a service acquisition executive (SAE).			Programs are executed, milestones are achieved, and companies obtain revenue. **Significant revenue can begin here.**	

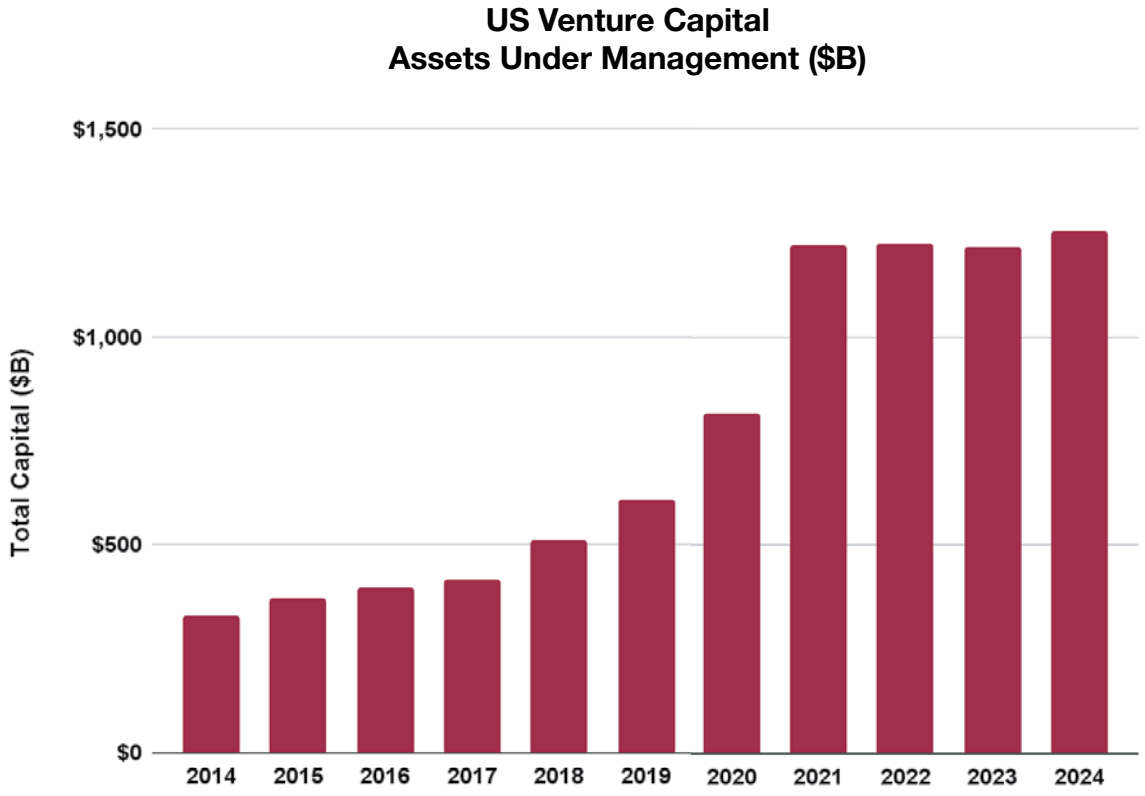
This timeline limits DoD's ability to pivot to emerging capabilities.

Sources: Congressional Research Service, Defense Acquisition University.

On average, a hardware-focused startup requires about $75M in capital to develop an initial product and $200M+ in capital to scale.

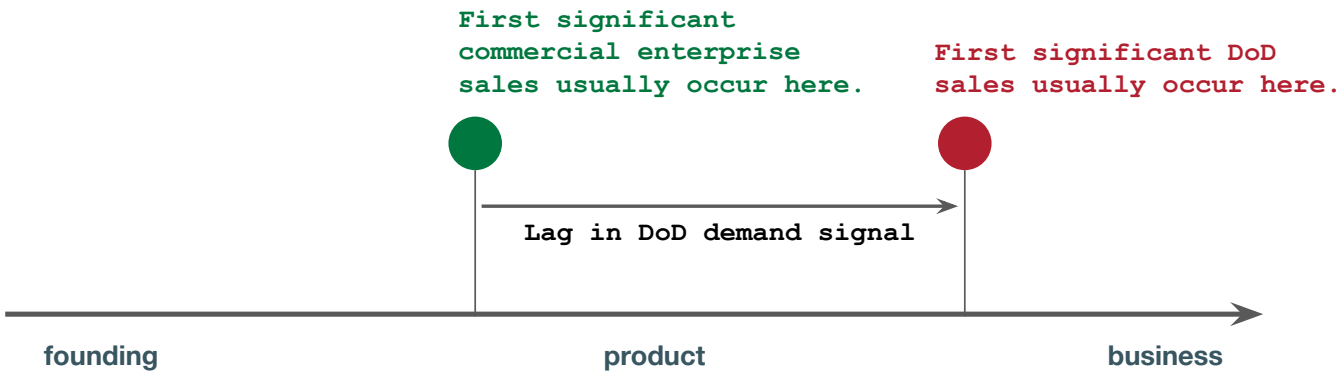
Source: PitchBook Data Inc.

The good news: Capital for venture investment has grown significantly.



Source: PitchBook Data Inc.

The bad news: Accessing that venture capital requires a clear path to revenue . . .

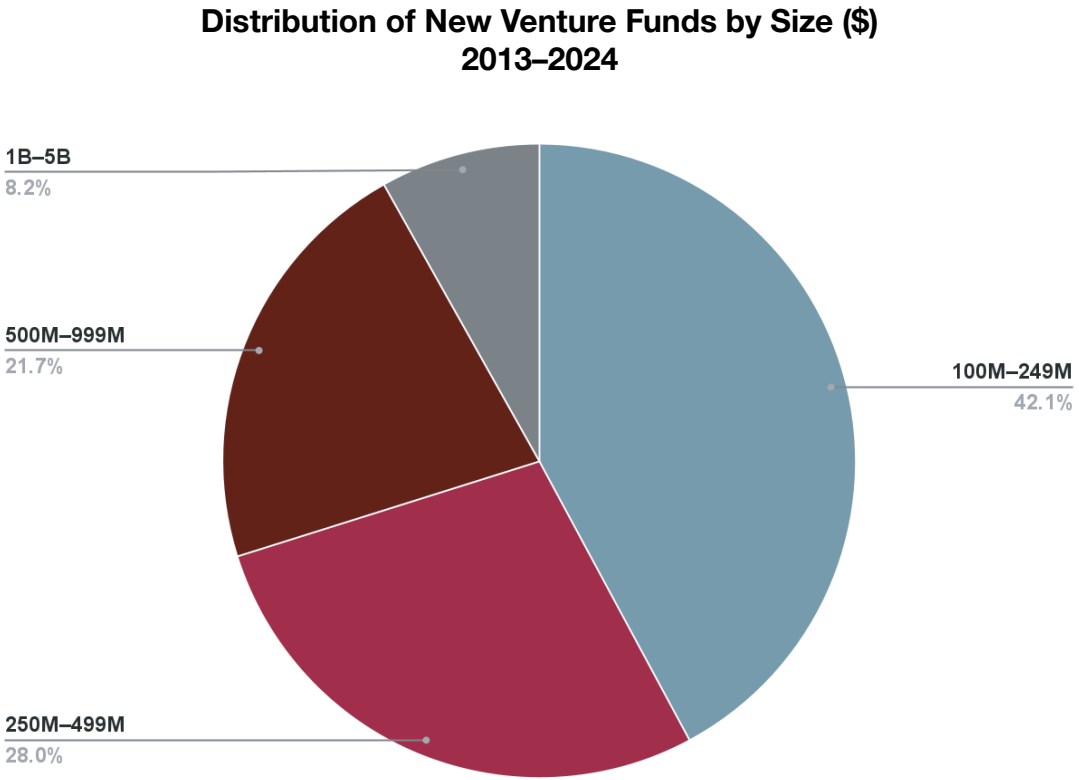


Signed contracts are a demand signal for investors that a company will eventually generate enough revenue to produce a significant return on their investment. Delays in this demand signal result in delays to capital and capabilities.

The CEO of a commercial enterprise customer has the flexibility to sign contracts for future purchases, demonstrating customer interest in advance of product maturity.

The secretary of defense does not.

Funds vary significantly in available capital, impacting your startup because . . .



Source: PitchBook Data Inc.

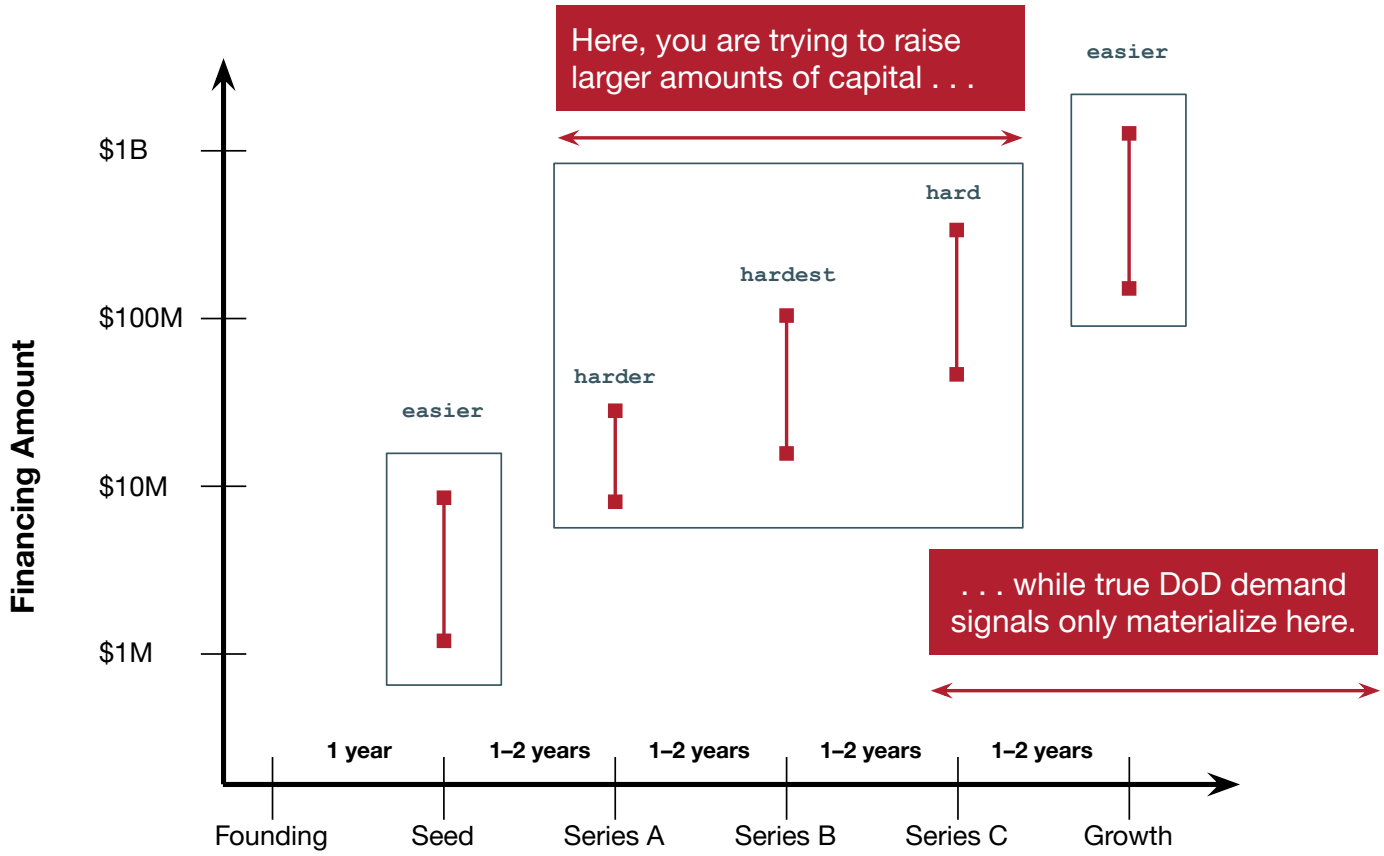
To commit, early investors need to believe your company can generate a return on investment that is about the size of their fund.

Larger funds can invest more capital, but need larger returns per investment.

This puts even more pressure on your company to demonstrate significant demand signals as early as possible.

For example, a $300M fund, expecting to own 10% of a company at exit, and believing that the company will be valued at a 10x multiple of revenue upon that exit, will need to believe your company can achieve annual sales of roughly $300M in a 5–10 year time frame.

These needs create a timing mismatch between financing and demand signals.



This assumes a standard venture capital financing model of milestone-based financing rounds, beginning with a seed round and focusing on the early-stage Series A though Series C. Sources: PitchBook Data Inc., investor interviews.

Your strategic path

This challenge can be overcome by following three steps:

1

Consider your resources and plan for the long term.

Recognize historical norms of funding by round for defense tech companies in order to understand the resources your company will likely have to work with.

2

Establish early demand signals via R&D funding.

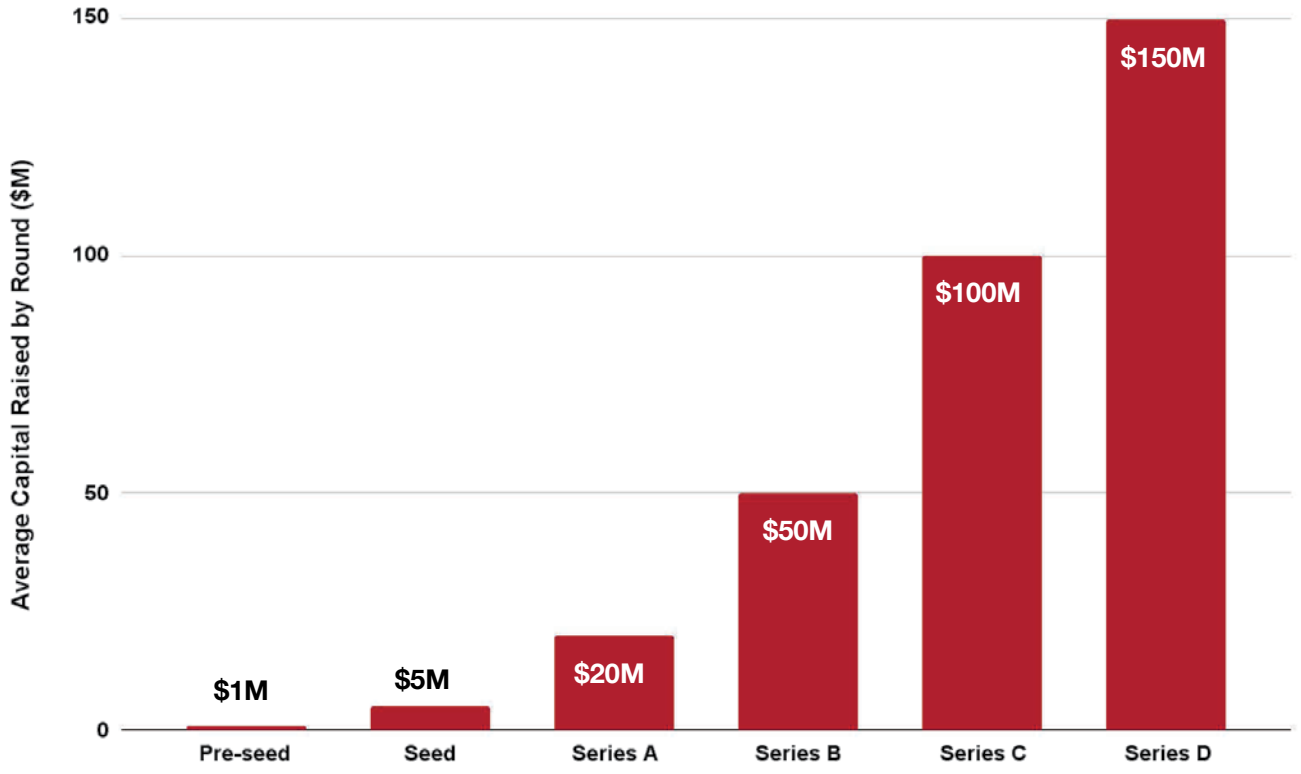
Spend those resources getting to valid demand signals as quickly as possible, primarily through DoD R&D funding opportunities that are linked to program office requirements.

3

Lay the groundwork early for scalable revenue.

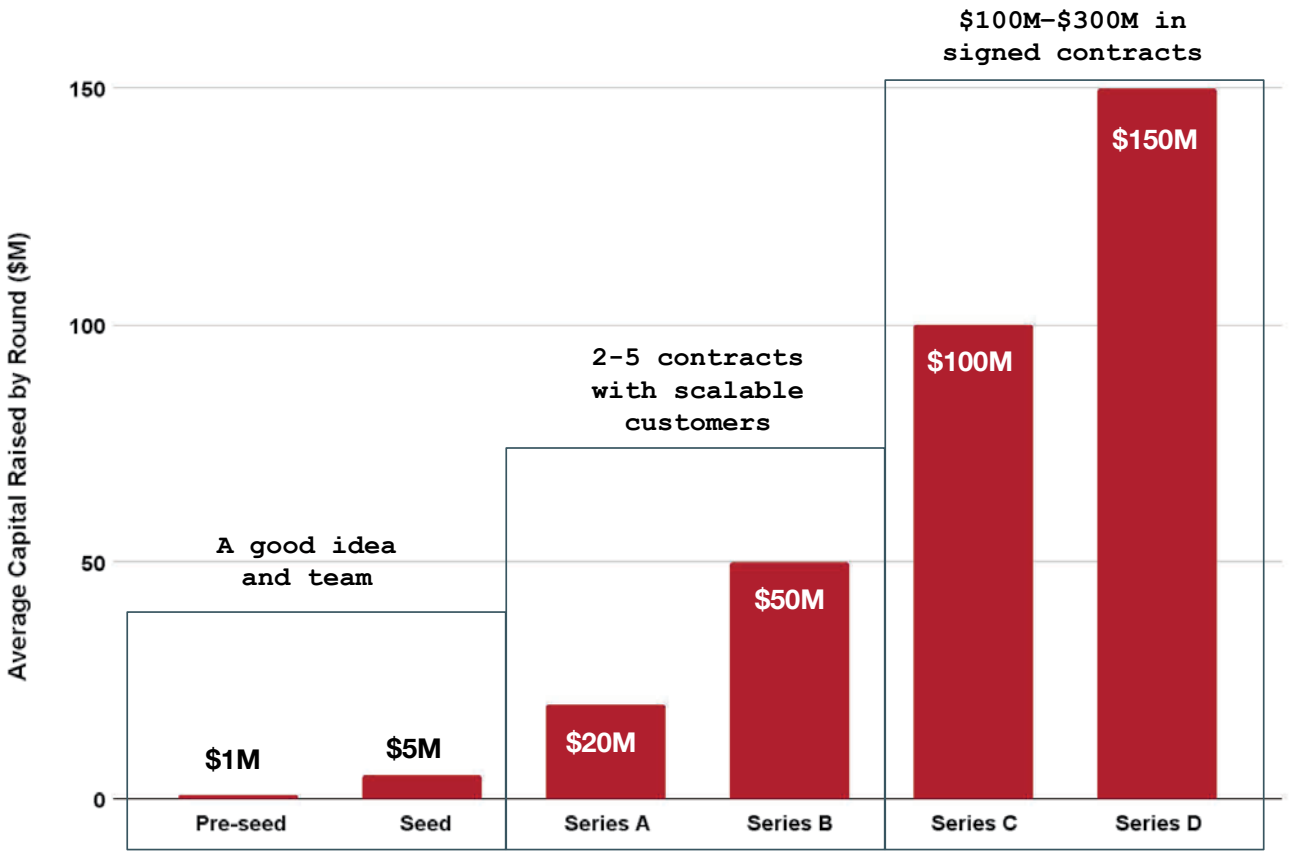
Engage early and often with the elements of the DoD that conceptualize how your capability will be used in future conflicts. Start that four-year process on day one of your business.

On average, successful defense tech companies raise about $325M in capital . . .



This chart shows the average amount of funding raised (for 170 active defense tech companies) by financing round from 2014 to present. This constitutes a baseline for the scale of resources you might expect for your company's development. Source: PitchBook Data Inc.

. . . with milestones that evolve toward concrete financial metrics.



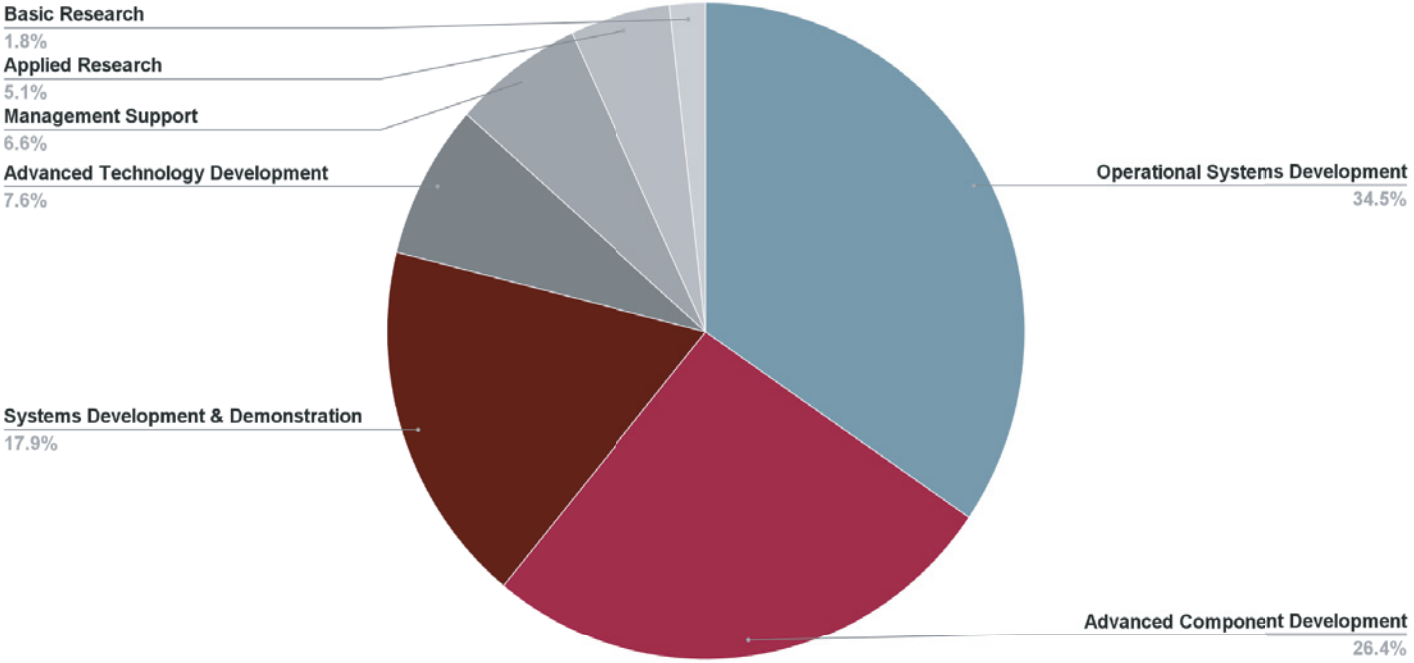
Understanding this evolution allows you to focus on what matters most.

A good idea and team	1. An idea that can lead to a standalone system or capability that will solve an important gap or create new capabilities for government users 2. A team that has credible technical and government knowledge and experience
2-5 contracts with scalable customers	1. Scalable customers = program executive officers (PEOs) or their representatives through various DoD innovation programs 2. Scalable contracts = $2M–$10M in committed awards, with the opportunity to grow into programs of record
$100M–$300M in signed contracts	1. Multiple congressionally appropriated programs of record, awarded by a program office 2. Signed contracts with international governments or prime contractors 3. Signed contracts with commercial customers

A first scalable sale is *the* critical early milestone.

Your first scalable sales

The Department of Defense spends over $150B annually on research and development.



Source: “Defense Primer: Research, Development, Test, and Evaluation,” Congressional Research Service.

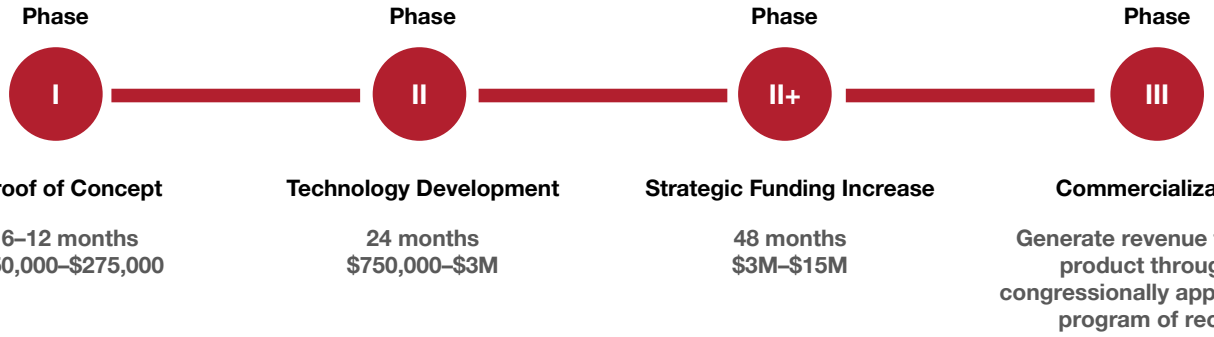
. . . which is administered by offices that fund the many phases of development.

The SBIR program includes three phases meant to advance new, government-relevant capabilities from concept to commercialization.

eligibility: US-owned and -based company with fewer than 500 employees ✔

Since 1982, federal agencies with external research budgets in excess of $100M must set aside 3.2% annually to support small businesses through the SBIR program. Associated policies and procedures are set by the Small Business Administration (SBA). Source: www.sbir.gov.

The Department of the Air Force offers the STRATFI program, worth up to an additional $15M in funding.



eligibility: have a current Phase II award and a program office willing to apply ✔

pro tip: STRATFI awards take about 12 months from application to revenue.

Since 2019, commercialization assistance funding programs have enabled certain offices that administer SBIR funds to follow Phase II awards with an additional phase, up to $15M in funding, if matched by program dollars and/or external investment. Source: www.afwerx.com.

DIU partners with users and buyers across the DoD to find companies to address critical capability gaps, from prototype to production.

DIU annual activity (round numbers)

Proposals	Prototype Awards	Production Awards
1,500	100	15
	Averaging $2M–$5M	Averaging $80–$100M

Initially created in 2015 as DIUx (experimental), DIU creates acquisition flexibility through the use of Other Transaction Agreements (OTAs), a type of contract that allows transition from prototype to production without opening a competition to other companies. Source: www.diu.mil.

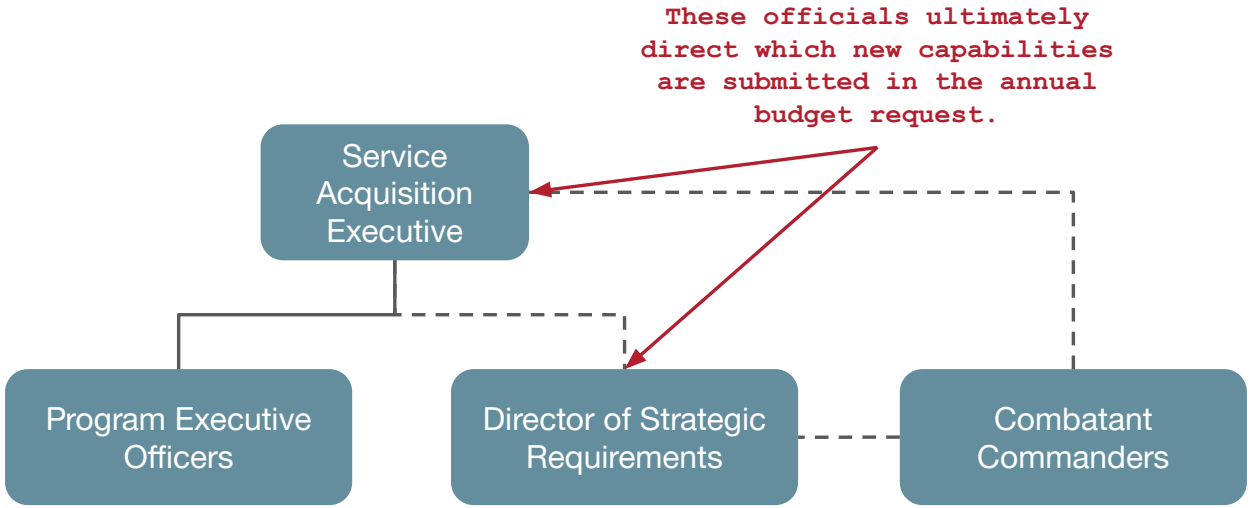
R&D funding can provide the demand signal to unlock early-stage venture capital, but growth capital requires multiyear revenue consistent with congressional appropriation.

> "A **multiyear procurement** (MYP) is a vehicle for acquiring multiple years of requirements for systems or subsystems with a single contract action, usually up to a maximum of five years. . . .**Authority** to enter into MYP contracts **must be included in the component's budget submission for the fiscal year** in which the multiyear contract will be initiated."
>
> **Defense Acquisition University ACQuipedia**

Scalable revenue requires Congress.

The Defense Acquisition University (DAU), established in 1991, is the primary training environment for the defense acquisition workforce. It's a great resource for you, too. Source: www.dau.edu.

. . . and their real value is in program office relationships that will lead to scale.

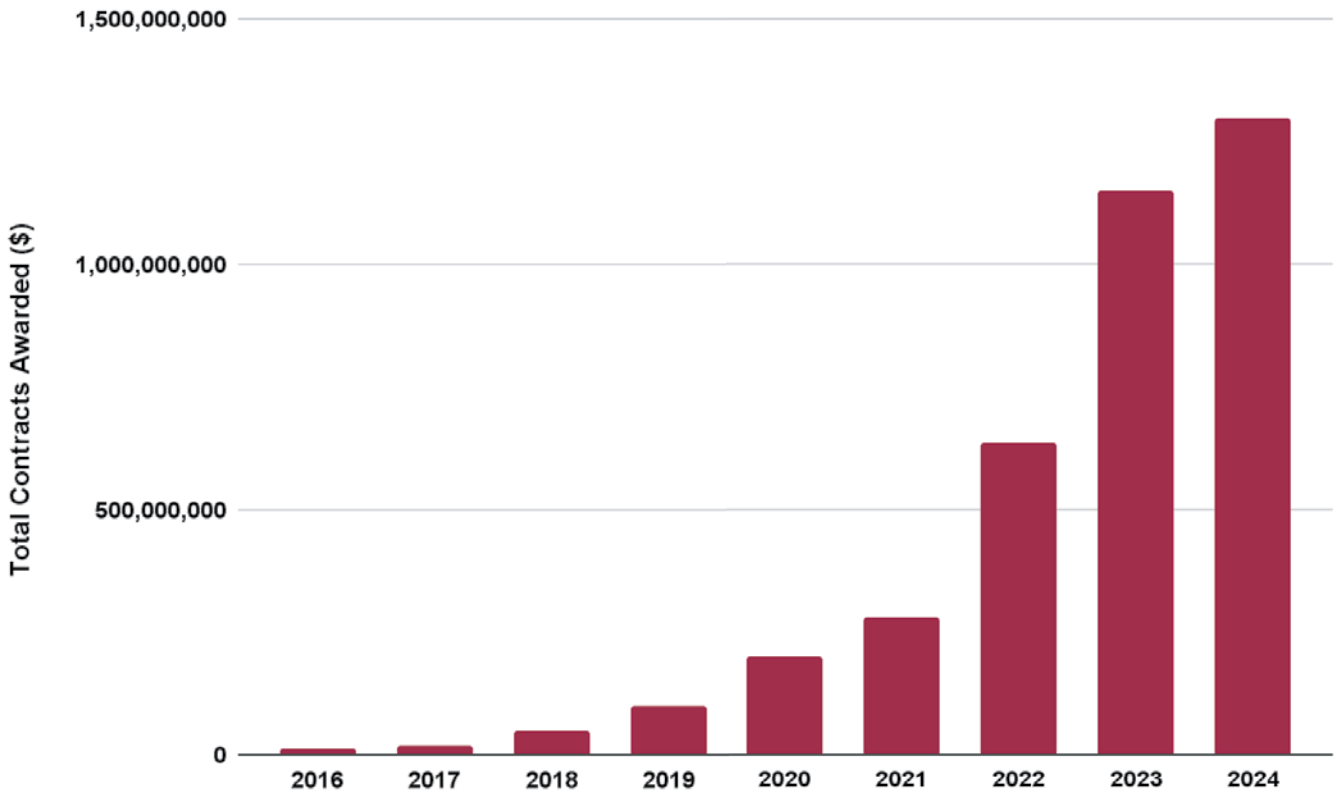


Program offices select individual companies to execute budgeted programs. Participating in R&D activities sponsored by a program office allows you to build the credibility and track record required for them to select your company for larger programs.

Combatant commanders don't directly control the budget, but they can be influential with the officials who do. Building credibility with them (as the users) is also important and can be accomplished through exercises and demonstrations.

The senior officials responsible for force design, strategy, planning, and requirements go by different titles in the different services but are generally responsible for the Future Years Defense Program (FYDP) and for aligning requirements across the joint force.

This approach is leading to meaningful revenue for the defense tech sector . . .



This charts depicts total US government (USG) contract awards to 170 venture-backed defense tech companies as represented in the federal procurement data system (FPDS) and reflects the emergence of these companies as well as USG willingness to fund them. Source: FPDS.

. . . and contracts that indicate significant demand signals for individual companies.

This charts depicts average US government (USG) contract awards to 170 venture-backed defense tech companies for their first five years contracting with the USG, as represented in the federal procurement data system (FPDS). Source: FPDS.

R&D funding alone may not be enough. You may have to seek out revenue from international governments or commercial enterprise customers.

Pros

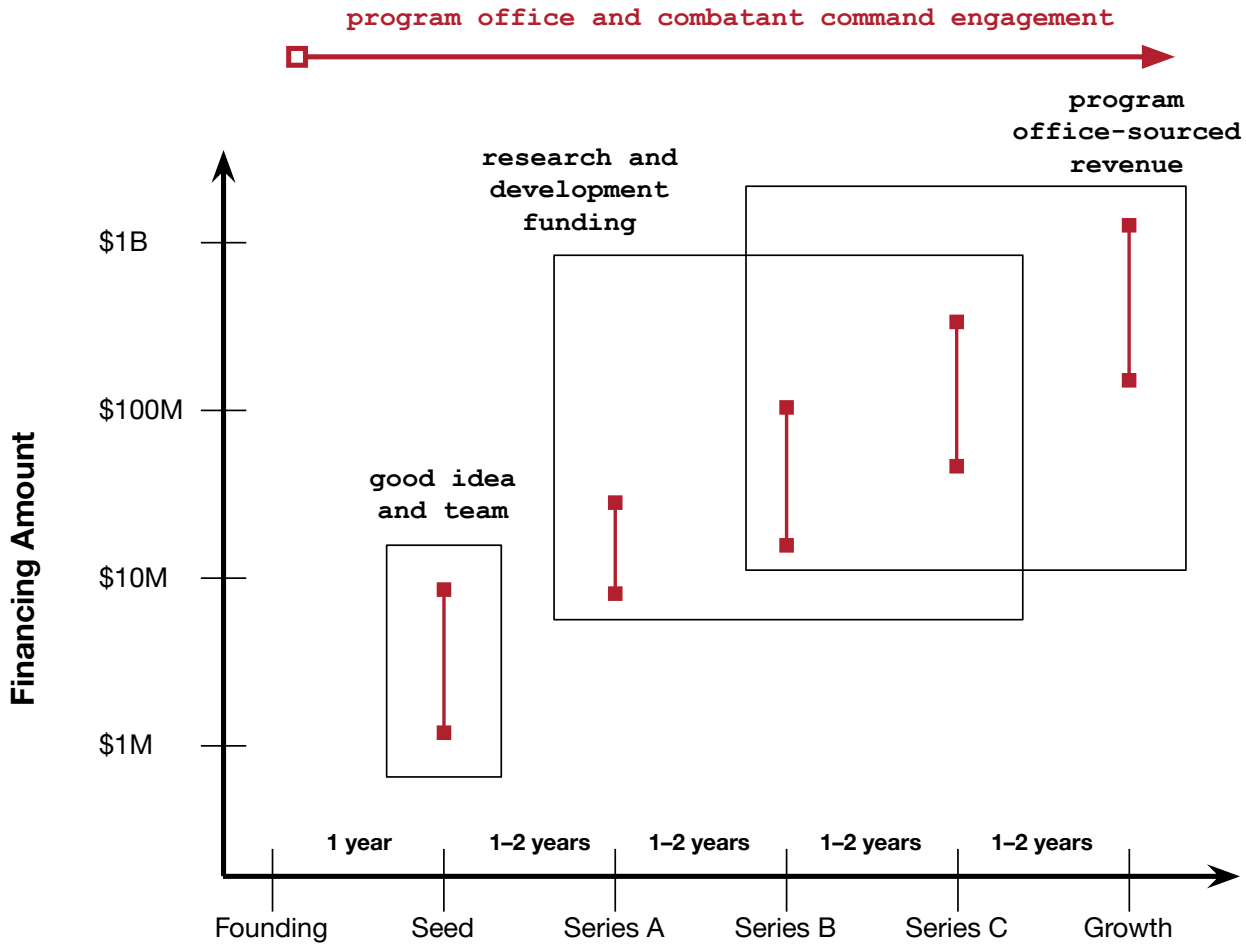
- Both types of customers typically have greater acquisition flexibility, especially for multiyear commitments.
- Progress with international government customers can be motivating for US government customers.

Cons

- Defense sales to international customers can be slowed by regulatory compliance, especially related to the International Trafficking in Arms Regulations (ITAR) .
- Most hardware-focused defense products are not directly applicable to commercial companies and may require extensive redesign that distracts focus from delivering capabilities for your primary DoD customers.

Adding it up

This outlined approach should catalyze increasing sales and venture investment.

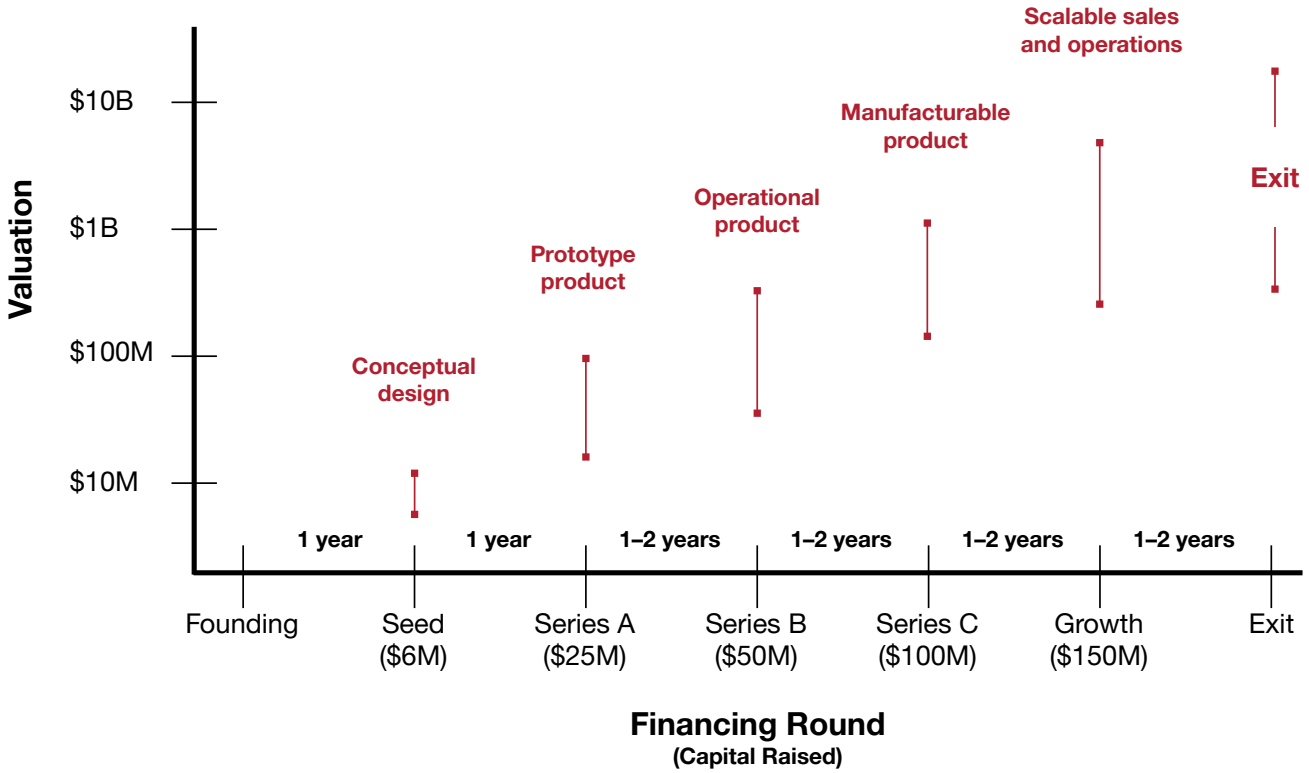


Focus your time, talent, and capital on the important milestones . . .

Before raising . . .	Your company should have . . .	By spending cumulatively less than . . .
Seed Round	An idea, customer interviews	$1M
Series A	A conceptual design, 1–2 scalable customers	$5–$10M
Series B	A prototype product, 3–5 scalable customers	$20–$45M
Series C	Revenue from a “market-ready” product, clear pathway to $100–$300M+ in signed contracts	$45–$120M
Growth	A manufacturable product, $100M’s in repeatable sales	$125M–$240M

In developing your plans, remember to include substantial margin. Not only do programs of record typically require 4+ years, but the STRATFI program typically requires about 12 months from application to revenue. Modulate your burn rate to absorb delays in revenue and financing.

. . . and you will maximize the likelihood of your company's success.



There will be setbacks, but understanding precedent in financing and revenue will help you maximize your company's chances of delivering both a high-impact product for the defense community and a significant return for investors.

By definition, startups are hard.

Defense tech startups are harder.

They are also vital for US national security.

You can (and should) do this!

Glossary

Air Force Work Project (AFWERX): Innovation arm of the Department of the Air Force; executes the SBIR program for the Air Force.
Broad Agency Announcement (BAA): Procurement tool targeted at basic and applied research and development.
Combatant Commands (COCOMs): Eleven geographic or functional missions that provide command and control of military forces.
Defense Innovation Unit (DIU): Organization founded in 2015 to accelerate commercial technology across DoD at scale.
Department of Defense (DoD): Government department providing the military forces needed to deter war and protect US security.
Director of Cost Assessment and Program Evaluation (D/CAPE): Office that reviews and analyzes the POMs developed by DoD components.
Facility Clearance (FCL): Clearance required for businesses to work on classified contracts with the US government.
Future Years Defense Program (FYDP): Five-year plan that projects the forces, resources, and programs to support DoD operations.
Initial Public Offering (IPO): Exit opportunity when a private company first sells shares of stock to the public (typically institutional investors).
In-Q-Tel (IQT): Independent, nonprofit venture arm of the CIA and broader Intelligence Community, established in 1999.
Mergers and Acquisitions (M&A): Exit opportunity when one company buys or consolidates with another company.
Other Transaction Agreement (OTA): Flexible contracting instrument, categorized as research, prototype, or production.
Planning, Programming, Budgeting, and Execution Process (PPBE): Strategic planning and budgeting process for DoD.
Program Decision Memo (PDM): DoD decision document that reflects all decisions made during the programming phase of the PPBE process.
Program Executive Office (PEO): DoD office responsible for a specific DoD program or entire portfolio of programs.
Program Objective Memorandum (POM): DoD components' budget request/funding plan with proposed resource requirements over five years.
Research, Development, Test, and Evaluation (RDT&E): DoD funding for R&D to explore and develop new technologies and capabilities.
Service Acquisition Executive (SAE): DoD official responsible for all acquisition matters within their service and who gives guidance to the PEO.
Small Business Administration (SBA): Federal agency that helps Americans start, build, and grow businesses.
Small Business Innovation Research Program (SBIR): DoD and SBA program providing contracts for small business research and development.
SpaceWERX: The innovation arm of the US Space Force and a division of AFWERX.
Strategic Funding Increase (STRATFI): AFWERX and SpaceWERX program ($3M–$15M) that requires private or government matching funds.
Tactical Funding Increase (TACFI): AFWERX and SpaceWERX program ($375K–$2M) that requires private or government matching funds.
Venture Capital (VC): Noncontrolling investments in private companies, via equity, focused on building the company and scaling.

Defense Tech Startup List

Aalyria
ABL
Adranos
Aeon
Aerodome
Aevum
Albedo
Alloy Enterprises
Antares
AnySignal
APEX
Archer
Armada.ai
Astranis
Astro Mechanica
Atomic Industries
Atomic-6
Auterion
Bastille Networks
Beacon.ai
BlackSky
Boom Supersonic
Brinc
Cambium
Canopy Aerospace
Cape
Capella Space
Castelion
CesiumAstro
Chaos
Citadel Defense
D-Orbit
D-Wave
Darkhive
Dedrone
DeepSig
Distributed Spectrum
Dive Technologies
Echodyne
Elroy Air
EOI Space
Epirus
EXOS Aerospace
Exyn
Firefly Aerospace
Firestorm
FlightWave
Formlogic
Fortem Technologies
Forterra
Fortify
Freeform
Frontier Aerospace
Gecko Robotics
goTenna
Gravitics
GRYFN
H3X
Hadrian
HavocAI
HawkEye 360
Hermeus
Hidden Level
Impulse Space
Inversion
IonQ
JetZero
K2 Space
Kall Morris
Kayhan Space
Kepler Communications
Kodiak Robotics
Kymeta
Launcher
Layup Parts
LeoLabs
LIFT Aircraft
Liquid Robotics
Loft Orbital
Longshot Space Technologies
Lunar Outpost
Lunar Resources
LunaSonde
Mach Industries
Machina Labs
Markforged
Maybell
Merlin Labs
Modern Intelligence
Moon Express
Morpheus Space
Muon Space
Near Space Labs
Neros Technologies
Northwood
Ocean Aero
oneNav
Orbion Space Technology
Orbit Fab
Orbital Sidekick
Outpost
Overland AI
Overwatch Imaging
Parallel Flight Technologies
Performance Drone Works
Picogrid
Pison
Pixxel
Planet Labs
Portal
Privateer
Proteus Space
Pulse Aerospace
Radian Aerospace
RangeView
RED 6
RISE Robotics
Rivada Networks
Rivet Industries
Saildrone
SandboxAQ
Saronic
SCOUT Space
Seasats
Senra Systems
Shield AI
Shift5
Skydio
Skydweller Aero
Skyloom Global
Skyryse
SkySafe
Skyways
Slingshot Aerospace
Solstar Space
Somewear
SpinLaunch
Spire
Squishy Robotics
Starfish Space
Stoke Space
Swarm Aero
Swarmbotics AI
Teal Drones
Terran Orbital
Tomahawk Robotics
True Anomaly
TrustPoint
TurbineOne
Turion Space
Umbra
Urban Sky
Ursa Major
Ursa Space
Vannevar Labs
Vantage Robotics
Varda Space Industries
Vatn Systems
Venus Aerospace
WhiteFox
WindBorne Systems
X-Bow
Xona Space Systems
Xwing
Zenith Aerospace

This is the list of companies included in the financing and revenue analysis within this playbook. SpaceX, BlueHalo, Joby, Anduril, Relativity, and Rocket Lab have been excluded as outliers in terms of capital raised (>$1.5B).

The Project for Accelerating Defense Tech Innovation

The Defense Tech Playbook is a product of the Project for Accelerating Defense Tech Innovation, an initiative housed within the Hoover Institution's Technology Policy Accelerator.

The Project for Accelerating Defense Tech Innovation seeks to enhance US national security by collaborating with leading entrepreneurs, investors, and defense policymakers to improve and accelerate the development of innovative defense capabilities.

This effort encompasses a combination of primary research and education. In particular, the project seeks to bridge the entrepreneur-to–Department of Defense divide through initiatives designed to teach entrepreneurs how to engage most effectively with government stakeholders, and government stakeholders how to better understand and partner with entrepreneurs.

For more information please follow the QR code below or email accelerating-defense-tech@stanford.edu.

The Hoover Technology Policy Accelerator

The Defense Tech Playbook is a publication of the Hoover Institution's Technology Policy Accelerator, which conducts research and develops insights that help government and business leaders better understand emerging technology and its geopolitical implications so they can seize opportunities, mitigate risks, and advance American interests and values.

Authors

Dan Berkenstock, PhD

Dan Berkenstock is a science fellow at the Hoover Institution, where he studies the intersection of space entrepreneurship, venture-backed defense tech companies, and defense acquisition reform. Previously, Berkenstock was the founding CEO of the venture-backed company Skybox Imaging. He holds a PhD in aeronautics and astronautics from Stanford University.

Helen Phillips

Helen Phillips is in the master's program for international policy at Stanford, focused on defense tech and international security. Previously, Phillips worked on the tech scouting and corporate venture capital team at Booz Allen Ventures. She also interned at the Defense Innovation Unit and Starfish Space. She holds a BA in economics from the University of Virginia.

February 2025

31 30 29 28 27 26 25 7 6 5 4 3 2 1

hoover.org

Hoover Institution, Stanford University
434 Galvez Mall
Stanford, CA 94305-6003
650-723-1754

Hoover Institution in Washington
1399 New York Avenue NW, Suite 500
Washington, DC 20005
202-760-3200

HOOVER INSTITUTION