

[H.A.S.C. No. 118-85]

**FIELDING TECHNOLOGY AND  
INNOVATION: INDUSTRY VIEWS ON  
DEPARTMENT OF DEFENSE ACQUISITION**

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COMMITTEE ON ARMED SERVICES  
HOUSE OF REPRESENTATIVES

ONE HUNDRED EIGHTEENTH CONGRESS

SECOND SESSION

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HEARING HELD  
SEPTEMBER 16, 2024



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U.S. GOVERNMENT PUBLISHING OFFICE

57-661

WASHINGTON : 2026

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ONE HUNDRED EIGHTEENTH CONGRESS

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HOUSE OF REPRESENTATIVES,  
COMMITTEE ON ARMED SERVICES,  
*Washington, DC, Monday, September 16, 2024.*

The subcommittee met, pursuant to notice, at 9:03 a.m. PST at the UCSC Silicon Valley campus, 3175 Bowers Avenue, Santa Clara, California, Hon. Mike Rogers (chairman of the committee) presiding.

The CHAIRMAN. The committee will come to order.

**OPENING STATEMENT OF HON. MIKE ROGERS, A REPRESENTATIVE FROM ALABAMA, CHAIRMAN, COMMITTEE ON ARMED SERVICES**

The CHAIRMAN. I want to thank the witnesses for being here, and the University of California Santa Cruz for hosting us.

This is the first time in several years the Armed Services Committee has left the bubble of D.C. for a hearing. We chose to come to Silicon Valley to hear directly from America's leading innovators about solutions to a problem that has vexed the Department of Defense for decades: Why does the DoD [Department of Defense] continue to struggle with rapidly developing, scaling, and delivering innovation to our warfighters?

For years we have been hearing complaints from industry about the glacial pace of acquisitions and from small innovators that lack the capital and support necessary to bridge the valley of death. This is immensely frustrating to us, because this committee has spearheaded dozens of efforts over the last decade to reform DoD's acquisition processes, create new flexible acquisition pathways, and make it easier for the DoD to partner with private sector to expedite the fielding of innovation.

It also is frustrating because our time to solve this problem is running out. China has invested heavily in new capabilities that are key to success on future battlefields, and they figured out how to rapidly deploy them. Make no mistake, these capabilities are being developed specifically to defeat our military. We cannot let that happen. We can't let China or any adversary outpace us on innovation.

Fortunately, the United States has something our adversaries do not: a robust innovation ecosystem. There is no shortage of innovative Americans, especially here in Silicon Valley, with the ideas and know-how to keep us ahead of our adversaries. We must take better advantage of this.

And we have seen in Ukraine the side effects—the side that is faster at innovating, scaling, and deploying has the advantage on

the battlefield. Earlier this year we held a similar hearing with senior DoD officials who insisted they had all the authorities they needed and were doing everything they can to expedite innovation. We are here today because we respectfully disagree. We think more can be done and should be done. We want to hear from American innovators on whether DoD's acquisition pathways are actually working, and we are eager to hear your recommendations for improving them.

Finally, we want to know your thoughts on how we can overcome DoD's historic aversion to moving fast and taking risk when it comes to innovation.

The CHAIRMAN. With that I yield to my friend, the ranking member, for any opening statement he may have.

**STATEMENT OF HON. RANKING MEMBER, ADAM SMITH, A REPRESENTATIVE FROM WASHINGTON, COMMITTEE ON ARMED SERVICES**

Mr. SMITH. Well, thank you, Mr. Chairman, and mostly I want to thank you very much for holding this hearing and making a decision to come out here and have this incredibly important conversation. I think it is, you know, one of the two most important things that we need to do to get our national security right, and to have the adequate defense that we need for this country, personnel being the other side of that, which I, you know, applaud your efforts on that, as well, in setting up the Quality of Life Commission.

But I continue to be concerned that the Department of Defense is not able to innovate quickly enough to keep pace with our potential adversaries. And we have, as the chairman has outlined, struggled with this for a number of years. We have, primarily under the leadership of Mac Thornberry, when he was chair of this committee, given the authority to the Department of Defense to make innovations in a variety of different ways. There is one important caveat to that, which I will get to at the end of my statement, but that authority is there, and yet we still move too slowly.

We are very focused on requirements and process, as opposed to being focused on solutions. An example I have used many times, I met with—Stanford has a thing called Hacking for Defense, which is at a whole bunch of different universities, where they take a group of undergraduates and give them a real-world Department of Defense problem, something that DoD is trying to solve, and ask them a question. Here is what we want. And when I met with the students who went through that process, every single group said the same thing: “The first thing we figured out is that they were asking the wrong question, okay, that they were actually focused on solving something else. So we pivoted and we adapted, and we solved that problem.”

Well, within the DoD world, that adaption and pivot is very slow because the requirements, because the processes built in—will spend years trying to trying to answer the wrong question just because that is what was set in motion. We have got to be able to pivot and adapt and move more quickly. And I think a big part of it is culture within DoD. But all of you have experience in working in that, and we would love to hear your particular stories about

what didn't work and, crucially, how it could work better. We have a bunch of changes that need to be made there, and we want to work on that.

The one caveat, yes, we have given the DoD a great deal of authority, but at the end of the day we still appropriate. There is the authority for other transactional authority decisions and a whole series of other things where DoD can theoretically make a decision to skip the normal requirements process and move more quickly. But Congress lays out—they have got to have money to do that. And if we appropriate down to the last penny and restrict their ability to move it around, that authority doesn't help them. So one thing I know this committee—we need to work with our friends on the Appropriations Committee to see how we can build in greater flexibility so that the Pentagon can use the authority that we have given them.

But I just want to close by emphasizing how important this is. Whoever gets there first on the new technology has an enormous advantage, and that has been true for as long as human civilization has existed and tried to defend itself against their adversaries. And there are all kinds of historical examples of who figured out the machine gun first, or the tank first, or the nuclear bomb first. Now this is happening weekly, if not daily.

You know, new technologies are being developed for drones, and for counter drones, for secure communications, or how to disrupt communications so that your missile loses its signal in mid-flight and can't hit its target. This is happening day in and day out. We need to get ahead of that. And the chairman is right, we should be able to do that. We are still the most innovative economy in the world. Best universities, best capital markets, entrepreneurship. We have got it, we just have to figure out how to make sure the government is able to access that in an effective way to give our war fighters what they need to meet our national security needs.

Mr. SMITH. And with that I look forward to the testimony and, again, I thank the chairman for holding this hearing.

The CHAIRMAN. I thank the ranking member. Now I would like to introduce our witnesses.

First we have Mr. Mark Valentine is the president of global government business for Skydio.

Mr. Brandon Tseng is the co-founder and president of Shield AI.

Mr. Shyam Sankar—did I get that right?

Mr. SANKAR. Shyam.

The CHAIRMAN. Okay, Shyam Sankar—I knew I would mess it up—is the chief technology officer for Palantir.

Mr. Peter Ludwig is the co-founder and chief technology officer for Applied Intuition.

And Mr. Richard Jenkins, the co-founder of Saildrone.

I want to welcome our witnesses.

Mr. Valentine, you are up.

#### **STATEMENT OF W. MARK VALENTINE, PRESIDENT OF SKYDIO GLOBAL GOVERNMENT**

Mr. VALENTINE. Thank you, Chairman Rogers, Ranking Member Smith, and members of the committee. It is a real honor to be here in front of you today. Thank you so much.

I am Mark Valentine. I am the president of our government business at Skydio, where we are the largest drone manufacturer, small drone manufacturer, in the United States and the largest in the world outside of China.

Rapid acquisition is an important topic, and I am really happy to be here today. It is also a timely one, because acquiring the capabilities represented by the folks at this table is absolutely essential for deterrence, and success if that deterrence fails.

So my journey in this space began long before I came to Skydio. As a combat fighter pilot I have a special appreciation for the shift that we were seeing in military air power today, and the way that small drones are actually transforming warfare. The war in Ukraine is highly instructive in this next generation of air power.

So when I was flying combat missions in the Middle East, drones were relatively large, and they were very expensive. Also, and even though they were providing outstanding support to our troops and great situational awareness to our commanders, they were very, very expensive, and typically required lots of people to make them work. And, for the most part, they were created to not work in a contested environment.

So the battlefield today, though, is fundamentally different. Drones are smaller, they are smarter, they are attritable, and often they are as important to ground personnel as the rifles that they carry. In short, these drones are no longer nice to have; they are absolutely essential on the modern battlefield. On the battlefield in Ukraine troops rarely maneuver or even fire a shot unless they have some small ISR [intelligence, surveillance, and reconnaissance] drone in the air.

So we at Skydio actually understand this very well. We have been sending drones to Ukraine since the beginning of the conflict. We currently have over 1,000 systems in country now, and we have many more that are on the way. Our employees have gone to Ukraine more than 25 times in the last year-and-a-half, and we have recently started hiring personnel to be there full-time so that we can get access to not only assist end users, but be able to make more rapid iteration based on these lessons we were taking from the modern battlefield.

So these lessons that we are taking from also our commercial drones are improving our products, which directly help the United States military and our allies. As an example, the AI [artificial intelligence] capabilities that are built into our newest drone, the X10D, make it more survivable on the electronic warfare regime in Ukraine and also in the urban canyons of New York City. So based on these improvements, the Ukrainians have requested thousands of the systems, and we are getting them on the way as soon as we can.

These advanced AI and autonomy capabilities and our ability to scale manufacturing are what is driving that success in Ukraine and for our Department of Defense partners. We now manufacture well over 1,000 drones per month, with the ability to rapidly scale to over 2,000 very quickly. This has allowed us to deliver thousands of drones on time and on budget to every branch of the United States military, and support the programs of record at the U.S. Army and the U.S. Marine Corps.

Our AI capabilities are also instrumental in DoD's AI for Small Unit Maneuver program, which seeks to distribute the intent of a single human to multiple autonomous systems. And this is a game-changer for drones. From one operator operating a single system to a single operator distributing their intent to multiple robots, some that are in the air, some that are on the water, and some that are on the ground, is the game-changer.

So my written statement includes several recommendations for improving DoD's acquisition of these capabilities, but I would like to leave you with two things before we get to questions.

First, the best way to improve U.S. drone capabilities is to surge American-made small drones to Ukraine right now. Not only is that going to help tilt the battle in the favor of Ukraine, it is also going to give us the ability to take advantage of an area where, bar none, is the most challenging environment in the world. It is the best proving ground for drones. So if we believe these drones are going to be valuable in deterring conflict in the future, or if deterrence fails, allowing us to prevail, then we absolutely need these systems in Ukraine now so that we can iterate, learn, and improve our own capabilities.

The second is that DoD's inventory of these small drones is woefully inadequate for great power competition. Ukraine goes through about 10,000 of these drones a month, and as of right now our best estimate is that the entire U.S. Department of Defense has about 5,000, and the procurement programs are only procuring roughly 1,000 a year. So regardless of the acquisition pathway we choose, the Department has to dramatically increase these numbers. Failure to do so is going to result in not enough drones when they are needed, and, more importantly, a manufacturing base that is incapable of properly scaling at the time of need.

And I don't share this as a drone company executive, I share this as an American citizen and as a combat veteran and fighter pilot who wants and absolutely needs our military to have the capability to deter and, if that deterrence fails, then to prevail in great power conflict.

So luckily, you all have the opportunity to rectify these issues and accelerate the procurement of these drones and the technologies at this table, and do so at a scale that makes our adversaries think twice before provoking conflict.

So thank you so much for the opportunity to be here. I really do look forward to your questions.

[The prepared statement of Mr. Valentine can be found in the Appendix on page 63.]

The CHAIRMAN. Thank you, Mr. Valentine.

Mr. Tseng, you are up.

**STATEMENT OF BRANDON TSENG, CO-FOUNDER, PRESIDENT,  
AND CHIEF GROWTH OFFICER, SHIELD AI**

Mr. TSENG. Chairman Rogers, Ranking Member Smith, and HASC [House Armed Services Committee] members, thank you for hosting this hearing on acquisition. The legislative work you are doing is vital, and I appreciate your consideration and swift action. And thank you for your service.

My name is Brandon Tseng. I am the co-founder and president of Shield AI, a nine-year-old, multi-billion-dollar defense technology company I founded with my brother in 2015. I am an engineer, a former Navy SEAL, and a former surface warfare officer with deployments to the Pacific, the Arabian Gulf, and twice to Afghanistan.

Shield AI's mission and my mission is to protect service members and civilians with artificial intelligence systems. And to achieve this mission we are building the world's best AI pilot, which is self-driving autonomy technology for aircraft. Shield AI won the DARPA [Defense Advanced Research Projects Agency] AlphaDogfight in 2020, beating all other AI pilots and human pilots in simulation. We have more flight hours than any company in the world flying jet aircraft autonomously. The Secretary of the Air Force flew in one of our AI-piloted F-16 flights back in May.

We also build and manufacture an AI-piloted drone, the MQ-35 V-BAT, which accomplishes the same mission as a \$40 million or \$100 million aircraft at a fraction of the cost. Most recently, this drone, the V-BAT, has been used by the Ukrainian military to successfully execute a first-of-its-kind deep penetration, long-endurance strategic targeting mission while GPS [Global Positioning System] and communications were being actively jammed, resulting in unprecedented effects for the Ukrainians.

And what makes these operations possible is the cutting-edge software that we build.

My perspectives on acquisition are informed by my experiences working through acquisition problems every single day at Shield AI for the past nine years, going from zero to hundreds of millions in revenue, a very unique perspective few have in this industry. And this experience leads me to some recommendations for you today.

My first recommendation is shifting the DoD from a requirements-based acquisition system to a problem-based acquisition system. Henry Ford once stated, "If I ask people what they wanted, they would ask for faster horses." The DoD, quite literally, has been buying faster horses for the past 60 years. This is because the DoD acquisition process is not built to solve problems; it is built to fulfill requirements, which takes anywhere from 3 to 20 years to validate and budget just to get faster horses.

To remain relevant and competitive, the warfighter should tell industry about their problems in the most intimate detail. Then industry submits a novel solution. Don't give me a spec that says, "Thou Shalt Fly at 1,000 miles per hour for eight hours." Instead, I prefer you to tell me, "I need to have strategic effects in this area, and this is what I am up against," and ask me, "How would you solve it?" Then let companies tell you how they would solve it.

For instance, Northrop may try to solve the problem with the Global Hawk. General Atomics may try to solve the problem with an MQ-9. Lockheed may offer an F-35. Shield AI may offer an autonomous swarm of V-BATs to solve the problem. But the DoD can choose the best solution for the problem, or a combination of the solutions for the problem, instead of one that just meets the requirements.

Second, the current House NDAA [National Defense Authorization Act] contains section 833, Autonomous Unmanned Aerial Sys-

tem Acquisition Pathways. This should be used much more. This would create a contracting preference for the DoD to use a dual acquisition pathway for integrating autonomy onto new and existing military aircraft. The Air Force's NGAD [Next Generation Air Dominance] family of systems program is already using this process, and more programs should in the future. It is worth noting that there is similar language in the Senate bill, which will surely be conferenced.

My third recommendation centers around increasing the funding and fielding of AI pilots, which is self-driving autonomy technology for aircraft. This technology enables unmanned systems to execute missions without GPS communications or remote pilots. It also enables the concept of swarming, which enables a single person to command hundreds of thousands of drones effectively on the battlefield.

With Russia, China, and Iran jamming GPS and communication links to stop our legacy drones and weapons, and their proliferation of surface-to-air missile systems to stop our manned fighter jets, AI pilots or self-driving autonomy has become the single most important technology since stealth and GPS-guided munitions.

AI pilots for drones and our weapon systems allow us to restore air superiority, our most conventional—our most strategic conventional deterrent. But today autonomy is funded at levels that lack credibility or seriousness, largely because requirements writers don't know how to write software requirements. And without a requirement, there is no budget, there is no program of record.

These are hard problems to solve, and I applaud you all in Congress, the DoD, and industry leaders that you see seated here before you, and the other companies present that are committed to solving these problems.

Thank you for having me today on the committee.

[The prepared statement of Mr. Tseng can be found in the Appendix on page 76.]

The CHAIRMAN. Mr. Sankar, you are recognized.

**STATEMENT OF SHYAM SANKAR, CHIEF TECHNOLOGY OFFICER AND EXECUTIVE VICE PRESIDENT, PALANTIR**

Mr. SANKAR. Thank you, Chairman Rogers, Ranking Member Smith, and the distinguished members of the Committee, for the opportunity.

I think we can all agree that we are in no ordinary state. We have had more than 100 attacks on U.S. bases by Iran, 1,200 slaughtered in a pogrom in Israel, hundreds of thousands dead in brutal combat in Ukraine, unprecedented tempo of gray zone and phase zero operations by CCP [Chinese Communist Party]. It is clear that we are living through a pretty hot cold war here. And unlike World War II, where America was the best at mass production, today our adversary is. And given the vast sums that we have spent on defense in these decades of Pax Americana, it would be reasonable to wonder what went wrong.

In 1993, after the end of the Cold War, America wanted a peace dividend, and defense spending was slashed 67 percent. The Secretary of Defense held a dinner in the Pentagon, the so-called Last Supper, where he told the 51 prime contractors that they were not

all going to survive. Today there are five. The actual consequence of the Last Supper is not a lack of competition in the defense industrial base. It is actually the fundamental decoupling of commercial innovation from defense and the rise of the government monopsony. Consolidation bred conformity and pushed out the crazy founders and innovative engineers.

That is, until now. Today we are witnessing a First Breakfast. America's commercial sector is re-industrializing and innovating at an incredible pace. The challenge before us is not whether America's industrial base is too small or too slow, but rather why is the government unable to fully realize the potential? And I think the antidote is simple: allow the free market to build commercial solutions to problems that meet the government's needs, and then actually buy those solutions.

Before the fall of the Berlin Wall, 86 percent of defense spending went to companies that had both a commercial and defense business. Chrysler made cars and missiles. Ford made satellites until 1990. General Mills, the cereal company, made artillery and inertial guidance systems. But today that 86 percent has become 6 percent. The monopsony's fixation on cost-type contracting has made working in the national interest a bad business, suitable only to risk-averse investors who are addicted to dividends and buybacks. That is not what the most dynamic parts of the American economy look like. That is what the dying parts look like.

The last defense company to be added to the S&P 500 was 46 years ago until Palantir's inclusion this month. But we will not be the last because today the founders are back, in the hundreds, around this table with me, backed by hundreds of billions of dollars of private capital to build in the national interest.

So the question is, how do we harness this?

First industry needs to build, and that requires government to buy. Ukraine expended 10 years of munitions in 10 weeks. That is a clarion call that America needs to fire up production. We need years' worth of weapons for our own needs.

Second, let us prove that the things that we have been building with great treasure over the last decade will actually even meet its moment in the modern battlefield. Ukraine shows us that it is not what your weapons system is able to do today, but how quickly you can adapt it to continue working tomorrow.

Third, if we want to compete with China we need to learn to compete with ourselves more inside of government. We need more crazy. The CCP is not going to know and be able to predict what we are going to do, because we don't even know what we are going to do. America's strengths are fundamentally creative and improvisational, and that underscores the problem with procurement. The predictability is a weakness. Highlighting that rigid procurement process puts us at risk.

Everyone, the Russians, the Chinese have given up on communism except for Cuba and the DoD. Five-year centralized plans; a focus on costs, not value; measuring time spent, not time saved.

If you want to start a new thing, you have to go ask for money that you might possibly get two years from now. That is actually insane. America's private sector has figured out how to dynamically reprogram money inside of a quarter to get and be able to buy

what they need to win. The DoD ought to, as well. And we must do that because we have to remember the only requirement is winning. So a few actual recommendations for the committee.

First, we should empower COCOMs [combatant commands] as buyers. Even moving five percent of the budget to them enables strategic competition with the services to ensure that we beat back the worst instincts of the monopsony.

Second, while our system is actually quite excellent at solving problems that can be solved deductively and top down, it is horrible at solving problems that require induction and iteration. Ironically, those things are the very strengths of American culture, and that is why we need more Joint Urgent Operational Need Statements, or JUONs, or their service cousins, the ONSs [Operational Need Statements], not less.

The folks who are crazy enough to submit JUONs, they don't toe the party line, people like Bill Perry, one of these heretics. He pushed through stealth in GPS, not through PPBE [Planning, Programming, Budgeting, and Evaluation], but by going around it. Or folks like Admiral Rickover, who built the nuclear Navy with 30 years of protection from Congress against his own service. Heretics, but also heroes.

We at this table, those at the First Breakfast, we are not just ready, we are painfully eager to ensure that America's warfighters want for nothing. I don't think we require new process or some massive overhaul. We just need the freedom to do what industry does best: to build. Thank you.

[The prepared statement of Mr. Sankar can be found in the Appendix on page 87.]

The CHAIRMAN. Thank you, Mr. Sankar.

Mr. Ludwig, you are recognized.

**STATEMENT OF PETER LUDWIG, CO-FOUNDER AND CHIEF TECHNOLOGY OFFICER, APPLIED INTUITION**

Mr. LUDWIG. Thank you, Chairman Rogers, Ranking Member Smith, and distinguished members of the committee, for this opportunity to testify at this important hearing.

As co-founder and chief technology officer of Applied Intuition, it is a pleasure to welcome you to Silicon Valley. We are grateful for your leadership and willingness to highlight the important national security work in America's hub of innovation.

Seven years ago, Qasar Younis and I founded Applied Intuition with the goal of accelerating the adoption of safe and intelligent machines. We began in the commercial automotive industry, and now today work with 18 of the top 20 global non-Chinese automakers. We produce some of the best software in the world for unmanned systems, in both the commercial and defense sectors. Specifically for defense customers, Applied provides the software to rapidly field and safely update autonomous systems. Our government-validated solutions are modular, platform agnostic, and commercially proven.

Since 2021 Applied has worked with the Department of Defense and was awarded three Small Business Innovation Research contracts and a tactical funding increase this year. These contracts highlight that the DoD recognizes the value of cutting-edge com-

mercial technology for military applications. They also demonstrate growing interest by both the Army and Air Force for applied software solutions.

While SBIRs [Small Business Innovation Research] are a valuable entry point for start-ups, what matters most is how quickly the DoD scales proven transformational technology. The Defense Innovation Unit has played a critical role in aligning commercial technology to programs of record. Through DIU's [Defense Innovation Unit] Other Transaction Authority and the Software Acquisition Pathway, the Army's Robotic Combat Vehicle Program is using applied tools to test and evaluate autonomy software. Unfortunately, the adoption of these agile acquisition tools and firm-fixed-price contracts is lagging across the DoD.

Meanwhile, China's commercial and military sectors are poised to leapfrog the U.S. in autonomous systems, and there is tremendous evidence for that in the automotive sector. In response, the DoD must pursue thoughtful program design that incorporates continuous development and integration. Our warfighters need seamless software updates on the battlefield. Software is never finished, and it becomes obsolete if it does not evolve at the speed of relevance.

Second, the DoD should embrace "buy before build," and strong collaboration with the commercial industry. We applaud the work of this Committee and the Appropriations Committee to evaluate DIU and fully fund its innovation hedge fund. We encourage Congress to provide continued political support and robust funding for that unit.

Finally, the successful deployment of software capabilities will require expanded use of the software acquisition pathway. Program officers should be encouraged to more extensively utilize these innovative pathways and firm-fixed-price contracts. This is because they are outcomes-driven, scale easily, and facilitate continuous improvements.

Applied Intuition is proud to accelerate the software-defined force and provide warfighters the technology they need to safeguard our national security.

Thank you again for the opportunity to testify, and I look forward to your questions.

[The prepared statement of Mr. Ludwig can be found in the Appendix on page 103.]

The CHAIRMAN. Thank you, Mr. Ludwig.

Mr. Jenkins, you are recognized.

**STATEMENT OF RICHARD JENKINS, FOUNDER AND CHIEF EXECUTIVE OFFICER, SAILDRONE, INCORPORATED**

Mr. JENKINS. Chairman Rogers, Ranking Member Smith, and members of the committee, thank you for the opportunity to testify today. I am pleased to offer my thoughts on the DoD acquisition process from the perspective of a small business transitioning its products from demonstrated operational success to large-scale, recurring fleet operations.

I am the founder and CEO [Chief Executive Officer] of Saildrone, a U.S. company based in Alameda, California. Saildrone is a world leader in providing oceanographic and C5ISR [command, control,

computing, cyber, intelligence, surveillance, reconnaissance and targeting] data solutions with autonomous, uncrewed surface vehicles. Saildrone is one of the first technologies to be funded by DIUx [Defense Innovation Unit Experimental] and, more recently, DIU enabled a significant deployment in 4th Fleet, supporting counter-narcotics and wide area domain awareness. Our unmanned surface vehicles continue to rapidly evolve their capabilities due to high cadence, year-round operations while facing real adversaries.

In my view, only in the face of real, long-duration deployments will solutions reach their full maturity and utility.

Saildrones continue to prove their value, and have undergone metric-based evaluations by OUSDI [Office of the Under Secretary of Defense for Intelligence and Security] (sic), amongst others. As an example, a recent report by the Center for Naval Analysis on Saildrone effectiveness as a radar platform reviewed four months of Saildrone operations of continuous fleet operations. The report concluded the cost of radar coverage to be around \$4 per square mile from a Saildrone and around \$88 per square mile from a DDG [guided missile destroyer], considering only operations cost, not platform acquisition. That is a 95 percent cost reduction.

Now, I am not suggesting that a Saildrone can replace a destroyer, but if we can use low-cost autonomous systems like Saildrone to undertake roles that a ship would otherwise perform, we can free up ship time for much higher-value tasks and take advantage of their unique capabilities.

The same parallel exists for other Saildrone services such as sea floor mapping and anti-submarine warfare, which can free up time from the TAGOS fleet, destroyers, submarines, and even P-8s, enabling them to be positioned elsewhere, doing high-value tasks that only those assets can do. If you want more ships at sea, then the fastest and most cost-effective way to achieve this is to free up our existing fleet by removing long endurance and persistent presence tasks that only unmanned systems like Saildrone can fulfill.

However, despite proven performance, demonstrated cost efficiencies, and multiple requests for Saildrone services from different fleets, the service level budget process lacks the flexibility to scale up these capabilities in the near term. The current POM [Program Objectives Memorandum] process requires funds to be requested multiple years in advance of the money being spent. This creates a multi-year gap between—

[Audio malfunction.]

Mr. JENKINS. —deployed at scale, the classic valley of death paradigm. To address this challenge, I ask you to consider the creation of a dedicated bridge fund within a service's budget, a fund to immediately roll out new technologies that are proven effective, have adequate demand signals, and are being included in the service's future POM submission. DIU has greatly increased the Department's ability to rapidly find and field commercial technologies. Now the services need the ability to immediately scale their solutions and not wait multiple years for dedicated bridge funds—dedicated funds to arrive.

Critically, this bridge fund would not be intended for R&D [research and development] or expanding funding for existing programs. The bridge fund would instead specifically address the val-

ley of death years between validation technology and the arrival of appropriations two years later. This approach would solve two of the most significant pain points of the current budgeting process.

Firstly, services would benefit from two years of additional operational experience while the budgeting process plays out. This technical de-risking is essential to enable bold budget decisions which will be critical to modernizing the future DoD.

Secondly, privately-funded companies would have headlights for near-term growth, enabling additional capital investment, scaling of inventory, growing manufacturing facilities, as well as internally resourcing continued capability development.

[Audio malfunction.]

Mr. JENKINS. I was happy to see language in the fiscal year 2025 House Defense Appropriations bill, which provides DIU with \$240 million for finding innovative projects that the services are committed to budgeting.

[Audio malfunction.]

[The prepared statement of Mr. Jenkins can be found in the Appendix on page 116.]

The CHAIRMAN. I thank the witnesses. I now recognize myself for questions.

Mr. Valentine, you talked about this large volume of drones being consumed by Ukraine, yours and others. Tell me some of the things that you have learned during this process of seeing your product deployed and others in Ukraine.

Mr. VALENTINE. Yes, thank you, Chairman Rogers.

At a high level, I think you actually mentioned in your opening remarks one of my biggest lessons, and that is speed matters. We, I think, in the United States—I know from my background in the military—we have faced the last 20, 30 years, where we have not been fighting a peer competitor. So in our minds, we launch eight F-16s out, we always expect eight to come back, and we need to get our head wrapped around the fact that, in a great power competition or a great power conflict we are going to launch those eight airplanes, and they are not all going to come back. And what are we going to do?

And so what we have seen in Ukraine so far is, first, drones actually are making a strategic difference. And if you don't believe me, all you have to do is look to see how the Russians have tried to counter to prevent the Ukrainians from getting value out of that. And the way they have done that, primarily, is through electronic warfare, jamming either the radio frequency from the controller to the drone or, in many cases, also jamming the satellite navigation systems so that the Ukrainians can't get value out of those drones, they can't get them to go where they need to go.

And they are so important to the Ukrainians because they are using them as—back in my old language I would call them forward air controllers to spot targets and then guide either artillery rockets or human-powered FPV [first-person view] drones to be strikers on those targets. So combating this electronic warfare has been a rapidly evolving *tete a tete*, make improvement, countermeasure happens, and it is literally a cat-and-mouse game. And the only way to win it is to move fast.

And another part of this is that we are living in a software-defined world, and once we realize we are living in that software-defined world, the ability to rapidly iterate, especially with companies that are dual-use, that are iterating quickly in the commercial space that can now bring those rapid innovations into the defense space and also take additional lessons from there, that is a critical component. So moving fast and then being able to do that at scale, I think, is the biggest lesson and the biggest takeaway that I have had from Ukraine.

The CHAIRMAN. At scale. Define what you mean, because you talked about the volume that you have been putting into that theater, and said that it was also other companies putting large volumes. What do you consider a good scale?

Mr. VALENTINE. Well, I would look at the rate at which Ukraine is losing small ISR drones, and that is roughly 10,000 a month. And I think that is probably a good benchmark. And when I look at what they are losing per month and what we currently have in our inventory, I think, my goodness, we would last less than two months in a great power conflict. And I just, personally, think that is unacceptable.

And I think there are some ways around it. Perhaps we start to think about especially small, attritable systems like we think of other attritable things like ammunition, and we start to stockpile them. Whether that is in the form of finished goods, whether that is in the form of at least the constituent components being on our own shores so that if we do have a demand shock we can rapidly assemble them, I think we have to start exploring those types of things.

The CHAIRMAN. I was listening to Mr. Ludwig's statement, though. If we stockpile this kind of technology, it is going to be antiquated in six months. I mean, how do we get around that?

Mr. VALENTINE. Yes, sir. I think if you look at devices as just a piece of hardware—it may or may not be true, but I go back to the statement that we were living in a software-defined world.

As an example, when we first sent drones to Ukraine, they actually didn't perform very well because of the radio. But it was a software-defined radio. And once we figured that out, we were able to create a—take that radio, which was a multi-band radio, and create a software-defined frequency-hopping schema so that we could avoid the electronic warfare. And that actual innovation, once we got that feedback, we made that software change in days. We were able to test it in a few more days and actually get it out to the field for field testing a few days after that.

And so I think you can iterate and stockpile at the same time.

The CHAIRMAN. Okay. Mr. Tseng, I would ask you the same question. I just think Ukraine has been a great laboratory for us to test things. What have you learned in your experience with your products there?

Mr. TSENG. Well, 100 percent, sir. It has been a great laboratory.

What I think the Ukrainians have discovered is that they are not going to use anything that doesn't work on the battlefield, period. And they—and the amount of U.S. equipment that they do not use is staggering because it simply does not work, and that is every-

thing from our most exquisite weapon systems to our—to cheap drones.

The CHAIRMAN. Give me an example. You can't just go—you can't just throw that one out there and leave it.

[Laughter.]

Mr. TSENG. We have been on the battlefield in HIMARS [High Mobility Artillery Rocket System] systems, right, our—which is an incredible weapon system that I have used to great success in Afghanistan. And look, there are variants of the munition that work without GPS, right? These are the laser-guided rounds.

But when you use a round that does not work or that is principally reliant on GPS, the effects are highly volatile and rare that you will actually hit things. And I think we need to take a big look at that as we start to think about great power competition, and have a really honest look at what we are buying and fielding and saying, “Will it work without GPS? Will it work without communications?”

And I get nervous because I have been around, or been involved with these U.S. military exercises that tout—and there are very few of them—that we are going to jam GPS and jam communications, and then they go back on their word. They say, “You know what? We are actually not going to do that because too many of our things we know are going to fail,” and that is the complete wrong mentality. We need to see those things fail in training in peace time so that we can prepare for war.

The CHAIRMAN. Great. In your opening statement you said that if the Defense Department—you said the Defense Department needs to put serious money into this technology. What do you consider serious money?

Mr. TSENG. I think it is—it would be on the strategic end of serious money. That is how I think about it. And if you look at our strategic capabilities and how much we are spending on different—we spend billions of dollars on the adaptive engine, we are spending billions of dollars on platforms. We spent \$30 billion on the Manhattan Project, built the nuclear bomb, and set the world order in four years. Right? This is the type of technology that autonomy, that AI are, right?

Tesla has invested \$10 billion into their self-driving. Larry Ellison just last week said, “Look, to write this new age of large language model algorithms, you need \$100 billion to start.” We are so far, as a Department, from any number that is close to a billion, it pales. I would surmise no more than \$100 million is being spent on autonomy technologies writ large in the DoD.

And so the number just needs to be higher, more immediately, if you are really talking about getting after strategic technology. And everybody in the DoD has said and acknowledged this is a strategic technology. It is a strategic capability. But if you go back to what I said originally, right, all budget stems from the requirements. And if you don't have people who can write autonomy requirements, then there is not going to be any real budget behind it.

The CHAIRMAN. Great. Mr. Sankar, you made reference to the structure. How would you structure the procurement process in the DoD to be more agile and effective?

Mr. SANKAR. Thank you. So when I think about my role, even in my own company, the most important thing I am paying attention to is where are we wrong. How quickly can I catch the error in our roadmaps and our designs and fix that?

So how do we institutionalize and reward the sort of defiance that we have from our warfighters on the front lines of what is not working, and bring capital and resources and innovation against those problems? That is where I think there is a critical role for the COCOMs and their voice. They are at the front lines. They are thinking through how they are going to fight. They are going through the exercises, and they understand and experience the gaps in the capabilities that are being delivered by the services. How do we provide them the power they need to go do the experimentation, build the capabilities around that?

You know, the amount of innovation in this country, we are unparalleled. The real question is, where have we bestowed monopolies that prevent us from getting after that sort of innovation, from confronting what are we actually wrong about?

You know, and I think the greatest missed opportunity with Ukraine is that could have been our lend-lease moment. In the counterfactual of World War II, without lend-lease it would have been an axis victory here.

We have clear signal that we need to fire up production. We also have clear signal that perhaps many of the things we have built over the last decade will not meet their moment on the modern battlefield. How many DMAG [Deputy Management Action Group] issue papers have come out of what we have been learning from the front lines of Ukraine? We have this sort of generalized attitude of, well, those are two Soviet armies fighting. We would fight differently. Things would be different. All of that is obviously true. But the idea that there wouldn't also be profound lessons to learn from those front lines, I think, is not true.

The CHAIRMAN. You really got my attention when you made reference to empowering the COCOMs in your opening statement, and just referenced it again there. I really do believe that we should be assigning each COCOM a pot of money that they have got discretion over. They have to answer for it at the end of the year, but they have got complete discretion over it.

I know I have a figure in my mind. What is the significant figure in your mind that would be a difference-maker for the COCOMs to have that kind of empowerment over?

Mr. SANKAR. I think something like two to five percent of the budget spread across the COCOMs would do a lot. You know, my observation, having done this for 19 years now, is that it is very hard to get a program and a service to wake up every day and say, "I got to fight and win against China." They got their program, they got their cost schedule requirements, they have got their—but it isn't that hard to get them to wake up and say, "I have got a PM [program manager] two doors down from me that I need to wake up and kill." You know, the competition within the government is vicious, and we should be leveraging that for productive gains, the incremental delivery of lethality.

So I think even just a small amount of budget reallocation of the COCOMs introduces the necessary competitive signal against all of

our current other investments, what we are spending the other 95 percent on, to actually see those things go faster. It introduces these why should you adopt commercial technologies that are cheaper and better when you are within your cost schedule performance? Well, you are going to do that if you think the good American two doors down from you might do it first, and beat you, and make your program not as successful as it could otherwise be.

The CHAIRMAN. Great, thank you. I will recognize the ranking member for his questions.

Mr. SMITH. Thank you very much. I am not sure about the whole COCOM thing, but that is a whole other—they have their interests in parochial things, as well, and I think we need to make sure we set up the Pentagon so that the services are focused in the way that you are talking about, but that is a niche little conversation.

It seems to me that we are talking about two different really big things here. One is process. How do we move off of our requirements-based, stuck process that just, you know, gets you locked into things forever, and move towards to the point all of you have made, a problem-solving, flexible, adaptive process that can change as it goes?

And then the second thing is, you know, even within that, where do we spend the money? And that is a difficult, you know, conversation when you are trying to anticipate where things are going.

But it seems clear to me that we are spending too much money on legacy systems from—well, and to Mr. Valentine's point, in a non-contested world. We are imagining fighting the way we have been fighting in a world that is not as contested when we are moving into a different world.

And I would add to one thing you said there. It is not just the great powers. I mean, the frickin Houthis are able to come up with something. The barriers to entry here have become so low that we are not going to go walking into Afghanistan, right, anywhere in the world where we don't face an adversary that has the capability of shooting down or sinking some of our largest systems. So we need to pivot to that.

But focusing on the drone manufacturing issue, because it seems like it has been a number of years now since it has become clear we need to move in that direction, and yet we are not manufacturing any significant numbers of the types of drones that are so critical, so very specifically—and this is for any of you—Mr. Valentine, Mr. Tseng, you have talked about it the most, but what do we need to change to start increasing that production capacity and building the number of drones that we really need?

Mr. VALENTINE. Yes, thank you, Ranking Member Smith.

I think, in short, provide a demand signal. With a codified demand signal, and knowing that there is a market there, then I think not only Skydio but drone manufacturers all across the United States can now start to purchase all the long lead items that need to be —

Mr. SMITH. What is stopping us from providing that demand signal?

Mr. VALENTINE. Well, Ranking Member Smith, there are some signals out there. But, you know, we hear words and rhetoric,

whether they are in the form of Replicator, this idea, that idea. But quite frankly —

Mr. SMITH. Well, let me ask you this —

Mr. VALENTINE. —I don't see much of that come to fruition at this point.

Mr. SMITH. To Mr. Roger's point—and there are reasons that we don't—we give a lot of demand signals, okay, because they are built in for years. But there is a central contradiction between industry saying, you have to give us a demand signal so we know what to build and, oh, by the way, you have to be flexible and adaptive. All right? Because if we give you a demand signal and then a year into it we are like, ah, we learned something new, we don't want that anymore, now we are locked into a contract forever.

This is the problem I have. I was very interested in ending the monopoly that ULA [United Launch Alliance] had over Space Launch. Okay, well, we gave ULA a really good demand signal, and to a certain extent they produced, okay? And it was really expensive, and then we got to the point where we needed to adapt and innovate, and we couldn't because we had 10-year contracts.

Mr. VALENTINE. Right.

Mr. SMITH. So how do you balance those two things?

Mr. Tseng, you seem to have a comment.

Mr. TSENG. So, I mean, you asked the question, "What is stopping you?" I think the requirements process is what is stopping you.

The DoD, to points made earlier, has all the authorities to go fast. So why can't they? Why aren't they? It is because all of their money is already allocated and budgeted for something that has a requirement —

Mr. SMITH. Right.

Mr. TSENG. —which, if you have the requirement, then you have fundamentally said you are not going to innovate anymore, we are just going to fulfill this requirement and execute.

If you move to a problem-based system, then that money —you are taking money away from the requirements process and actually focused on —

Mr. SMITH. So what would be the first step, then? Because that is—I am very interested in that, and you—I think most of you at this table have heard me talk about how I would like to snap my fingers and eliminate half of the requirements, and I don't care which half, just a good starting point. How do you—how would we do that? How would we go in there and say, okay, there is 5,000 pages of requirements. Those are in the garbage. Solve this problem.

Mr. TSENG. I think I would—first I would mandate or I would encourage the DoD that 25 percent of their acquisition dollars in the next 3 years be spent on a problem-based acquisition system. And from there, what you are going to see is they are going to have to come up with an acquisition system to—a problem-based acquisition system to actually hit that target that you guys set out for them. And what that is going to do, it is going to shift the flow of money from primarily a requirements-based system. And over time we can get more to a problem-based system.

And are there going to be hiccups, or there is going to be challenges along the way? Yes. Do they hit 20 percent or 18 percent? Maybe. You know, but at least we have started that —

Mr. SMITH. Which —

Mr. TSENG. —motion of getting them back in the right direction.

Mr. SMITH. —brings me back to the question that I had asked

—  
Mr. TSENG. Yes.

Mr. SMITH. —that we moved off of is, how do you balance the need that industry is begging for, for a demand signal, with the flexibility?

And Mr. Ludwig, you are shaking your head or nodding your head there. So why don't you take a stab at it?

Mr. LUDWIG. I think I really want to emphasize that the importance of software and then, generally, agile methodologies to all of these things—I strongly agree with the remarks from Mr. Tseng about a problem-based system being highly advantageous because, in our own work with the Department of Defense, many times we feel somewhat restricted in terms of what we can propose because of the requirements given to us. Whereas, if the requirements are more so in the—in a problem statement, we can actually provide a much more comprehensive solution using more creative adaptations of our technologies.

Mr. SMITH. Yes, it makes sense. It doesn't answer my question, though.

Mr. Sankar?

Mr. SANKAR. If I can offer—so I don't think you need 10-year contracts. When people say, “demand signal,” I think what it comes down to is what is the marginal time and effort it will take to make a new fiscal purchase.

Mr. SMITH. Right.

Mr. SANKAR. So what is the fiscal OODA [observation, orientation, decision, and action] loop? And, you know, private capital will show up if I know, like, look, you can make a buying decision every two months.

Mr. SMITH. Right.

Mr. SANKAR. I think even one year is too late and too slow.

Mr. SMITH. Yes.

Mr. SANKAR. So if we can get many more bites at the apple, this is the fiscal version of DevSecOps [development, security and operations].

Mr. SMITH. Right. So to some extent, it is less a matter of a demand signal and more a matter of a signal that we will change and we will—you produce something we want, we are going to buy it. Okay? And that is important, because, I will tell you, the bigger primes, they like their demand signals, too. And what they mean by demand signal is promise us that, no matter what, for the next 10 years you are going to keep giving us money, okay? And we have been locked into that in a very crippling way. So I appreciate that distinction.

Last question. Where is DoD spending money right now that we shouldn't be spending money? Because that is the second part of this. It is a finite amount of money, okay? You want us to spend all this money on drones? We got the budget we got, we got a \$34

trillion debt or deficit—either debt, actually. What shouldn't we be spending money on that we are spending it on right now, Mr. Jenkins?

Mr. JENKINS. So I thoroughly agree with the requirements argument. One of my favorite sayings is a camel is a horse designed by committee. I think LCS [littoral combat ship] is well described by that. So yes, precise requirements or lack of requirements and project-based solutions is key. You then have a lot of people making new, innovative systems, but do they actually work at scale that we need, right?

So the concept of a bridge fund approach was to give more money for testing prior to end-of-lifing something. So the process, zero net sum game, you know something is going to have to go to get something new in. Those officers, those individuals don't have the confidence in the new technology to end-of-life something that is not proven. So running alongside is the next piece.

To your question of what can you cut, I think I look at it as how is the spend spread across the DoD. From my perspective, which is at the lower end of the innovation loop, I see a lot spent on R&D innovation. Now, I think the DoD spends \$50 billion on innovation, and zero on go-to-market. As an example, the Navy spends less than \$40 million on fleet integration projects a year. That is 0.01 percent of the R&D budget. If you are a commercial company, a civilian company, you have a product, you spend some money on R&D, you make a product, then go-to-market strategy, customer testing, innovation testing, supply chain, manufacturing, advertising, marketing, sales. What we do is, as a DoD, as a country, is we spend all the money on R&D and nothing on the go-to-market strategy. If you were Apple, invented a new product but spent nothing on how to make it, how to ship it, how to sell it, how to market it, and just sat on your hands waiting for orders to come in, you would have no sales.

Mr. SMITH. I think that is a really good point that I had not heard or thought of that way before.

Mr. JENKINS. So I think —

Mr. SMITH. Yes.

Mr. JENKINS. —you need to equalize the money between the R&D stage and then the testing and implementation phase before the full-scale operations. Right now we are just missing that —

Mr. SMITH. Got it.

Mr. JENKINS. —which is the point of the bridge fund concept.

Mr. SMITH. I am about out of time here, but, Mr. Tseng, I will give you the last word on that question of where we potentially save money.

Mr. TSENG. Yes, sir. If the countermeasure to a system is very cheap—the example being if a \$1 million missile can blow up a \$400 million ship, or if a \$1 million surface-to-air missile can take down a \$100 million fighter jet, then we probably want to be buying less of those. And I am not saying you are getting rid of every single one of them, right, but I am talking about what the Air Force would call a high-low mix, where we have a few exquisite systems that are augmented by thousands, tens of thousands, hundreds of thousands, eventually millions, of cheaper unmanned systems.

And so you just want to move that cost asymmetry advantage to the United States versus where it lies right now, which is with China.

Mr. SMITH. So just to close, being provocative here, we might not need 1,800 F-35s.

Mr. TSENG. I agree.

Mr. SMITH. Okay, all right.

Thank you, Mr. Chairman. I yield back.

The CHAIRMAN. I like him.

[Laughter.]

The CHAIRMAN. I just want to remind everybody we are being relaxed on the time, and we are going to remain that way, but we also will have a second round. So if you think of something after your time, we will come back around.

Mr. Gaetz of Florida is recognized.

Mr. GAETZ. Well, I think we are really getting somewhere here. You know, you all have terrifically described the future of warfare. And even a country lawyer can hear what you are saying, that it has to be autonomous. And yet we are lashed to a present where we are spending billions of dollars on stuff that doesn't work, right?

It is not a bug of the system that we are not more rapidly acquiring these technologies, it is a feature of the system. So let's just—for quick math, President Biden requested 68 new F-35s to purchase. Today in America, 29 percent of the F-35s are fully operationally capable. Now, I don't know much about warfare, like my colleagues, but I do know if something costs \$100 million, it should definitely work more than 29 percent of the time, especially if you are telling us it is the past.

So we, I think responsibly, as the authorizers, we cut 10 off the block and said, "You got to make more of these things work." And then the Appropriations Committee not only restored the 10 that we cut, they went and added 10 more.

So when you critique our system —

VOICE. And didn't allow us to vote on it.

Mr. GAETZ. —Mr. Tseng—yes, and didn't allow a vote on the good amendment—so that is what you are up against. What you are up against is a corrupt system, where principally five companies distribute hundreds of millions of dollars in campaign donations and hire former staffers and hire former lawmakers to be able to influence the process for them.

And I bet you didn't have me citing Elizabeth Warren on your bingo card today, but she released a 2003 report entitled, "Pentagon Alchemy: How Defense Officials Pass Through the Revolving Door and Peddle Brass for Gold." And the key findings of Senator Warren's report are that top defense contractors hire hundreds of former government officials, mostly as lobbyists. The defense industry consolidation increases the risk for big corporations to abuse the powers of the revolving door. And the big defense contractors hired the most revolving door lobbyists and stocked their board with the most former government officials.

So to all of you great innovators who are describing the future of warfare to us, do you think it is a fair fight? Like, do you actually think that if you come up with a better mousetrap, that that is going to result in rapid acquisition? Or is it just about who gives

out the—let's see. Let's see. In the last two decades, defense contractors have given out \$285 million in campaign contributions and have spent \$2.5 billion in lobbying. So you guys think it is fair?

Anybody want to take that up?

Mr. Jenkins?

Mr. JENKINS. I would say no, it is not a fair playing field by firepower. You know, small companies like Sairdrone cannot match the firepower of big, big primes.

I would like to see competition on the battlefield or the pre-battlefield, and actually comparing technologies and choosing a winner. As a, you know, commercial citizen, we are very competitive, and we are happy to go head to head with any other technology to prove that one is better than the other.

Mr. GAETZ. Yes. No, having a bake-off would be lovely, Mr. Jenkins, but I don't think you are going to get that opportunity, based on the rigged system we have.

And the fact that we are buying 10 more F-35s for billions of dollars, that don't work—when Mr. Tseng says you guys are spending less than \$100 million on that, which is going to win the future on AI and autonomous systems—is the fundamental critique.

So the GAO [Government Accountability Office] does this big report, and they say, look, we have got to have these lobbying reforms where you can't have people rolling right into influencing the very systems that they were a part of, and they apply that to lobbying. And we, to our credit, passed that in the 2018 NDAA. But then DoD started interpreting that to say, well, that is just registered lobbying. That is not acquisition, as well. So people engage in the revolving door on acquisition, whereas on lobbying they are tightening down on that.

Does anyone think that we should be more lax on the acquisition revolving door reforms than we are on the lobbying reforms? Does anyone think that?

Do any of you challenge the premise that the acquisition process is corrupted when the senior Pentagon officials and the senior generals involved in these programs then go work for the big five companies? Do any of you say no, that is not corrupt? Any of you?

Well, the silence is deafening. The silence is deafening, because you all know you are playing a rigged game. And we participate in it, and it is shameful. It should be the very bake-off that Mr. Jenkins is describing.

But we will do all this stuff to learn about all these exquisite technologies, but again, it is not a bug of the system, it is a feature of the system, and it is deeply unpatriotic.

A final question for you, Mr. Tseng. How much money—you made mention of the amount of U.S. equipment in Ukraine that is not being used on the battlefield because the Ukrainians don't think it works. Do you have an assessment as to, like, how much money that is?

Mr. TSENG. It is in the billions.

Mr. GAETZ. The billions. In the billions. And so U.S. taxpayers are paying for the inflation to send stuff to Ukraine that doesn't even work, and it is magnitudes more than on the stuff we are spending for ourselves that does work.

Thank you for your testimony. It is illuminating and enraging all at the same time.

I yield back.

The CHAIRMAN. I thank the gentleman. The chair now recognizes Mr. Khanna of California.

Mr. KHANNA. Thank you, Mr. Chair. Thank you for having this hearing in Silicon Valley to you and to the ranking member. And we are in my district, so welcome to both of you and to every member here. It is fantastic.

I don't know, with Gaetz quoting Elizabeth Warren, I am concerned he may be gearing up to run against me here.

[Laughter.]

Mr. KHANNA. I hear his wife likes it out in Half Moon Bay. So it is a great district that I hope everyone will get to see.

I was struck, Mr. Tseng, by your statement an adversary military with a budget of 25 billion that effectively employs lower-cost drones and autonomy will be able to decimate a military with an 800 billion budget without drones and autonomy, and I guess I am trying to understand the balance.

You know, I actually put into ChatGPT—not that it is authoritative—what would be the top seven things to fight in China, and swarm drones came out sixth. I am not saying it is correct, but, you know, F-35s and aircraft carriers and submarines still matter. I mean, they—it is not like we can just have a military of drones. And yet we need to have some of the new technology to be competitive.

And I guess the two questions I would start to ask is, first, we have known on the F-35s, as Mr. Gaetz and the chairman and others have said, that there have been cost overruns, that they haven't been effective. Do you think any of the technology companies here providing more contracts or competition will do anything to improve the F-35 delivery, or is there—what do we need to do to improve the traditional platform delivery?

Mr. TSENG. I think the companies here could, in concert, make the F-35 more effective on the battlefield in terms of its employment, but I couldn't speak to how you could increase that 29 percent fulfillment rate. I don't think that is our company's specialties here.

Mr. KHANNA. And there is nothing that any of the new technology companies could do eventually to compete with the primes in terms of—you know, when you say “problem solving,” my guess is DoD will come back and say, okay, to solve the problem we still need a lot of legacy traditional platforms.

So are you saying here that your value add would be the 20 percent where they say, yes, we need swarm drones and other things? Or could you also in any way compete on the 80 percent?

Shyam?

Mr. SANKAR. You know, 50 percent of our business is commercial. We help people build planes, trains, automobiles, ships. The largest ship manufacturer in Korea runs on our software. We help GE [General Electric] build the J85 jet engine that goes into the T-38 trainer. We helped Anduril build their latest weapon systems. So I think there is a huge amount that Silicon Valley and technologists can do to change production of existing systems here.

I think to everything Mr. Gaetz said, I would agree, but I would also say one of the deeper issues is the dysfunction and pathology of the monopsony. You know, having a buyer that has kind of unilateral control, it doesn't get to benefit from any of the market forces and innovation. You know, in the commercial world you don't have to be the smartest company; the aggregate signal from all of the companies allows you to innovate and capture things. And so when you have a buyer who has to "figure it out all on their own," and then is convinced they can't be wrong, it is quite disastrous.

So I think many—if you think about the F-35, I would love to help with the readiness the same way that every—I manage over 65 percent of the world's air fleet, commercial air fleet, but I don't have access to managing the DoD's fleet or helping out in any way, shape, or form. These things are locked up vertically within the prime contractors in their programs. There are different rice bowls here.

So I think there is a huge sea change that we could have —

Mr. SMITH. And I am sorry, Mr. Chair, important to this point—we could maybe pause Mr. Khanna's time, but there is a way to go after the larger systems.

The B-21 was built much differently—is being built much differently than the F-35. And part of it was it was done with other transactional authority, so it skipped a lot of the requirements process. And crucially, it maintained competition within sub-systems, instead of like what we did with the F-35, where we just gave it to them at the start of the process. So they owned us at that point. Vendor lock.

So yes is the answer to your question. Whether you are talking about building an aircraft carrier or a drone, you can do it in a way that maintains competition and gets out of the requirement-based process, which is crucial, to your point, because we are going to have to spend money on those things.

Thank you, sorry.

Mr. KHANNA. And I would just say—and then I will give you the last word, Mr. Ludwig—I think it is important for the tech companies, yes, talk about drones, AIs, but also talk, in my view, about how you are going to make the traditional planes and weapons more competitive, because I don't think you are ever going to convince the American people that we could just have an American military of drones and AI in the next 10 years.

Mr. Ludwig?

Mr. LUDWIG. To Mr. Smith's point on competitive sub-systems and to Mr. Khanna's point on F-35 competitiveness, I do want to emphasize, especially, the capabilities of these companies in supporting extremely advanced software on these systems, right? The next generation of these vehicles in the concept of autonomy, that is mostly software. And in the case of the F-35, that is not a software company, right? The primes are not software companies. And the way that their organizations are structured view software as a cost center, not a profit center. And that means they are not getting the best people from industry in those software teams.

The companies here on the panel, we are largely software companies, and we are fighting for the best talent in the market, and we

can provide that talent to work on these systems—as an example, adding autonomy capabilities for the F-35.

Mr. KHANNA. Thank you, Mr. Chair.

The CHAIRMAN. I thank the gentleman. I want to remind people I am not being the usual Mike Rogers who enforces the five minutes.

[Laughter.]

Mr. GAETZ. We are so well trained.

[Laughter.]

The CHAIRMAN. That is right.

Mr. Gimenez is recognized.

Mr. GIMENEZ. Thank you very much. You know, Hyman Rickover, the father of the nuclear submarine force, he was rewarded with his vision by being reassigned and also given an office in a ladies bathroom.

Billy Mitchell, he was rewarded for his vision for air power and the dominance of air power in the future, air warfare, by being court martialed.

So, you know, we are—I am wondering if the same kind of mentality still reigns at the DoD, where anybody who dares to challenge the orthodoxy is put away. And so, Mr. Tseng, you talked about your AI-powered F-16s and they did very well. How did they measure up to the piloted F-16s in simulated combat?

Mr. TSENG. Oh, win 99.9 percent of the time.

Mr. GIMENEZ. Which is the worst it will ever be.

Mr. TSENG. So —

Mr. GIMENEZ. Right, because AI is still in its infancy.

Mr. TSENG. Yes.

Mr. GIMENEZ. So it is just going to get better and better and better. So do you believe, like, that it is possible that the F-35 could actually be the last manned aircraft, fighter?

Mr. TSENG. I believe it should be, personally. And I think you can augment it with swarms of unmanned fighter drones, swarms of lower-cost drones, yes.

Mr. GIMENEZ. And I disagree with the ranking member. I think the American people would welcome our machines fighting for us, so we don't lose our young men and women in battle. I am ready to go there right now, okay, if —

Mr. TSENG. Yes.

Mr. GIMENEZ. —we actually win the battle.

Mr. TSENG. Yes.

Mr. GIMENEZ. Okay, so —

Mr. SMITH. Just to clarify here, I was talking about how the systems were built, not about whether or not there is a pilot. Okay? You can build a B-21 bomber that is flown autonomously, and I am fine with that, okay? So I am—sorry, there was a misunderstanding there. That is not what I am saying at all.

Mr. GIMENEZ. I am sorry, I am sorry.

Mr. SMITH. Yes.

Mr. GIMENEZ. I am sorry I misunderstood you.

Mr. SMITH. That is —

Mr. GIMENEZ. I just think we could sell that pretty easily, okay, to the American people.

So it is critical that we win the race and we always have the most intelligent artificial intelligence if that is the way we are going to go, and I think that is the way that we are going to go.

Actually, Ukraine is our Spain, right? The 1936 Spanish Civil War, the—it was a proxy war, Germans against the Russians and—you know, and then we—they figured out what the next war was going to be like, and then they—you know, they kind of adjusted accordingly. Maybe we didn't in the United States, it took us—it took Pearl Harbor for us to wake up to the fact that we were about to go into war, and that is why we were so far behind. I don't want to be caught like that.

Somebody talked here about the need for drones, and that we could only produce X number of drones per year. What is China's capacity to produce these drones?

Let's say Mr. Valentine.

Mr. VALENTINE. Yes, Congressman Gimenez. First off, I trained the human pilot that competed against his AI. So it is probably all my fault that the AI won.

[Laughter.]

Mr. VALENTINE. But anyway, I don't know the actual capacity that China can put out right now, but I know that they are pumping out at least 10,000 a month because that is what Ukraine is replenishing their stocks with, and that is just one buyer. They are worldwide, they are subsidized by their government.

We at Skydio are ready to compete toe to toe with any company in the world, but it is really hard to fight an unfair fight when we are fighting an entire country.

Mr. GIMENEZ. Right.

Mr. VALENTINE. But I don't know their actual capacity.

Mr. GIMENEZ. In the Black Sea around Ukraine and parts of Russia and all that, is the Ukrainian—are the Ukrainians—I am not going to say Ukrainian navy. I am going to say are Ukrainians having success in denying the Russians access to certain parts of the Black Sea?

Mr. TSENG. I think the Ukrainians are having a number of tactical successes which are leading to strategic dilemmas for the Russian Navy. And their use of drones and low-cost, one-way attack drones or one-way missiles, whatever, cheap missiles, whatever you want to call them, have put the Russian Navy to a massive—it is a strategic dilemma for them. It is why they have sunk—why the Ukrainians have sunk so many of those ships.

Mr. GIMENEZ. So —

Mr. TSENG. They say big ships are big targets in Ukraine.

Mr. GIMENEZ. So the Ukrainians must have gobs of submarines and destroyers and frigates and all kinds of stuff, huh?

Mr. TSENG. No.

Mr. GIMENEZ. They don't?

Mr. TSENG. No.

Mr. GIMENEZ. How in the world are they doing this? How in the world are they actually, you know, denying the Russian Navy, which has gobs of submarines —

Mr. TSENG. Right.

Mr. GIMENEZ. —and frigates and all kinds of stuff, and destroyers, and cruisers, how are they doing this?

Mr. TSENG. They are employing asymmetric capabilities that have tremendous tactical advantage.

And I want to be clear. I think you need a high-low mix. Again, I am not for a 100 percent—you know, at least in the next couple of years—drone military.

Mr. GIMENEZ. Look —

Mr. TSENG. But I want—yes.

Mr. GIMENEZ. Look, I am not saying you are.

Mr. TSENG. Yes.

Mr. GIMENEZ. I am just making a point.

Mr. TSENG. Yes.

Mr. GIMENEZ. Okay? Because I am sure that, if we asked our military, hey, we want to deny the Russian Navy access or free reign of the Black Sea, they are going to tell us how many nuclear submarines they are going to need in order to go in there to do that, because that is the way they think, all right?

And if they want to do X, Y, Z, how—we have to ship the—a carrier task force, you know, over there, which I think—I have said it many times—we have way too many eggs in too few baskets because they don't think differently. I would rather see us disperse our assets so that when one ship is sunk, the entire battle group is actually useless, and 85 airplanes go down with it.

So, you know, I am intrigued by the testimony. I believe that the problem lies—there is a two-pronged problem. It is in DoD, it is in the Pentagon, and it is in us, right here.

Mr. TSENG. Right.

Mr. GIMENEZ. Because, because of us, we foster that culture, that risk-averse culture, the one that wants to go to what is tried and proven, and I will be promoted, you know, if I don't rock the boat. Right?

And so I guess I am over. Thank you, Mr. Chairman, for not shutting me down, and I guess I will have—I will have a second round. Thank you.

The CHAIRMAN. I thank the gentleman from Florida. The chair now recognizes another local Californian, Ms. Jacobs.

Ms. JACOBS. Yes, though I am from the other side of the state.

Although Mr. Tseng failed to mention the most important part of his company when he was doing his intro, which is it is headquartered in the best congressional district.

[Laughter.]

Ms. JACOBS. So, you know, first, thank you all. I wanted to ask you, you have all sort of talked in various ways about how to get—change the way we do contracting and procurement, getting more towards this problem-based approach. There have been a few of these different initiatives that have already been coming out of DoD, and I just wanted to get your all's take on if you feel like they are going in the right direction, if you feel like they have helped.

So first I want to ask about Replicator. Do you believe Replicator has provided the sufficient clarity on its objectives and plans for companies in—that—particularly ones who are potentially less familiar with the way DoD generally works?

And just how do you feel the Replicator program has been going so far, for any of you who want to answer?

Mr. JENKINS. I can speak briefly to that. So Saildrone is not a part of Replicator. They have a very, very narrow focus on kinetic explosive devices for a particular fight near Taiwan. So it is a very—I am not saying it is the wrong mission, I am just saying it is a very unique and very narrow. So it doesn't go much further than that. I don't think anyone on this panel is actually involved with Replicator, I am guessing, significantly because of that very narrow focus.

My point is that there is many more things we—challenges we face around the world that have a very different set of requirements to the Taiwan Strait challenge, so —

Ms. JACOBS. But would you use the—the way you do Replicator as a model to say, like, okay, this is another challenge, but would you advocate doing similar to Replicator for that challenge, as well?

Mr. JENKINS. It is great to see pace. Speed is very good. But unless there is recurring program money to take that on and back it up, it is going to be wasted because it is a small blip, not a long, continuing story.

The other thing we are seeing, my counterparts in Ukraine that I am talking to, they are telling me there is a six-week cadence of having a new solution to that solution being redundant because they have got a countermeasure. So we have to be very, very careful when we buy things en masse, that they are actually going to even work when they are fielded, if they are fielded. So it could be a very, very large number spent on something which never actually gets deployed.

Ms. JACOBS. Got it.

Mr. VALENTINE. Yes, Congresswoman, I think of Replicators—two things. And on one side it is a strategic concept. And as a strategic concept, I think it is actually a seed of getting to this idea of problem-based acquisition that I think we are all seeking. And of that, this idea of a future battlefield that has thousands, hundreds of thousands of autonomous systems supporting a smaller number of humans, I think, is absolutely the right way to go.

The second part of Replicator is that of an acquisition program. And there I don't think that the action has met the rhetoric. So I think the seed is there to create this idea of a problem-based acquisition system, but what we have actually done to date on the acquisition side, I don't think has lived up to that.

Ms. JACOBS. Got it. And then, you know, over the last five years we have seen a number of different defense innovation organizations across OSD [Office of the Secretary of Defense] and the different services. How have you guys felt those have worked?

Is it too many? Is it not enough? Have you gotten the—what you need? All of that.

Mr. TSENG. Ma'am, I think all of those—all those programs, all those institutions, they are Band-Aids. They are Band-Aids that don't address the root cause of the problem, which is—the root cause of the problem is all the money in the DoD goes to the—things that are requirements. And so the Band-Aids are nice, right, if you are bleeding out and, you know, you want a Band-Aid, there pretty immediately. But if you have a cancer, you need to tackle the internal cancer if you want real fundamental, institutional change.

Ms. JACOBS. Got it. Thank you. And then I wanted to ask you. Like, to me, one of the things that we are really struggling with is that, if you look at a lot of the innovation in the 1950s, 1960s, 1970s, it was a lot of research and technology that government or DoD initially funded and then spun out commercially. Now we are in a world where most of the innovation and research is actually commercially funded, and then we are trying to figure out how to spin it back into DoD, which is a slightly different problem set than what—than the way the system is currently set up.

And I guess one of the ways—if you guys have thoughts on, like, part of what is hard about that is that, for instance, the accuracy level you need on AI for something commercial is very different than the accuracy level you need if you are using an AI technology to do a kinetic strike, right? Because then we need, like, 100 percent accuracy. We don't really have a lot of room for error in a way that you might in a commercial system.

So how are—how should we be thinking about the way, then, to take commercially-produced innovations and figure out how to bring them into DoD, which is a completely different problem set than the way most of these acquisition processes have been designed?

Mr. SANKAR. I think the software acquisition pathway is a very powerful tool. I think it has not been used much so far, and it should be used much more.

With regards to the relevance of commercial technologies for DoD, right, in our own business we do a lot of work with autonomous cars. And so you actually do deal with many of the same types of challenges that you would deal with in a defense context. Like, it is unacceptable for a car to hit a pedestrian, but those same types of technologies are also used in many types of weapon systems.

But we highly encourage the use of the software acquisition pathway, and using that mechanism actually with groups like the DIU has been quite beneficial to us.

Ms. JACOBS. The last question I have is somewhat around some of the language that is in this year's NDAA but, you know, more broadly about how do we think about the sort of balance between making sure you guys have your proprietary stuff, but then making sure DoD can, for instance, repair. We have got some right to repair language in this year's NDAA—can actually provide oversight.

So, like, how should we be thinking about that question of, like, how much we can let you guys have a black box versus the need for us to be able to repair or do oversight or make sure that things from different companies are actually able to operate together?

Mr. SANKAR. To address this from the software perspective, people tend to think about vendor lock. You know, any decision my engineers make, they are locking me into that technology. The real question is not do I face vendor lock in my own software stack, it is what is the switching cost? If the switching cost is two days, I really don't care. They can go forth and make whatever decisions they would like. If it is two decades, I care a lot. I am going to have a huge amount of scrutiny over the technical decisions they are making and the implications of that.

And I think if we could just own it—so in particular, a lot of the time the DoD says, well, I want to avoid vendor lock, so I am going to build it myself. They are just locking themselves into this, you know, Galapagos Island that doesn't benefit from any commercial innovation or R&D. They are not going to be able to outspend the commercial world. But instead, if we started thinking about strategically where do we have vendor lock that has unacceptable switching costs, we can bring market forces to that.

Why does the commercial world not face this? Because the incentive for every company is to compete based on switching costs. So people invest in making that possible, and I think a similar approach is very, very possible within DoD.

Ms. JACOBS. Thank you, Mr. Chairman, for the extra two minutes. I am getting spoiled over here.

I yield back.

The CHAIRMAN. The gentlelady yields back. The chair now recognizes Ms. Mace of South Carolina.

Ms. MACE. Thank you, Mr. Chairman, and thank you all for being here this morning and briefing us.

Mr. Tseng, you mentioned GPS a couple of times in your testimony and answers. How do we address the GPS issue? How would you solve that problem?

Mr. TSENG. I think about, one, putting ourselves in real, relevant battlefield conditions in training, right? In the SEAL teams and the entire military we say, you know, the more you sweat in training, the less you bleed in war, and that is 100 percent true.

It is very disappointing. I think I can count probably on one hand, maybe on two, but I am, like, pretty sure on one hand the amount of actual relevant electronic warfare pre-deployment workups that our troops go through. They are simply not experiencing the problem, they do not know what will work or what doesn't work when it comes time to deploy, and that is something that I think needs to be changed immediately.

Ms. MACE. But also in terms of GPS, I mean, China is trying to hack our GPS systems. Like, what is the future? What do we utilize? How do we get away from GPS, I guess, is where I was trying to go with that.

Mr. TSENG. Yes. I think you have to build systems that are completely non-reliant on it. It is not going to be a reliable support mechanism on the battlefield.

And in humans, right, we—in the SEAL teams, fighter pilots, you learn to navigate without GPS, right? But obviously, for the weapon systems that have been proliferated, the surface-to-air missiles —

Ms. MACE. If you are flying a C-17, right?

Mr. TSENG. Right, it is—you don't want to go up against a surface-to-air missile system, right?

Ms. MACE. Right.

Mr. TSENG. And so you need to build systems that fundamentally don't rely on GPS.

Ms. MACE. Mr. Valentine, did you want to jump in?

Mr. VALENTINE. Yes, Ms. Mace, the way we have attacked that, we fundamentally believe that AI, which many of the companies at

this table represent, is the antidote to GPS jamming and the GPS spoofing.

Ms. MACE. I agree.

Mr. VALENTINE. So the way we have done that is we have taken navigation cameras that were designed to prevent the drone from running into things, and realized that we can use those to do a visual-based navigation system, much like an old Tomahawk would navigate by comparing two pictures, realizing that, oh, I should be here, but I am here, and then doing some trigonometry. We are kind of doing the same thing, but we are doing it roughly 60 times a second through about 8 neural networks. And so it is much more accurate. And we have seen great success with that, to the point where after a 40-minute flight of jamming against GPS and active spoofing with no GPS—our drone, by the way, in the rain in Ukraine—came back and landed about 20 feet from where the operator was. So that was pretty impressive.

So we fundamentally think that the technologies that we represent at this table will ultimately solve that GPS challenge.

Ms. MACE. Mr. Ludwig?

Mr. LUDWIG. I would really like to emphasize that this is a software problem, not a hardware problem. And we have software-defined radios today, and we also have very sophisticated test infrastructure for being able to test these things.

I think especially when we talk about a system like GPS, we think of it as satellites and electromagnetic waves. Fundamentally, though, the way that these autonomy systems work in the presence of electromagnetic interference is very sophisticated software, which gets back to this splitting the software and the hardware components and the importance I think that has for the DoD.

Ms. MACE. Okay. And then you mentioned too, Mr. Ludwig, since you got the microphone, in your testimony about China leapfrogging the U.S. in terms of autonomy. When will they leapfrog us on autonomy?

Mr. LUDWIG. I think this has already happened. A group of our leadership team earlier this year was at the Beijing International Auto Show, and we got to test drive the latest commercially-available Chinese vehicles, literally going to dealerships in China and trying those systems. And I think it is fair to say that the Tesla autopilot system is actually not competitive compared to the things that we saw in China. Some of the most impressive technologies coming directly from Huawei, in fact.

Ms. MACE. Okay. And then, in terms of technology and AI, when does China leapfrog the U.S.?

Mr. LUDWIG. I think that is harder to say, but I think it is important to note that the innovation is very vibrant in China. The most recent CVPR [computer vision and pattern recognition] conference, which is the world-leading Computer Vision conference, had more submissions from Chinese researchers than any other nationality.

And so the amount of innovation that is happening in China is really quite incredible, and we should take it very seriously.

Ms. MACE. Okay. And then speaking of innovation—and I agree with everything, just about everything that has been said today—I mean, we have created a bureaucracy, it takes a really long time. Things are changing so rapidly, and you guys have testified today

on how quickly the technology and the capabilities of your technology are changing, as well.

Short of World War III, which nobody in here wants, we always want to avoid that, what do we need to do? How do we force innovation? How do we force ourselves to be more nimble, understanding that we are not going to get this massive overhaul?

I agree with you on the problem-solving acquisition sort of process. That is very private sector. That is not the environment that we have right now. So given the chessboard that we have our pawns on, that the chips are on, how do we—what small parts will make a big difference?

What are some small things we can do now to be more innovative, to be faster, to be more nimble?

As you all say, the pieces are in place, but we are just not doing it. It could—personnel could be the answer. It could be technology. But how do we incentivize?

I mean, I have seen some really crazy things. I had a hearing, I think it was earlier this year or last year. It was like \$300 million spent on a software system by DoD. Never got implemented because there are—none of the service branches were ready for implementation. We basically poured gasoline on \$300 million and lit a match. Just never—you know, so how do we avoid that?

I mean, I just—what is the answer here? What can we do now in the next 12 months with the regulatory environment, the acquisition environment we have? What can we do now to make a bigger difference?

Mr. Sankar?

Mr. SANKAR. I go back to the submarine-launched ballistic missile. When Admiral Rayborn was developing that in the 1960s, we had four competing programs going on simultaneously.

I think the root cause for the lack of innovation is that when you have a single source that gets to decide whether they want the innovation or not, they don't. There has to be something worse than change, which is irrelevance, in order to get people to adopt and change faster. And so I think we need more competing initiatives.

You know, we struggle for a lack of competition inside of government. We are often trying to externalize that competition to the companies, but that is not the root cause of the issue. It is—you know, this is why I think empowering the COCOMs does matter, because it provides incremental signal on different needs and incentives of where to go that forces services to react to those needs

—  
Ms. MACE. But how do we break up those monopolies? Like, how do we break it up? What can we do now, in terms of the process, the environment we have today?

Mr. SANKAR. Right, I think a very tactical solution is every program that is a major program should have multiple competing PMs.

When we were going through the Titan program with the Army, there was one PM who was overseeing the competition between Raytheon and Palantir. Maybe we should have two PMs, one attached to Palantir, one attached to Raytheon. And those PMs wake up every day trying to win, trying to beat each other. It provides incentive on the margin to adopt new technologies, to go faster, to

trade off small requirements, you know, use human judgment to see what is going to happen, and that then puts natural weight into the COCOM command.

You know, what does General Flynn in the Pacific think he wants? Does he want this Titan or that Titan? And how do we get into constant iterative cycles? I think it provides the right basis. It starts to approximate what commercial competition looks like.

Ms. MACE. And then, if the others—if everyone else—I will start over here, Mr. Valentine, and we will go through the table.

Mr. VALENTINE. I agree with Mr. Sankar. Competition is an incredibly important part of this. I also think personnel, that is a big part of it.

There are several programs the Department already runs, where they do fellowships with private-sector companies so that program managers, so that military officers can start to understand what it means to actually innovate. I think we should fund those and send more people to them.

Ms. MACE. Mr. Tseng?

Mr. TSENG. I think you can create emergencies around the problem. I think everybody in the DoD, I think leaders in Congress recognize the state of our national security, the state of our technological edge is in an emergency situation. I say “emergency,” because I think Congress and the DoD does a very good job when an emergency has been declared, right? And that is when, for whatever reason, we all get the most bang for our buck as taxpayers.

But that is what I think about. You can create these mini-competitive Manhattan Projects, where you are funding a handful of these efforts to create these capabilities and technologies, but there has to be a sense of urgency behind it. There has to be a recognized—a recognition that we are in a very challenging situation.

Ms. MACE. Mr. Ludwig?

Mr. LUDWIG. And I would just underline that I really do feel the primary innovation, looking forward to the next century, is going to be in software innovation. And so right now, as a matter of fact, the DoD does not purchase much software. And I think that, in order to unlock that huge amount of innovation in software, there just have to be more mechanisms to more iteratively and more quickly procure software.

Ms. MACE. Mr. Jenkins?

Mr. JENKINS. For me it is all about incentivization. How do you incentivize companies to innovate, innovate competitively amongst each other? Then how do you incentivize budget creators to be bold in what they are choosing? If you can do those two things, there is a huge amount of private capital, as this panel demonstrates, that can put their power to bear on the solutions. But if there is no pathway, no roadmap to get to the end goal, it is not going to happen. So incentivize private companies, incentivize government to choose the right products.

Ms. MACE. Thank you, Mr. Chairman, I yield back.

The CHAIRMAN. The Chair now recognizes the gentleman from Texas, Mr. Veasey.

Mr. VEASEY. Thank you, Mr. Chairman, and I thank the panelists for being here today.

Mr. Tseng, I wanted to specifically ask you about the V-BAT. And I know that you said that they may not directly fit in with the Air Force's Collaborative Combat Aircraft Program, which focuses on AI-piloted jets working alongside crews like in the F-35, for instance. And so I wanted you to elaborate that—elaborate on that a bit, and just explain how these V-BAT teams could potentially be integrated with such a program in the future, and what are some key considerations for making such integration successful.

Mr. TSENG. Sure, absolutely. The V-BAT, at its core, the problem it is solving is that of a targeting problem. A long—you need long endurance. You need long duration to actually target assets on the battlefield. We learned this very well during the global war on terror, and we utilized a wide array of drones to execute these targeting cycles. And so the V-BAT is a platform that is really a next-generation targeting platform that is meant to solve that targeting problem.

The Air Force CCA [collaborative combat aircraft] program is a—it is an air dominance, air superiority program of record that looks to solve the problem how can we establish air superiority? And so these two things are in concert when I think about them. Where you would say, you know, the CCAs that are being contemplated are primarily strike platforms, well, what the V-BAT does is it provides targets for those platforms to strike.

Mr. VEASEY. Okay. So given that the Air Force's focus on is on developing these AI-piloted jets, how could a V-BAT—because I know the F-35 has come up—how can V-BAT teams be complementary to F-35s?

And how can Shield AI's technology enhance the effectiveness of the F-35 in joint operations?

Mr. TSENG. Yes, a handful of ways.

The V-BATs themselves, they can forward deploy, they are highly mobile. You don't need runways to launch out of them. They are logistically simple. And so you want to start creating that targeting picture well ahead of the utilization of any long-range—like strike assets. Whether they are missiles, whether they are fighter jets, you need the targeting picture first.

In the SEAL teams, in Special Operations Command, it was driven into our head that 99 percent of, you know, what we do was intelligence operations, 1 percent is the kinetic piece. Obviously, a very important piece, but you have to know what you are going to hit, when you are going to hit it, how you are going to hit it, and that is the targeting picture that the U.S. has become, you know, best in the world, premiere at doing it.

V-BAT is well out ahead. I am talking days, weeks, months ahead. Creating that targeting picture is how I contemplate—in these electronically warfare-contested environments, with—while GPS is being jammed, while communications is being jammed, is the role that it plays directly into our air superiority, you know, mission with a joint strike fighter, with a CCA, et cetera.

Mr. VEASEY. Yes, no, thank you very much.

And Mr. Sankar, you said something that stuck out a little bit for me. I know that in order to make all of these changes and to be able to improve these procurement processes that you talked a lot about in your testimony, to me it sounds like that is obviously

going to take, you know, resources to be able to do that. And I know that also there seems to be a bullishness not just on the panel, but for the American public to see more of these, you know, drone-type capabilities, these things that don't require as much human risk involved. And, of course, we hear that a lot from our constituents.

But being able to do that, it seems like it would take, like, a generational investment to be able to do it. It just doesn't happen overnight. If you think about, you know, what this country did in the 1980s, we spent a lot of money in order to create this perception that the U.S. was the biggest military power in the world, and we were. Not only did we spend money domestically at our defense plants, but we put base—forward bases around the country.

Do you think that, A, that we are able to do all of these things that you would like to do without spending much more than we already do?

And also, do you think that just having these more, you know, AI-type capabilities or, you know, planes that don't have pilots, that that is going to really be enough in order to deter war? Because on this panel, that should be the first thing that we, you know, work on.

I know that, obviously, we want to make sure that we are being competitive with the Chinese, but we obviously want to have the perception and have enough military might and muscle and have other people see that we do in order to deter war. And so does that do that?

Mr. SANKAR. I absolutely—well, you could say that we are spending at historic lows as a percentage of GDP [gross domestic product] relative to what we have in the past.

But I do actually think that the primary issue is of asset allocation. If we said we have the budget we have, are we allocating it to maximize our lethality, I think the answer is no there. And I think a big part of that is how much innovation are we able to benefit from?

This decoupling of the commercial world from the defense world is very profound. When at the beginning of World War II, when the U.S. Army went to Pontiac and asked them to start making anti-aircraft guns, the U.S. Army's production time per unit was 3.5 hours. For Pontiac, it was 15 minutes. Why was it 15 minutes? Is it because they are smarter? No, it is because they had so much experience making cars that they were able to transfer laterally here.

Only 30 to 40 percent of Chinese primes' revenue comes from the PLA [People's Liberation Army]. So that cheap toaster your neighbor is buying on Amazon is subsidizing lethality against U.S. service members. This is why it is such a profound problem that 86 percent of defense spending goes to defense-specific companies that have no ability to benefit or amortize or learn any lessons from the broader commercial market.

You know, this is a challenge for us here. Actually, sorry, it is 94 percent. And it didn't used to be that way. This is a consequence of winning the Cold War. When we were competing, trying to win the Cold War, we had this diversified industrial base. Why is that important? Today it is very hard for me to compete on price. I

would love to go to existing programs and say, I can do this at half the price. Absolutely no one is interested in that proposition, which is crazy, because that is exactly how I built my commercial business. I go to companies and compete on price. So how do we create that mechanism?

The other—one of the reasons that is incredibly difficult is we have this fixation on the cost-type contracting. I want to pay you for what it costs. Well, I want to spend billions of dollars to create technologies that mean I can deliver for you at half the price. I can do that because I am going to have twice the margin. And so we need to move to a value measurement. What is the government getting for this, as opposed to what did it cost me to build the thing? And by doing that, you are going to liberate massive amounts of the budget to reinvest in the capabilities that drive incremental lethality. Unfortunately, that is what our competitor is doing. We have no time to waste on that.

The CHAIRMAN. The chair now recognizes the gentlelady from Virginia.

Mrs. KIGGANS. Thank you, Mr. —

The CHAIRMAN. Mrs. Kiggans.

Mrs. KIGGANS. Thank you, Mr. Chair. We have talked a lot about drones and innovation in modern warfare. Today, and much like machine guns in World War I, small drones have emerged as the new staple of the modern battlefield. This is demonstrated by the ongoing conflict in Ukraine, where drones are used in a wide range of applicability, ranging from FPV drones being utilized to kamikaze strikes or larger quadcopter drones being used for ISR applications. Interestingly, NATO [North Atlantic Treaty Organization] recently reported that two-thirds of all Russian vehicle losses in the conflict have been a result of Ukraine's employment of FPV kamikaze drones.

I know that you all are probably watching just some of the challenges that Congress has had with Ukraine aid and funding, and also just listening to you all talk about how the DoD budget and acquisition process has just really stifled your ability to develop new technologies. So could you address for me just how impactful those—that Ukraine aid piece was for your companies, for your—improving your business models, expanding your portfolios, and just developing new technology?

Mr. SANKAR. For me, the Ukraine—for us, we have gotten zero resource from the Ukraine aid that has been given. We have been on the ground there since May of 2022. We have a full office in Kyiv. We were out forward. We are there at our own expense to learn. And the rate of learning there far exceeds what we are often able to learn in any other theater that we are at.

Now, you know, the Europeans have contributed resources, but I think it is kind of a shocking statement that we have not had any contributions from the resources that have been given to the Ukrainians.

Mr. VALENTINE. Congresswoman, also of the roughly 1,000 systems we have in Ukraine right now, I think the vast majority of them were either donated by us or were purchased by the donor community at the beginning of the conflict. So I can't directly trace any of the Ukraine funding to supplying systems—from our com-

pany, at least—to Ukraine. But I can absolutely tell you the need is there. They have the need, they have the will, and they have the capability to use this, as you mentioned, to a tactical and strategic advantage. At this point they just need the stuff delivered.

Mrs. KIGGANS. Thank you. And clearly smaller drones are here to stay. And the DoD needs to examine ways it can strengthen the supply chain of domestically-produced drones. So Mr. Valentine, can you tell me what ways the DoD can help to foster a strong domestic supply chain of smaller drones?

Mr. VALENTINE. Yes, Congresswoman. Again, this comes back to when we start to buy things consistently. And I think Mr. Tseng actually said it correctly, and Ranking Member Smith, as well.

This isn't give us a contract for 10 years. But if we can demonstrate that we have a consistent set of small bites at the apple, and we will iterate and deliver whatever capability you need, but once that is demonstrated, now we have the essential buying signal we need to go and buy all the constituent parts. There are things that take a long time to get, and sometimes those things can take four months, which has led to this idea—at least that I have started to think—about around stockpiling so that we have some tremendous demand shock. We can flash the systems with whatever the latest software build is and get them out the door to be able to respond to that demand shock.

And then the only other thing that I would mention are chips are always an issue. The more that we can bring that chip-making capability, at least to friendly countries, ones that we have access to during a time of conflict, I think that is supremely important.

Mrs. KIGGANS. Thank you.

And Mr. Tseng and Mr. Sankar, you guys talked about just the—moving from the requirement space to—well, Mr. Tseng did—moving from a requirement space to problem-based, you know, acquisition process. And so I am just curious. How do you all, as software companies, work with the primes to integrate the latest and best technology?

And then how do you work with the warfighter to actually hear from them what they need?

Mr. TSENG. Yes, we work with the primes every single day. And it comes to, actually, a lot of people's recognition, the primes' recognition, the warfighters' recognition that the best way to solve this problem is with the software-first mentality, things that both my—you know, all of my colleagues here have referenced.

And the way that we, you know, hear from them, work with them, no different than any commercial company, you go out, you find your customers, you talk to them, you aggregate as much input as possible, you filter out the noise, you see—you recognize what makes sense, which is standard best product management practice at any, you know, Fortune 500 company. That is the model that we take. And I—you know, yes.

Mrs. KIGGANS. Go ahead.

Mr. SANKAR. And I would just add to that, you know, we ship out 90,000 software upgrades to our fleet a week.

One of the really interesting lessons for me during the Afghan NEO [noncombatant evacuation operations] was that usually in a crisis, when something happens, the old mentality is that you

freeze things. You know, the change seems risky. But actually in the crisis, we accelerated the amount of change that was happening. We pushed out more than 90,000 upgrades a week because it enabled us to be responsive. Software became the most malleable weapon system.

So I can't understate the importance of being out there with the war fighters, getting the—each incremental piece of feedback, and then closing those code chains. We spent a lot of time talking about kill chains. If you want to close kill chains, you need to close the code chains as quickly as possible.

Mrs. KIGGANS. Is there a way that Congress can intervene to improve that process of communication between the warfighter, or do you feel pretty good about that, then?

Mr. SANKAR. I would come back to my suggestion of giving more authority and voice to the COCOMs, that that is where the need really is, and that is going to drive the speed of these code chains.

Mrs. KIGGANS. And out of curiosity, what do—do you speak to the pilots out there? You are talking to—this is the pilot end of the table. And just about the—this progression of making us—of us just not relevant anymore, and do they recognize that? What—how do they feel about that?

Mr. SANKAR. They feel good about it. I tell people, look, being a Navy SEAL is really cool until you are asked to fight inside a tunnel system, right, where attrition rates, casualty rates are 80-plus percent.

Being a pilot is really, really cool until you are going up against an integrated surface-to-air missile system, where you have a 0.1 percent chance of survival. That is not a mission I want any of our pilots ever to take.

Mrs. KIGGANS. I agree with you. As the mother of a future naval aviator, I agree 100 percent.

Thank you very much, and I yield back.

The CHAIRMAN. The chair now recognizes the gentleman from Georgia, Mr. McCormick.

Dr. MCCORMICK. Thank you, Mr. Chair, and I am sure AI will never be able to duplicate our good-looking pilots on the beach, which is really important for movies.

[Laughter.]

Dr. MCCORMICK. I am really enjoying this. This is the first field hearing I have ever participated in. This is fantastic. It is a fantastic panel, a very fascinating topic that really is maybe one of the more important, germane topics for what we need to conquer in the near future, because it will affect our readiness for our men and women and also for our great country because, let's face it, we don't have enough qualified people out there to even man the 17 naval vessels that can't be deployed this year because we have an undermanning process. And the more automated we become, the fewer people get killed, the better we do our process, the less we spend on recruiting instead of R&D. I think this is fantastic topic. So thank you, Mr. Chair, for doing this for us, and thank you to the panel for taking time from your very important responsibilities for doing this, because I love this.

I love the idea of the First Breakfast. I thought that was a—just spot on. I might actually watch this hearing over again, just because I am learning so much after all of you speaking.

In medicine, we have also had that same resistance to change. Because I am not just a pilot, I am an ER [emergency room] doc, in case—you ever want to know if there is a Marine in the room or a pilot in the room, how do you know? They will tell you, right? [Laughter.]

Dr. MCCORMICK. But in medicine we resist change, too. At one time it was considered a great thing to have dirt all over your jacket. It shows how salty you were. And they actually made fun of people like Dr. Lister, who wanted to use antiseptic, or somebody who actually wanted to wash their hands in between surgeries. We resist change, even when it is a very good thing for the future.

As a matter of fact, we demonize people, as we have pointed out, for people who have done the right thing in the military, and in medicine, and everything else like that. We always resist change. But thank God for change, because that is what is going to keep us relevant into the next generation of weapons systems.

I was kind of trying to figure out who is more answerable to what we are actually talking about today. Are we answering to you, or are you answering to us as far as how do we change this? Because ultimately, we are the people who are going to be the instrument to changing how this process works so that you can do your job better. But ultimately, we are answerable to the people of the United States because we are taking their money and funding it, which brings up an interesting point.

This is the first time, maybe since Roman history, where you have individuals that are as powerful, maybe even more powerful, than the government. You remember Pompeii. He could raise his own army, he could fund his own consulship. Those days have been gone for a long time ago. It used to be that the United States and Russia were the only two countries that could put people up in outer space. Now you have an individual who can put more space-ships up in outer space than the entire American Government.

Times have changed. Seventy-five percent of our government is based on welfare programs. Another 10 percent, we argue all of our non-discretionary spending—it is what we spend everything else on, and we think that those are the powerful committees, whereas I would say that the last bastion of hope for America and its progress in technology, really, is right here in this room.

The Armed Services Committee is the only real investor in progress in technology, if you think about it. Eight hundred billion is being spent, not only in the advancements as we are talking, we waste a lot of money. But if you think about it, what else do we invest in anymore? We don't. The American Government is not good at investing. We need this hand-in-hand attitude, where we actually have corporations doing the hard work for us so you can make a profit, but we can benefit. Because let's face it, NASA [National Aeronautics and Space Administration] is not the one going up to outer space to rescue people from a space station that is 30, 40 years old. That is where we are at. That is the reality of where we are at right now. So I am really excited about what you guys bring, especially when we look to the future of budgeting.

You talked about stockpiling. It worries me a little bit, because I agree with the chair. You become antiquated very quickly. We have watched this in our weapons systems even now. And you talk about—not to pick on F-16 pilots or F-16s in general, but it struck me as curious that Ukraine even wants them when you consider about the future of warfare, and what you can do against an F-16—and you only have a few, compared to the SAMs [surface-to-air missiles] and everything else that you have in Russia. Why are we even bothering with that technology?

Let's stick to the more advanced technologies, which also worries me about the future of countermeasures, where you have Iran and China supplying our enemies with very cheap, technologically-advanced weaponry. And yes, we can—the kill chain book alluded to this, and we have been briefed on it, right, how we are countering those measures.

But how—here is my first question to you guys is, how do we come up with new technologies to counter these drones that are going to come after us and our legacy systems?

And I think we do need carriers, but I am worried about what do we need to be investing in to counter the measures that we are actually developing from Iran and China and things that are going to protect our larger systems?

And I will start with the First—I just love the First Breakfast comment, so we will start with you, Mr. Sankar.

Mr. SANKAR. Well, thank you.

I will say, when we talk about stockpiling, we tend to focus on the stock in the pile. But what really matters is your ability to produce the stock. Innovation is a consequence of productivity. When you don't produce, you can't innovate on what you are—what it is that you are producing. So we have to be thinking about what are we buying here?

We are not actually buying the end product that you are then going to stockpile because, you are right, it is—there is an ephemeris component to that. You are actually keeping alive the knowledge and the innovation cycle. You are funding the OODA loop. And I think that is a critical part of how are we going to counteract these capabilities. Because, you know, it is not a—it is a moving target itself. Like, as we counteract, they are going to counteract again, and we have to stay on top of that.

So I think the broad set of investments comes down to the need to produce enough scale of mass so that we can keep innovating on what it is that we are producing.

Dr. MCCORMICK. And Mr. Tseng, did I hear that you—I mean, we talked about the legacy systems. We talked about different things we use that aren't effective in Ukraine. Did I actually hear you say that the HIMARs were not a good weapon in Ukraine?

Mr. TSENG. GPS guided rounds.

Dr. MCCORMICK. Okay.

Mr. TSENG. There are certain rounds. Again, it is a mix of some things that work and some things that don't. And if it has GPS, it has got a very, very, very, very, very low success rate.

Dr. MCCORMICK. Okay, and I understand—I have heard from different companies that we are not delivering the weapons that we actually have stockpiled in America to the Ukraine basin, and I am

not sure if that is due to purchasing or delivery problems or regulations.

What is the biggest problem in our deliverable? Because we have the weapons that we are not giving to them that they could use in the battlefield that are the most effective weapons I have seen. You could talk about switchblades. You could talk about any sort of drones. You could talk about all kinds of different things. But why are we not delivering? Is it the purchasing problem or is it the delivery?

Mr. TSENG. It is probably a combination of both. There is a lot of noise coming out of Ukraine. There is certainly a bureaucracy going through that process right now in terms of the foreign aid process that is something that our company is going through right now with the Ukrainians, hand in hand.

And then certainly, also, when you talk about the delivery mechanism, again, the Ukrainians very—they force companies to come to the front line now and—right? And work alongside them as they use their product. And this is a very hard thing. It is a very expensive thing to do, as a company. But I give them all the credit in the world because they simply don't want things that are not going to work on the battlefield.

And so while there is a lot of noise in this space, I think you see, if it is not on a buy list from the Ukrainians, there is a good chance they—like, they just haven't tested it, or they have tested it and it is not being successful, period.

Dr. MCCORMICK. And then final question, Mr. Ludwig, you mentioned the importance of software. When we talk about investing in the future, whether it be software or hardware, the difference between quantum, AI, and autonomous, those three things all kind of combine into one system sometimes, and if they do—if we get those all together, man, it is going to change the world. And of course, that is why it is really important to develop these hand in hand.

I don't know if you think that we are going to be able to—is it realistic that in the next couple of years we will be able to integrate those three things in a realistic way that is going to affect the—shape the battlefield?

Mr. LUDWIG. Well, certainly, AI and autonomy, these things are deeply intertwined. And those fields are evolving at a rapid pace. Quantum still exists more on the research boundaries. The primary promise of quantum is the ability to more easily crack cryptography standards. And if—certainly, if a country does have the ability to crack all cryptography standards, that is a game-changing capability. But that is more in the research phases today.

I really want to underline, though, just how quickly AI and autonomy are advancing and, again, how little, frankly, focus there is on this, generally, at the Department. We are, generally, talking about building—talking about systems like a plane or a boat, and not talking about the advanced software capabilities that are required to actually make that effective in the modern war.

Dr. MCCORMICK. Thank you.

With that, I yield, sir.

The CHAIRMAN. I thank the gentleman.

I wanted to ask—we talked about the tests and seeing how things work in Ukraine. Have any of you had difficulty in being able to sell to Ukraine, any restrictions put on your ability to sell by our government?

Mr. Valentine?

Mr. VALENTINE. Congressman, we do have issues getting systems into country. Many of our systems that have thermal cameras or they are not ITAR [International Traffic in Arms Regulations], but they are BIS-controlled [Bureau of Industry and Security], getting those export licenses can be a challenge, especially when that export license process starts with getting an end user to certify here is me, here is my address, and I need X number of these things. That is pretty challenging to get from a platoon of soldiers in Ukraine, even working through the Ministry of Defense. So that can be somewhat challenging.

Mr. TSENG. I will just say there is not a fundamental, like, limiting—like, they are—the export regulations have been solid. Yes, you have to go through a license process, but it hasn't been a limiting factor in terms of getting capabilities over there.

The CHAIRMAN. Good. Mr. Ludwig, you made reference to the DIU hedge fund needs to be fully funded. How much is it being funded? I am skinning my ignorance. I don't know.

Mr. LUDWIG. I would actually have to ask my team for the precise number. I am not sure.

The CHAIRMAN. Yes, I would like to know what “fully funded” is for that hedge fund.

And you also made reference to the software acquisition process. Is it different? Is it different from this requirements-based acquisition process we have been talking about?

Mr. LUDWIG. Mainly, I am referring to the splitting of procuring software from hardware. And so often times software is thought of as a, let's say, the thing that you do after you have thought of the hardware system. And what this does is this forces many hardware companies to think about software as a cost center, rather than a profit center.

And in the reality of the talent in software, it is extremely competitive, and often times it is very difficult to hire the talent that is required to build these most advanced systems if you are thinking of this as a cost center.

The CHAIRMAN. Mr. Tseng, a couple of things you said, I think, are big takeaways from today. One is the requirements based system is a cancer. I like that, it is very easy to understand. And another was that we should dedicate 20 to 25 percent of the acquisition budget to a problems-based system, as opposed to a requirements-based system. Give me another thing that you think this committee should take away from this committee, other than—this hearing, other than those two principles.

Mr. TSENG. Those are very, very top of my list, so I am glad that that would be your number one.

Behind that, I think it is about really, really being customer-centric, warfighter-centric here. Again, whether it is going to the COCOMs, as my colleague, Shyam, talked about, or increasing the amount of reality in training on the battlefield.

And that, to me, is what is nearest and dearest, because I have friends, I have teammates who are preparing for deployment. And you ask them, you know, are you going up against what the battlefield is going to look like, the electronic warfare battlefield? And they tell me—they are like, no, we are still preparing in the same way we prepared for Iraq, for Afghanistan. And that, to me, is—that is a heartbreaking thing, because I think we owe it to them to actually prepare them and train them for what the conflict will actually be like.

The CHAIRMAN. Great. Mr. Sankar, you have had a lot of very thoughtful suggestions in here. I am really impressed with your thought process on this.

The Defense Department is made up of a lot of very patriotic Americans who love this country and want to help us be successful. It is also the largest organization on the planet, and culturally very indoctrinated. And it has been my experience in 22 years on this committee that it does not change unless it is forced to change. I offer that as the backdrop to this question: Do you have some statutory suggestions that you think the Congress should consider imposing on the Department to bring about the kind of changes you think are important?

Mr. SANKAR. All my suggestions come around to the idea of increasing the amount of competition within the Department across programs. So ideas like competing program managers, competing PMs to go after this, to create the right incentives to adopt innovative approaches that shave time off schedule, that provide lower-cost options. I think we should—we do need a little more crazy.

I think Congress—you know, in the Rickover story, Congress doesn't probably get as much credit as it needs for how much protection it—you know, Zumwalt said, "The Navy has three enemies: the Soviet Union, the Air Force, and Hyman Rickover." And you can think about how important the role of Congress played was there.

I think we should recognize that we have uniquely talented people in the service, and there is probably a role for some DOPMA [Defense Officer Personnel Management Act] reform here. You know, the idea that people have to keep moving every three to four years, even though they might be the most uniquely suited person to carry some of these roles forward, is a challenge. It is not how we would operate in the private sector, right? You know, when you get the—some projects can only be done by a certain set of humans, and you have to, like, wrap yourself around them and make everything happen as a consequence of that. So I think that is pretty important.

And then we should probably be more open—Andy Grove had a saying. First you got to let chaos reign, then you rein in chaos. We have very low tolerance in the Department for letting chaos reign. You know, it is okay for it to be confusing, what is happening with Replicator. My question would actually be maybe it should be more confusing. Maybe we need two or three Replicators happening at the same time to create the necessary sort of incentives here.

You know, I think space is one of the most innovative areas because, frankly, it is a bit of a food fight between NRO [National Reconnaissance Office], NGA [National Geospatial-Intelligence Agen-

cyl, Space Force, Spacecom, and that is increasing our lethality. So you could look at that and say, oh, this looks like a bug. I see it as a huge feature. You know, we are going to be better off because of it.

Now, what are the other areas where we don't have enough of that? Is Ukraine's idea on unmanned surface crazy? It is not even about whether the unmanned surface is going to work. Does it provide the necessary incentive for everyone else to adapt around that? Does it provide the reason, as you said, for them to change?

The CHAIRMAN. Well, I would make reference to what the ranking member said earlier, and that is this committee, in the last 10 or 12 years, has given the Department all sort of authorities. They won't use them.

So I would urge you all and your counterparts, who are not necessarily witnesses here today but are paying attention to this, come to us with specific statutory language that you think will be—have a forcing function. We are all ears. We want to get it from you, but you are the folks that interact with them. You are the best person to give us that language.

And I would end my comments with what I think is the most important thing that you have said here, Mr. Sankar, and that is we are spending on defense at historic lows, as a percentage of our GDP. That is a fact for over a century. The last three years has been the lowest spending on defense as a percentage of GDP in our country. That is unacceptable. The last 2 years, we are at 2.9 percent, this year is at 3 percent. That is inviting problems, and we have got to get after that. We have got to spend it better. Lord knows, we need to be wiser about it, but we also have to recognize that we have gone from a strategy that focused on fighting two wars simultaneously and successfully and defending the homeland to one war successfully and defending the homeland. The world is too volatile for that.

And with that I yield to the ranking member.

Mr. SMITH. I thank you. Just a couple of closing observations.

First of all, I love what Mr. Sankar said there. I think unity is the most highly overrated thing that I have ever come across. You know, I was, oh, no, we can't have disagreement, we can't—there are political sides to that that create problems.

No, I mean, you need to challenge assumptions. And a lot of times, when people are pushing for unity, they are basically pushing for you to shut up and do what they want, as opposed to challenging it. So we need to move past that.

I think the readiness point you made at the end is something I hadn't thought of, that I think our readiness subcommittee should really take a serious look at: how are we training our service members right now to go into battle, acquisition and procurement notwithstanding? I hadn't thought of that point.

The big thing on the—and I agree with the chairman that we have given DoD the authority they need to do, to your point, a problem-solving-based acquisition process. But what we haven't done is we haven't given them the money. At the end of the day, that is the real problem. The Replicator, I don't know, I think it is classified, what it spends, and I don't know. So whatever number. But it is not in the billions, let's put it that way. It is a very

small amount of money, as are most of the OTA [Other Transactions Authority] authorities. So we lock people in in the money. So I really want to sort of get after how can we free up more money, whether it is 25 percent of the budget or whatever percent of the budget to get outside of that, and I think that falls on Congress.

And that is why, when you think about how Congress approaches this, a point I haven't made at this hearing that is really important, you know, how—I think this committee has really changed and evolved from when I first got on it a long time ago. We are less parochial than we used to be. It is still a problem. And when Congress—when we want to look at, okay, how can we help, stop defending every last project that is in your district and in your state. That really impedes the ability to be flexible, and it turns it into a fight just to preserve things for the sake of them being in your district.

And political, I will tell people everyone thinks that is the key to winning the election. I always love to tell the story of the A-10. You know, we had to protect the A-10. And I am not going to get into the argument of whether or not we really needed it or not. But first, we had to protect it because of Ron Barber. He was in a swing district, it was going to be difficult, he was going to get killed if we didn't—we protected it, he lost.

[Laughter.]

Mr. SMITH. Then we had to protect it for Martha McSally. And we did, and she lost twice.

[Laughter.]

Mr. SMITH. I mean, you can get reelected without just trying to bring home all the money to your district. Honest to God, you can. So please, let's move past that.

And then the second thing, to defend DoD a little bit, part of the reason that they don't want to step out and make difficult, change-oriented decisions is because, in addition to us being parochial, the other thing we love to do is grandstand at the expense of the DoD, okay?

If someone makes a decision, makes an innovative decision, and it doesn't go well, we talk all the time about how DoD needs to be tolerant of failure. We are not tolerant of failure, you know, because we want to get—no, I want you to make sure that we never—this never happens again. You will rarely hear me ever utter that sentence, you know, because you just—you can't. And trying to make sure nothing bad ever happens again leads to all kinds of bad decisions. So I hope we will think about that, too, as we try to figure out how to work better with Congress.

The closing comment I think—I want to really amplify what Congressman McCormick said. Yes, there is problems with conflicts of interest, there is problems with Congress, there is problems with prime contractors. But at the end of the day, the biggest impediment to what we are trying to do here is what Richard said: resistance to change. Okay? That—if we could smash any one thing, the resistance to change is what we have to smash in order to successfully implement the changes that we have talked about today.

But again, I want to thank the chairman very much for this hearing. This has been incredibly informative, and we will build on it going forward.

I yield back.

The CHAIRMAN. The chair now recognizes the gentleman from Florida, Mr. Gaetz.

Mr. GAETZ. Thank you, Mr. Chairman, but we are not in service of those very valuable goals that the chairman and ranking member just laid out. We are not on a basketball court uncontested. You know, there are a group of people assembled to try to figure out how we never change, because that is how they make money, and that is how they pay their dividends. And so—and by the way, that is an incredibly sophisticated infrastructure.

Mr. Ludwig, you said earlier that the next big innovation will be a software innovation, not a hardware innovation. Just expand on that briefly.

Mr. LUDWIG. Fundamentally, AI is a software problem. I think there is a lot of talk about chips and advanced chips. The reality is the chips are good enough that we have today to do extremely advanced things. Many of the hardware systems that are involved in making planes and boats are commodity parts. The little electric motors, little—the little lithium batteries that exist in planes, these are commodity parts. The sensors that exist in your smartphone are plenty powerful enough to be on a missile. The real innovation and the real discriminator is going to be the software capabilities that these systems have.

Mr. GAETZ. Yes, so—and Mr. Sankar, you said the principal takeaway you want us to draw from your appearance today is the need for competition, more competition across all of these. Software is certainly not an exception to that, right?

Mr. SANKAR. Absolutely. I would even go even further. It is like software is a unique American strength that we are so good at as a country that we tend to underestimate how good we are at it.

Mr. GAETZ. Right, but we can only be that good with the competition. And here is —

Mr. SANKAR. Yes.

Mr. GAETZ. Here is the point I want to draw out. So we go back to sort of my favorite, you know, punching bag, the F-35. So in the F-35, we go buy the \$100 million commodity, right, the hardware, and then we put into our decision-making a full-system performance contract for Lockheed. So now, if anything goes wrong with anything software-wise, the point of entry to be able to solve that problem is the entity that created the problem and wants you to buy 10 more \$100 million paperweights.

So, you know, I guess I would ask, do you believe it is wise, in this era of great software innovation, for us to ever again on any platform give a defense company a full-system performance contract, Mr. Ludwig?

Mr. LUDWIG. I strongly feel that Congress should encourage that hardware and software are competed and procured separately, and this allows strong software companies to put their best foot forward and provide their best innovation, and strong hardware companies can put forward their best innovation.

Mr. GAETZ. And now, by force of law, we have no ability to do that. If one of you showed up tomorrow with a widget to make the software work better on the F-35, you would have no point of access to be able to present that solution because of the way we have chosen to give the five legacy defense contractors these type of full-system performance things.

So, like, while I think—I really think the chairman, Chairman Wittman, a bunch of our team members on Armed Services did hard work to try to limit our purchase of the \$100 million paperweight, at the same time what we didn't do was unlock the competition on the existing commodity. And if we do that, I think that your goals would be more easily achieved.

So that is all I have, Mr. Chairman, I yield back.

The CHAIRMAN. The gentleman from California, Mr. Khanna.

Mr. KHANNA. Thank you, Mr. Chairman.

I will be parochial in saying whichever of you two gentleman are chair next year, I hope this can be a tradition in coming to my district once a year. I think it is a helpful thing you have started. And I have two questions.

One, do you have any recommendations and—of people who understand the industry technology, but also would be effective in the Department of Defense, who would be good people for either—the new President to appoint? Does anyone have recommendations?

Mr. SANKAR. I have maybe a broader observation, not specific names.

One of the things, I have worked with the Israeli Government since 2014, and it is a country that thinks very highly of its own technical capabilities, correctly. So when they mobilized 360,000 reservists after October 7, those reservists, now with two decades of industry experience, were horrified at the state of technology in the IDF [Israel Defense Forces].

That is an implicit self-critique of their younger, 20-year-old selves that they had all the IQ [intelligence quotient], they had all the skills, they didn't have the experience. We have that experience in this country in spades. And creating opportunities for part-time service members, leveraging space forces, part-time authorities, creating opportunities for America's unique tech industry to be able to contribute, provide advice, guide our senior military leaders would be uniquely valuable.

And often the most important advice is what not to do, because that person has already screwed it up in the private sector and knows that this place, this isn't going to work, here is an easy way to save \$10 billion, and I think it is a missing natural resource that we are not leveraging. It is maybe the new equivalent of the dollar-a-year man that we used to great effect to win World War II.

Mr. KHANNA. Mr. Tseng?

Mr. TSENG. So I do have names I could follow up with you afterwards, but it is more important from, like, who you are looking for. And I think it is about—you are looking for people who are working to solve these problems every day, who have actually solved them in terms of scaling, who know the problems inside and out.

One of my major challenges, one of the complaints that I have about the leadership in DoD, they are not actually solving the problem. They are not on our side of the table, trying to figure out how

to scale—how to how to get, you know, a company’s product into the warfighter’s hands every single day. And so, when I talk to them about the problems, they visualize them as very abstract. Or if you talk to industry, I think what you have seen here is very, very tangible—like, every single person at this table has felt and experienced those problems.

So I claim you want someone, if it relates to acquisition or scaling innovation in the Defense Department, someone who has actually gone from zero to a billion in the Defense Department. And if you look at the list of the names who have actually been there and done that and led it, there is probably three on the table.

Mr. KHANNA. I would just encourage you to, given that there is going to be a transition, to be specific. I mean, my view is, for example, Ash Carter was very, very forward-looking in that, and made a huge difference. And whether it is at the Secretary of Defense level or below, if there are specific names or people you think would be good, giving them to the—either the chairman or the ranking member, I think, would be helpful.

And my second question is more broadly I—you know, in Silicon Valley one of the challenges is a lot of the—candidly—the recruiting happens at the top 10, 15 “universities.” And I have always said that DoD could be one of the places that young people get to go for technology, talent, where it is not just the top 15 universities, where they are contributing, getting training, and then can go into the private sector. How are you seeing that pipeline of young folks in technology, AI, other places?

And could DoD be one of the first hires for some of those individuals?

Mr. VALENTINE. Absolutely, Congressman. I think one of the most interesting programs that I have seen recently—in another life I also serve on the Software Defined Warfare Commission with the Atlantic Council. And one of my fellow commissioners is the president of Purdue University, and he introduced me to this new organization called DCTC [Defense Civilian Training Corps], or the Defense Civilian Technology Corps. So it is like a ROTC [Reserve Officers’ Training Corps] analogy, but for the civilian portions of the government.

I thought that was fabulous, and so I did some research on that. I think that is a great program and should be continued.

Mr. KHANNA. Terrific. Thank you.

The CHAIRMAN. Mr. Gimenez.

Mr. GIMENEZ. Thank you. And some of the things that were—that struck me was that there is a lot of stuff that we sent to Ukraine that they don’t use. Is that right?

Do you think that is done on purpose, the stuff that we know that doesn’t work anymore that we are sending over there, or is it stuff that they asked for that now they figured out doesn’t work? What? Which is it?

Mr. TSENG. I don’t think there is—I hope there is not malintent. I don’t think there is malintent. I think it is people.

When you give something, there is no better customer than a warfighter using your product. You will find out really fast if they are going to—that is how we measured, like, our success, actually, was how often would a warfighter take our product over someone

else's product onto the battlefield? That was the measure of success. It wasn't—because at the end of the day they are making a choice. You can only carry so much with you, and they have to make a very deliberate choice of what they are bringing. And so they have made their deliberate choice by not bringing a vast amount of U.S. equipment that is sitting over there.

Mr. GIMENEZ. But again, the question again—you kind of dodged the question, okay?

There is stuff over there. Did they ask for it, or did we just send it to them?

And if we are sending it to them without them asking for it, are we sending them stuff that we know doesn't work and we are just getting rid of it because we know we don't need it anymore over here?

Mr. TSENG. It is probably a combination of them both.

Mr. GIMENEZ. That is troubling.

Mr. TSENG. Yes.

Mr. GIMENEZ. Because then you have this figure of billions of dollars of American aid that are going to Ukraine that people are going bananas about, and most—a lot of it, I don't know how much—we have got to dig into that one—is actually just stockpiled somewhere because it is useless to the Ukrainian and to the war effort.

And again, if I were over here, maybe I would want to get rid of some of that stuff that I know doesn't work, all right, and send it over to them and let Mikey eat it, okay, because I don't really want it. So that is something—that is another avenue that I would like to pursue, but not in this—right here.

Is it possible with AI and automation that we can turn, let's say, a fourth-generation fighter into a fifth-generation fighter, into a sixth-generation fighter, giving them more capability because you take the pilot out?

Mr. TSENG. Yes.

Mr. GIMENEZ. Boy —

Mr. TSENG. One hundred percent.

Mr. GIMENEZ. —on that one.

[Laughter.]

Mr. TSENG. Yes, yes. No, I think about that a lot. There is 4,000 F-16s in the world, right? I tell people there is already a long laundry list of potential CCAs that we are already sitting on. But —

Mr. GIMENEZ. Which is exactly what I want to get to, because —

Mr. TSENG. Yes.

Mr. GIMENEZ. —they already are there.

Mr. TSENG. Yes.

Mr. GIMENEZ. Instead of buying fifth and sixth-generation stuff

—  
Mr. TSENG. Right.

Mr. GIMENEZ. —we already have fourth-generation stuff that is sitting there. Can we increase the capabilities by automating them, getting rid of the pilot —

Mr. TSENG. You —

Mr. GIMENEZ. —getting rid of the life support systems, all that, and also enhancing the capability of that aircraft? Because, probably, the aircraft capabilities are hindered by the human body, they

can only take so many Gs, et cetera, right? AI can take, I don't know how many Gs, you know, whatever.

Mr. TSENG. You could absolutely retrofit all of those aircraft. That is—I mean, we—the U.S. Air Force retrofitted aircraft for the purposes of the DARPA program that Shield AI was a part of. And so you could do it at a greater scale. There are pros and cons to doing it.

Mr. LUDWIG. I would just add that, absolutely, the most fragile component of an aircraft at this point is the human body. The hardware capabilities definitely exceed what is possible with a human pilot, and I am optimistic that very advanced AI technologies really could unlock a lot of new capabilities.

Mr. GIMENEZ. Yes. Go ahead.

Mr. SANKAR. If I could add one point to the point of competition here, it is like when we consider the next generation coming, we have already sunset the legacy without making the next generation prove its worth.

You know, as we think about funding counterfactually, the F-35, why aren't we encouraging the legacy platforms to innovate and compete and be relevant in the next fight, make the F-35 earn its place, rather than bestowing its future and closing out on all the systems and capabilities that we have today?

Mr. GIMENEZ. That is interesting, because we—one of the problems that we have is the production, right, of these aircraft, whereas the Chinese right now are able to outproduce us. Maybe that gap can be, you know, closed by thinking about it in a different way. And so that I find that to be very interesting. I would like to get more into it, you know, when we have some more time.

Finally, on the issue of promotions, I agree with some folks, I guess, up here that the way that we promote and we move our personnel around all over the place every three years because, you know, that has got to be three years, you have got to move on, is insane. It is actually insane. I was mayor of Miami-Dade County. I wouldn't say, well, you have been the director of solid waste for three years. I got to move you now to animal services. No, okay? You have been a great director of solid waste, you are going to stay in solid waste, thank you very much.

But I guess, you know, with them, it is, well, I want to get to four stars. And I will give you an example. I have a really, really good commander of Southern Command who is respected tremendously in South America and Central Area. Tremendously, okay? They love her. She has to move. Why? Well, her time is up, right? She can't get another star, all right, but she has to move. Okay? And so, you know, I think that that is something else we need to break.

I understand the need to move around and to understand the entire force and all that. But sometimes, when somebody is critical, maybe just instead of being, well, that only calls for a one-star, well, maybe I—okay, now it is a two-star, all right? Because they have done such a good job. But it stays there. And so that is just an editorial comment on my side.

Do you guys have anything to comment on that?

Mr. LUDWIG. At a high level I absolutely agree. I think it is important that deep expertise is—it takes a long time to build. And

certainly, we see sometimes that an individual who has developed deep expertise is then moved on to something else, and that expertise vacuum is a real problem.

Mr. TSENG. I also completely agree with your comments. It is also about accountability, right? If you have a program manager who takes over a program that seems to be failing in the first year or even the first two weeks, right, how do you hold that person accountable? You need someone there for the duration to—you know, them hitting milestones, very clear milestones along these programs, where they can be held accountable.

Mr. GIMENEZ. Okay, thank you.

I yield my time.

The CHAIRMAN. Ms. Jacobs of California.

Ms. JACOBS. Thank you. In order to give my friend over here who represents the F-35 factory a break, I am going to turn us from F-35 legacy systems to shipbuilding legacy systems.

[Laughter.]

Ms. JACOBS. And I represent San Diego, so I am doing this to myself, Mark.

Mr. Jenkins, I imagine you on the panel have the most experience on this, but of course any of you are welcome to weigh in. Obviously, shipbuilding has been another area where it has been incredibly hard to modernize and to figure out how we do things differently. And, you know, in recent years we have seen success in industries like drones and other areas. But given the historical challenges and the current need for shipbuilders to keep pace, what specific strategies or reforms could you help us think through in shipbuilding or the shipbuilding industry to embrace the same level of innovation that we have seen in other areas?

Mr. JENKINS. So thank you for the question. It is a big question.

Shipbuilding is a complex piece. I think, as earlier—with the requirements, and having narrower requirements would lead to more efficient, smaller ships, probably. They are more effective and they will be dynamically changing. I think hypersonics have changed the face of naval warfare forever. You are not going to deploy large ships forward-deployed, they will be standing back, out of the range. You will transfer to a UUV [unmanned underwater vehicle] or a submarine world with long-range fire. So that will be supported by a large fleet of unmanned systems—air, surface, underwater—to give you the ISAR [Inverse Synthetic Aperture Radar] targeting information for your services to hit.

So it is a rapidly evolving piece. We still need ships. It is not a replacement for ships. You are still always going to need ships. They are incredibly capable when needed, but we can't build them fast enough. Even if you had all the money in the world, with our shipbuilding capacity you could not produce them faster and better and quicker and better ships. So we have what we have. Making the best use of the ships we have, but augmenting them with new devices is going to be the best way to get more data to support our mission.

Ms. JACOBS. Did anyone else want to add?

Mr. TSENG. I would have one more thing to add on shipbuilding.

We power HD Hyundai's shipbuilding in Korea. They are one of the largest. Secretary Del Toro went over there, saw what they

were doing, how automated and wonderful the software was, and said, “Why can’t we have this in the U.S.?” And really, you can. I mean, it is a U.S. company that is powering this.

In my own interactions with the shipbuilding industrial base, I have been told numerous times, “Look, if I get more efficient, I am just going to have to give this profit back in a recompetete,” and so I think there is a role of thinking through the complicated incentives that actually drive people to want to go faster, to make it in their self-interest to actually serve the National Defense Strategy.

Ms. JACOBS. Mr. Chairman, maybe this can be a good Alabama-California shipbuilding collaboration.

I also wanted to ask you, I think that we have—we have foot-stomped a lot, everyone here, that it is a culture issue at DoD that we are dealing with, right? And some of that culture is derived from leadership, as Mr. Gimenez, as Mr. Khanna both have sort of talked about. But obviously, we know that leadership is only one piece of culture and cultural resistance. And as folks who, you know, run or work in big, private-sector companies, do you have any other specific steps you would advocate for us to think through in terms of, you know, changing this culture or the entrenched mindset?

So, you know, for instance, examples of accountability mechanisms, leadership evaluations, innovation, performance reviews, like, how would you—if you were going to have to sort of try and, well, for lack of a better metaphor, move the aircraft carrier that is the DoD into this better, you know, direction, in addition to leadership, are there other specific things we should be thinking about?

Mr. TSENG. I just think a lot about incentive structure, and that is what private industry will focus a lot on, right, is do you have the right incentives that are going to drive the right behaviors? Do you have the right accountability that is going to drive the right behaviors, as well? But those two go hand in hand.

But you can incentivize people to do incredible—there are incredible people, as you all know, in the Defense Department. Sometimes they are stuck under a rock. But if you have the right incentive structure in place, they can move mountains, and will move mountains.

Mr. SANKAR. I would add one comment. I would second Ranking Member Smith’s comments that, really, we need to create a culture that fosters risk acceptance. When we are doing new venture formation, you are lucky if 1 out of 10 of these things really work, and you are betting on the trend, the ability to learn, you know? So thinking about how we encourage and accept the risk in the portfolios that we are going after here is, I think, very important.

I hear, almost as like a shibboleth, people, general officers will tell me, well, we have proven that, you know, we need the congressional oversight because we have proven that we are not good at spending taxpayer money.

Ms. JACOBS. That is true.

[Laughter.]

Mr. SANKAR. But it has almost become—it becomes self-defeating, you know? It is like by creating processes that make sure that nothing goes wrong, you also create processes that make sure nothing can go right, and it constrains you to mediocrity.

And so I would gladly accept more failure if it meant that we had more catastrophic success, as well.

Ms. JACOBS. Yes. And my last question—again, for Mr. Jenkins—you know, Saildrone has been one of the big success stories of DIU. How can we do more of that? How can we have more success stories, right? Because for every one of you there is a number of companies that weren't able to get the funding they needed or, you know, couldn't get through the bureaucracy, even with DIU. So do you have suggestions for us on how to make DIU easier to work with, or anything like that?

Mr. JENKINS. So I think it is a good time to point out that, even though we are hailed as one of the best success stories, we were one of the first projects funded by Ash Carter back in 2016. It had incredible impact to the Navy and operational field. We still do not have a program of record, so the system has not been able to get itself into a way that says this is a—not only just promising, this is a system that does what we want, it is cheaper, it is better, it is faster. They can't pay for it.

And what we are seeing is a whole plethora of Band-Aids of—whether it is SBIRs or APFIT [Accelerate the Procurement and Fielding of Innovative Technologies] or Replicator, they are all just congressional plus-ups as Band-Aids to try and give them more things. And what we need to do is say, no, no, there is lots of amazing R&D innovation. How do you take that and put it into operations?

So as you are saying, it is incentivizing the folks who control the COCOMs budget, the fleet budgets. They have to be incentivized to take risks. Otherwise, the system will never reform itself. So lots of ways to do that, but I think DIU—off your question, but DIU has been a great initiative. It has got us to where we are. It is fantastic, huge support, I thank them a lot. But there is almost no stepping stone to go into operation, so we have to create that vehicle to do that.

Again, DIU has done it very successfully, done the—kind of the project-based requirements. Rather than setting strict requirements it said, we have this problem, give me air superiority, I don't care whether it is a plane or a missile or a bomb, and that has been very quick to get commercial minds on the case, which is what drives innovation.

Ms. JACOBS. Got it. Thank you.

The CHAIRMAN. The gentlelady from South Carolina, Ms. Mace.

Ms. MACE. Thank you, Mr. Chairman.

And I believe, Mr. Valentine, you mentioned it sort of in passing earlier, and I would like to maybe have a slightly more in-depth conversation. Talk to us about chips.

Mr. VALENTINE. Yes, Congresswoman. I think it is pretty well known that we have a deficit of the ability—most of our chips are made in Taiwan. They might have been designed in the United States. We send those designs out. They are actually etched, lithography happens there. Then they are delivered back. So that creates a vulnerability in getting those advanced chips that we may need at any one time.

So I personally think that whatever we can do to start onshoring that capability so that we have access to those chips in time of need is of strategic importance.

Ms. MACE. Anyone else want to chime in on the issue of chips and how we get them here, how do we solve the problem?

And then I guess, two, the other question I have, I would like to hear from everyone who is here today about, you know, the advances in AI and technology, the amount of energy that is needed and going to be needed in the near future to keep up with the advances in how fast things are going. The data centers. Is it nuclear? What is it? How do we handle what is going to come in terms of—in order to keep up with the technology we have got to have the energy capability, the energy infrastructure. We have to have the data centers to be able to keep up. You know, how far behind are we on this? How do we solve this problem? How do we keep up with what is happening in this space?

Mr. SANKAR, you can start.

Mr. SANKAR. Thank you. I think this is an opportunity to really organize a whole-of-government effort.

Like, what would it take for us to have 10 times the amount of energy production? We have been roughly flat for the better part of three decades or more now, and I think it is going to pose challenges on the grid. The answer is we need all of every type. You know, I don't think it is going to be a single modality. But the prosperity, the economic prosperity of our nation here so profoundly depends on this singular starting point and the—kind of the value generation supply chain of having enough power to continue to create the advances and maintain our lead as the dominant country with AI.

Ms. MACE. Does anyone else want to chime in?

All right, that is all I had, Mr. Chairman, I yield back.

The CHAIRMAN. Mr. Veasey, Texas.

Mr. VEASEY. Thank you, Mr. Chairman. I just have one question for Mr. Jenkins.

You said something very briefly in your testimony earlier about the Chinese, and I guess the—a vehicle that they have that is much superior, from certain technological standpoints, than Tesla. And I wanted you to touch on how that should be worrisome, from a military standpoint and all the things that we have talked about here today, because we are still having some huge philosophical disagreements on, you know, EVs [electric vehicles] and what role they are going to play in just everyday American society.

Mr. JENKINS. Yes, I think that wasn't my testimony. It might have been one of —

Mr. VEASEY. Oh, maybe it was—okay, I am sorry, I apologize. Yes.

Mr. LUDWIG. So I think the important thing to understand is that there is an enormous amount of innovation happening in China. The automotive industry there is incredibly competitive. There is over 140 Chinese car companies. And of those 140, I would say probably 20 of them are, I would say, best in breed. That would be fully competitive globally.

Importantly, the rate of software updates that go to their vehicles is much faster than what you would typically be used to in

most types of vehicles on the road. And the pace of innovation is so fast that leaders in the auto industry, they are now making it a point to travel to China on the order of every three months, just to see the latest software updates that are going to these vehicles. And this really underlines the importance of enabling rapid software updates for all of our hardware systems, because hardware can become obsolete very quickly without up-to-the-minute software.

The CHAIRMAN. Mrs. Kiggans.

Mrs. KIGGANS. I just was curious about a little more clarification about some of the Ukraine aid that Congress has approved, and you mentioned that you got zero of those dollars. So are you benefitting at all?

Because I know you talked a lot about all of your involvement, some more than others. But, you know, is it worthwhile for us to continue to invest? I want to make sure our dollars are—it is easier to get more of Congress to approve this type of aid if we can guarantee that our dollars are benefitting our defense industry. So it would be helpful to know—or maybe to not, if you can shed light on that—if that aid that we are approving is somehow helping you all.

Mr. VALENTINE. Congresswoman, again, I can't directly trace a dollar that has currently bought one of our drones to send them over. I know the U.S. Department of State has purchased several that they have delivered to both members of the Ministry of Interior and other organizations within Ukraine, to include the office of the Prosecutor General. But to be honest, I don't know where those dollars are coming from.

I will tell you, though, the funding is making a difference, and I think it is instrumental because it helps Ukraine, it helps America and our industrial base and, quite frankly, increases our competitiveness, which hurts our competitors. So from those three perspectives, I think it is a no-brainer.

Mr. TSENG. I would just add I think it is a good thing. I think it incentivizes companies to go out there and solve the hard problems, knowing that there is a—knowing that there is opportunity, should you solve those hard problems, it gets a lot of companies to go out and figure out how to solve them.

Mrs. KIGGANS. And it sounds like—and I think you even used the words—it was a laboratory or test bed for you all. So that is good, because we know the battlefield is changing. We know it has changed from Vietnam to when we fought in the Middle East to now, what is going on with Russia and Ukraine. And we know that the battlefield for probably Southeast Asia is going to look different, as well. So you have probably made a lot of progress in that European domain space, and that—what that Russia-Ukraine battle looks like.

But are you able to make any progress in Southeast Asia? We would probably predict that that is where, potentially, our potential next fight would be at. So is there anything going on that is enabling you to make the kind of progress that you have made in Ukraine, and apply that to Southeast Asia?

Mr. TSENG. Yes. The principal difference in Ukraine is actually something everybody expects in a China-Taiwan conflict, as well, and that is just the prevalence of electronic warfare, right?

The Chinese see that the Russians are being very successful with electronic warfare, jamming GPS, jamming communications. And the Ukrainians, we see that—the Ukrainians are also very successful jamming GPS and jamming communications. And so I think it is very reasonable—it is reasonable to expect everybody in the DoD knows, and China has tested this in the Strait where they are jamming GPS and communications. So there—the point of a battle lab of what is going on in Ukraine, is it going to have relevance in China-Taiwan? Absolutely.

There are other subtle differences, right, okay, it is a principally maritime environment. The geographies or the distances are much longer because it is a maritime environment, because it is an island. But I think that those core principles of, hey, you are going to be operating without GPS and communications, those are enduring.

Mrs. KIGGANS. That is good to hear. And then I guess those lessons learned that you all have learned—because we obviously don't have U.S. troops on the ground, thankfully, in that conflict—so are you able to communicate, and is the military listening to those lessons learned, and be able to hopefully apply that to—I know you have talked a little bit about how we are not practicing how we would, you know, conduct warfare. So I just want to make sure those—the things that you all have learned as civilian companies are getting translated to the military.

Mr. TSENG. They are, and I—well, there are pockets of success. That is what I will say. It is not—so for me to say broadly, yes, everything gets disseminated down the chain of command, I would think, would be—or to every operational command is absolutely not true. But there are pockets of success where commands take those learnings and translate them down into action.

Mrs. KIGGANS. Well, please be a loud, squeaky wheel, and we will try to help.

Thank you. I yield back.

The CHAIRMAN. The gentleman from Georgia, Mr. McCormick.

Dr. MCCORMICK. Thank you, Mr. Chair.

Interesting, Mr. Gimenez, I thought you brought up an interesting point about retrofitting aircraft. My personal opinion, I don't think it is worth it, and here is why, because, like, take an F-16, who has a great roll ratio, one of the fastest, one of the best G ratios. The problem is that it is still designed around a human to begin with, and so you are never going to be able to upgrade the capability of stressing the airframe beyond the human being, which we designed it around.

And so—and quite frankly, the biggest loser in all of this is really the good movies we are going to make.

[Laughter.]

Dr. MCCORMICK. Because when the dogfighting is over—and those days are actually gone already, I don't even know why we bother doing dogfighting, because, quite frankly, it is back in the Yeager days. Yeager used to always say that the first pilot who sees the other pilot wins, because you put yourself in that—those

days have been gone for a long, long, long time now. It is the best person who has the best radar and the weapon that can fire the furthest way wins because you are going to fire before you ever see them and you turn around. That is our dogfight now. It is ridiculous that we even have G-rated aircraft that—I mean, other than to evade. And we know that our evasion capabilities aren't going to exceed whatever some little tiny missile is for Gs.

So we are kind of, once again, thinking futuristically. Retrograding doesn't really help us quite—in my opinion. We need systems now that are smaller, more maneuverable, require less fuel. These systems are based way too large, and we need to scale down. That is my personal opinion on that as a kind of—a pseudo-expert, if you will.

Ukraine. You know, one of the things I thought was interesting, everybody gets really upset in America about now wasting money in Ukraine, and how inefficient we are and we are sending the wrong weapon systems. It pales to what we did in Afghanistan. We did not learn a lot of lessons in Afghanistan. We should have. But one of the things is we sent so much money and so many things that they could not use over there constantly because of our contracting—and this is recent, by the way—that it was criminal when I was over there. Literally, we had parts to show up for five tons that were from Humvees on purpose. And I know it was on purpose, and we did nothing about it in our accountability. And now, all of a sudden, we are going to be accountable in Ukraine, where we are 20 times at least more accountable in Ukraine than we ever were in Afghanistan, when we never talked about it. I think it is hypocritical.

So I hope we do get our stuff together when it comes to Ukraine, because the American public is watching. We are accountable to them. And so—and then so those are two topics somebody else already—that had very strong opinions on, I just had to state.

And then the final one Ms. Mace brought up I thought was really interesting, when it comes to what TSMC [Taiwan Semiconductor Manufacturing Company] does for us and the AI production. We have the CHIPS [Creating Helpful Incentives to Produce Semiconductors] Act. But in my opinion—I would like to hear your opinion as a community—I don't think the CHIPS Act really brings enough home when it comes to the most advanced chips, the AI chips, because the CHIPS Act addresses chips that we use for our cars, you know, cars that drive themselves, stuff like that, that is great. But the real AI, the leading-edge technologies, we are not bringing home. And we do have an adversary who is saying, "We are going to take Taiwan," which means that they are going to control basically 100 percent of our AI production in the future. I don't think we are talking about it. I think we thought the CHIPS Act solved it. I don't think we are having a realistic conversation in Congress about that.

Do you agree or do you disagree with my assessment of not bringing home enough—quickly enough, given the threat to taking out 100 percent of our chip production on the leading edge?

Mr. VALENTINE. Congressman, I admit I am not an expert on the CHIPS Act, but I agree with your thesis that we need to bring home the chips, and do it fast.

Mr. TSENG. I would just add to that. I think I applaud Congress for pulling the CHIPS Act together. I think the—you know, there are things money can't buy, implementation. And so the Japanese started building their TSMC fab a year after us, and they are already done. You know, where is the organizing, whole-of-government effort to pull this together as a cross-functional effort to make sure that we build this thing as quickly as possible, we solve all the problems?

There is going to be so many problems between here or there. It is not as simple as just cutting a check. So we have got to organize around it, as this nation is so capable of doing.

Dr. MCCORMICK. And just—I think we need to do the same thing with our production of medications, because I think there is too much quality control we don't have that is over there that we need to bring back home because we are getting bad drugs, poisonous drugs, ineffective drugs, and we don't do any sort of investigation like we do on our own homegrown products, and I think it is absolutely dangerous to our future.

Thank you. With that I yield.

The CHAIRMAN. I really appreciate you all making yourselves available. This has been very helpful, and I thank you very much.

We are adjourned.

[Whereupon, at 11:39 a.m. PST, the committee was adjourned.]



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**A P P E N D I X**

SEPTEMBER 16, 2024

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**PREPARED STATEMENTS SUBMITTED FOR THE RECORD**

SEPTEMBER 16, 2024

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**Statement of W. Mark Valentine  
Skydio, Inc.**

**U.S. House of Representatives Armed Services Committee**

**“Fielding Technology and Innovation: Industry Views on Department of Defense  
Acquisition”**

**September 16, 2024**

Chairman Rogers, Ranking Member Smith, members of the Committee, thank you for the opportunity to appear before you today. I am the President and General Manager of Global Government at Skydio, which is the largest manufacturer of small drones outside of China and the world leader in aerial robotics. This hearing takes place at a critical time in the evolution of aviation that is transforming the character of war. The last century of aviation was gas powered and largely crewed; the next century will be electric and largely uncrewed. This paradigm shift will fundamentally change the way airpower is employed and wars are fought.

Skydio was founded in 2014 based on the core belief that AI and autonomy—America’s asymmetric advantage—represented the future of flight. Skydio’s world-leading autonomy has unleashed exponential growth and is now transforming multiple industries. Skydio shipped its first drone in late-2019, and since then, we have delivered over 45,000 dual-use drones to more than 2,000 customers. Skydio is proud to serve every branch of the U.S. military, every Five Eyes military, and over a dozen allied and partner militaries around the world.

I have been fortunate to witness firsthand many of the changes we are seeing in air power and modern warfare. Prior to joining private industry, I served over 25 years as a combat veteran fighter pilot (F-16), commander, and staff officer at Headquarters US Air Force and the Joint Staff. In my testimony that follows, I will expand on the incredible lessons Skydio is learning from our work in Ukraine, explain what these lessons mean for the future, and offer recommendations to strengthen the acquisition and employment of drones throughout the force.

**I. Skydio Autonomy and Scalability: Serving the US Department of Defense**

Skydio’s success serving the Department of Defense (DOD) is a product of two core strengths: autonomy and manufacturing scale. Skydio autonomy makes our drones easy to fly and extremely hard to crash, turning every drone operator into an expert pilot. Autonomy removes the cognitive burden of piloting the system, allowing our drones to conduct intelligence, surveillance and reconnaissance (ISR) overwatch and other tasks while the ground operator focuses on other tasks and mission execution.

We bet early and big on computer vision and AI, but we also bet early and big on the tight integration of hardware, software, and manufacturing. Last year we opened a new manufacturing facility in California ten times larger than our last facility. We can now produce over 1,000 drones per month, with plans to scale far beyond that, to support our servicemembers across every branch of DOD and our allies and partners. We believe our manufacturing capacity and scalability exceeds any small drone company outside of China and is essential to deterring—and if necessary prevailing—in a great power conflict.

Our autonomy and manufacturing scale is making an impact for the Department of Defense. We are proud to be a part of two programs of record: the U.S. Army's Short Range Reconnaissance (SRR) program and the Marine Corps' Short Range Short Endurance (SR/SE) program. To date, we have delivered thousands of drones for the Army's SRR program, and thousands more for the Marine Corps' SR/SE program. Both programs aim to integrate small, smart drones at the unit level, providing organic ISR capability previously unavailable to front-line forces. This capability makes a life or death difference.

Although existing U.S. military procurement programs focus on single drones flown by single operators, DOD and Skydio are investing significant resources in breaking that paradigm, enabling a single operator to control multiple systems. Skydio plays a key role in DOD's Artificial Intelligence for Small Unit Maneuver (AISUM) program, focused on developing the technology and tactics necessary for operators to control fleets of robots in the air and on the ground. Multi-agent operations offer the ultimate asymmetric advantage, augmenting the reach and awareness of human teams and providing extraordinary situational awareness. We recently hired a world-class team of engineers that developed some of the foundational technology behind human-machine teaming. This is the future of drones, both for warfare and commercial use cases. We will continue to invest in industry-leading, multi-agent capabilities.

Beyond the traditional ISR operations enabled by small, smart drones, Skydio is widening the aperture of drone use-cases for our defense customers. While front-line use cases remain critically important, the next frontier for the military's use of drones is simple but significant: we believe drones will revolutionize the way DOD secures installations and inspects equipment. Skydio is the leading Western provider of drones for infrastructure inspection. We've seen the way smart drones transform the way commercial companies secure their facilities, inspect and monitor their infrastructure, and track inventory in warehouses. In that arena, DOD is behind the power curve, continuing to rely on humans to perform monotonous, routine tasks that could easily be augmented by flying robots. People will always have a role. But people become much more effective when they can lean on robotic teammates to perform routine, repetitive tasks—from inspecting a military power facility to patrolling a base perimeter. Along with empowering people, robotic teammates curb costs and increase efficiency.

Some of this work is happening now. Our drones have the ability to autonomously build a digital model of almost any structure, a feature known as 3D Scan. Enterprise customers use it to build models of bridges, power plants, and dams. Increasingly, defense users are finding value. The Ukrainian government uses Skydio 3D Scan to build rapid digital models of civilian sites damaged by Russian forces, creating compelling evidence for war crimes prosecutions and accelerating reconstruction efforts while protecting investigators. In the U.S., Skydio drones recently deployed with a Navy Arleigh Burke-class destroyer to support rapid battle damage assessments. We have demonstrated methods of transforming the inspection of military aircraft, including the B-52 and C-17, using the same fundamental technology. Instead of taking days or hours to manually inspect these critical assets, drones can do the same work—with higher fidelity and better data capture—in hours and minutes. Traditional inspection of a C-17 Globemaster aircraft by three Airmen can take up to eight hours. Autonomous aircraft drone inspection cuts that time by 90% to just 40 minutes. This technology will transform military readiness and keep our planes in the air and our ships at sea, deterring our adversaries and ensuring rapid response for contingencies around the globe.

Remote operations are the future of drone operations. Skydio developed the Skydio Dock, which allows operators to conduct remote drone operations from almost anywhere, automate tasks, and gain rapid, real-time situational awareness. Dock and remote operations are already being implemented across the critical infrastructure industry for automated asset inspection. Dozens of public safety agencies now operate the same technology to respond to 911 calls in a paradigm shift known as Drone as First Responder (DFR). DOD invented the remote operation of large drones but has yet to remotely operate small, smart platforms. Remote operations promises to significantly improve installation security and readiness CONUS and OCONUS, enabling the autonomous inspection of facilities and ranges, warehouses, and base perimeters, along with emergency response missions.

## **II. Pulling the Future Forward: Ukraine as a Case Study for Drones in Warfare**

To understand the future of drones and warfare, look no further than Ukraine. Necessity has pulled forward the future of drones, turning small drones—once considered toys—into critical tools on the battlefield. I have seen that future firsthand, traveling twice this year to Ukraine, where Skydio employs full-time employees. Past wars featured large and expensive drones supported by dozens of people. That paradigm is gone. Now, small teams field small, cost-effective drones. And commanders would not dream of conducting operations without them. This section discusses the transformation we're witnessing in Ukraine and what it means for the future of war and our own security.

**a. Standing with Ukraine**

Within hours of Russian tanks crossing the Ukrainian border in February 2022, Skydio began fielding requests for drones. Within days, Skydio had donated hundreds of drones, calling major enterprise customers to let them know their shipments would be delayed because their drones were going to Kyiv.

Since then, we have deployed more small, dual-use drones to Ukraine than any other company outside of China. The vast majority were purchased and provided by the U.S. government. Earlier this year we passed extremely demanding electronic warfare tests conducted by Ukraine's Ministry of Defense and Ministry of Internal Affairs. We believe we are the only American and allied drone company in our class to pass those tests, reflecting months of work across our engineering teams to make our products resilient in contested or congested environments. Skydio's core competency is GPS-denied, vision-based navigation. That skill—common to all of our platforms and customer verticals—gives us an inherent advantage.

To serve our customers, we have hired full-time employees in Ukraine, stood up customer support services, and translated our operating software into Ukrainian. Our U.S.-based team members have completed 30+ trips to Ukraine.

At a high level, Ukraine is pioneering the military application of drones of all sizes. On the battlefield, small, dual-use drones form the cornerstone of the kill chain, gathering real-time information critical to decision making. Almost nothing on the battlefield happens without a drone in the air. In general, soldiers only fire artillery, launch armed first-person-view (FPV) drones, or maneuver with the benefit of information gathered by drones, often small, dual-use drones. Operational and tactical commanders monitor dozens—sometimes hundreds—of drone feeds, orchestrating action in real time.

Without a drone in the air, a soldier is a “[dead man walking](#).” For American audiences, the role played by small drones in Ukraine is profound and initially hard to grasp. In Ukraine, drones have democratized ISR, enabling everyone—including front-line soldiers—to have their own eye in the sky, without competing for scarce aerial resources controlled by higher headquarters. It is a dramatically different landscape from tactics the U.S. military developed during the Global War on Terror, where total air superiority enabled commanders to rely on multi-million-dollar, high-flying systems, and front-line soldiers typically did not need to carry their own aerial ISR capabilities. Great power conflict flips the script.

### b. Ukraine's Lessons for Modern Warfare

Three lessons learned in Ukraine merit discussion:

- 1 *More is more.* In wars of technology attrition, the side that has access to, and the capability to build drones and autonomous systems at scale gains a strategic advantage. Ukraine loses thousands of drones a month, with some estimates as high as 10,000. Many of those are small, dual-use ISR drones made by DJI and other Chinese companies. Those drones are fundamentally hostile to Ukraine's interests. Chinese drones use software to prevent takeoff in Ukraine. If the drone does manage to take off, surveillance technology produced by DJI enables Russian forces to identify—and target—the operator within seconds. To defeat these measures, Ukrainian operators must perform surgery on the drone, installing features that trick the drone into believing it is in a country without geofencing. Getting it wrong is a death sentence.

But the most serious limitation associated with Chinese drones is supply. China has used trade as a weapon of war. In the early days of the war, Chinese drones were plentiful. DJI and Autel publicized their strong opposition to Ukraine's use of their products, but Ukraine and its supporters managed to buy huge stocks from global resellers. Things appear to be changing. In September 2023, China issued novel export controls on small drones, evidently aimed at strangling Ukraine's primary source of supply, illustrating the country's "no limits" partnership with Russia. Based on first-hand accounts, those controls have started to take effect, making it more difficult and more expensive for Ukraine to replenish Chinese systems.

- 2 *Communication resilience is table stakes.* In Ukraine, the electronic warfare (EW) environment is constantly changing, often every few weeks. This dynamic EW environment requires constant iteration and software updates. But AI is the true antidote in an EW environment. AI enables drones and autonomous systems to operate without traditional communications links to a controller or GPS. We recently released a new product, the Skydio X10, that embodies the improvements from our work in Ukraine and elsewhere around the world. Skydio X10 features a next-generation NVIDIA AI processor to detect and avoid obstacles and process information, coupled with the most advanced thermal camera on a small drone. An external radio antenna we designed increases range and reliability. Advanced software features make the system more resilient in the face of radio frequency and GPS-jamming that is a hallmark of the modern battlefield. Built on that strong foundation of software-defined technology, Skydio X10 passed demanding operational tests in Ukraine against high-end electronic warfare, leading Ukraine to request thousands of units to replace Chinese-made drones. Those same capabilities make the drone resilient in enterprise and public safety use cases.

- 3 *Drones must be democratized.* In Ukraine, every soldier—from the frontline ground troops, to top commanders at headquarters—is monitoring, and reliant on, a drone in the air. In the trenches of the front line, small ISR drones flying overhead enable squad-level troop movements and identify targets for kamikaze and first-person view (FPV) drone strikes. Behind the front lines, kilometers away, mid- and long-range drones are conducting broader battlefield surveillance and reconnaissance. Feeds from these drones are provided to brigade headquarters for operational commanders to direct battlefield maneuvers and call for fire.

Ukraine's experience shows that drones must be democratized. The integration of drones throughout every troop echelon can determine the difference between success and failure at the tactical and operational level. Unlike the wars of the past, drones cannot be limited to select units. Operating a drone is as basic—and as important—as operating a rifle. We should not limit drone training to select troops. It must become a shared skill. Some drones are larger and harder to fly and will remain the purview of specialized forces, but every soldier should know how to employ small, unit-level systems.

These lessons from Ukraine serve as a wakeup call. We need to train and equip our forces for the next fight, not the last. I've had the privilege of sharing these lessons with our partners in DOD, and I know they are working around the clock to make the changes we need. The only question is whether they have the funding—and the mandate—necessary to meet this challenge.

### **III. Building the Future Force: Recommendations for Accelerating Drone Procurement**

Although I believe the Defense Department is committed to internalizing the lessons learned in Ukraine, much work remains. Open source projections suggest that the U.S. military's existing stockpiles of drones would last less than two months at the rate of attrition to that faced in Ukraine. Investments are needed in several areas to ensure we have the requisite number of capable drones for modern warfare. DOD and Congress—with its power of the purse—are necessary to make that a reality.

I have three primary recommendations: (1) surge American drones to Ukraine; (2) integrate drones at every level of the military; and (3) utilize non-traditional procurement pathways for drone acquisition. I expand on these three recommendations below.

1. *Surge American Drones to Ukraine.* The United States should surge drones to Ukraine, in particular the small, dual-use ISR drones critical to Ukraine's ability to defend itself. Despite Ukraine's desperate need for these systems and the benefits it would provide to our own military, to date, DOD has not provided small, dual-use ISR drones to Ukraine.

- a. Delivering American small drones to Ukraine does much more than aid in Ukraine's defense. In fact, it is essential to strengthening our own defense. Deploying American-made small drones to Ukraine results in battle-tested products capable of operating in great power conflict. The sooner we learn and adopt these lessons, the stronger our deterrent posture becomes, and the more likely our enemies will think twice before threatening America and our allies.
  - b. Surging drones to Ukraine will naturally enhance the American drone industry's ability to scale manufacturing and offer secure alternatives to the unsecure Chinese drones that dominate the global market. Scalability not only drives down the cost of the systems—which indeed benefits the American military—but sets the foundation for American industry to meet the extraordinary requirements that will face the United States in a time of conflict.
2. *Integrate drones at every level of the military.* Every soldier should have access to attritable, autonomous ISR drones. That will require meaningful increases to existing programs. Dramatically increasing procurement levels, supporting the development of adjacent capabilities, and expanding procurement pathways will put the entire U.S. military on the right path to ensuring the force is properly equipped for modern warfare.
- a. *Scale drones across the military.* To date, existing programs have purchased thousands of drones. As Ukraine has demonstrated, that is a fraction of the amount of systems needed for a protracted great power conflict. Without significant increases—and the establishment of additional, similar programs—the U.S. military will not have the required mass of drones to be decisive on the battlefield.
  - b. *Extend strategic stockpiling to include drones.* Stockpiling munitions remains essential, but is no longer sufficient. The Defense Department should expand stockpiling to include capabilities necessary to close the kill chain, beginning with small, unit-level drones and expanding to other attritable, autonomous systems. Congressional leadership could play a key role.
  - c. *Support next-generation wireless capabilities.* Chinese-made drones often contain advanced wireless solutions based on custom silicon developed by Chinese companies, including those sanctioned by the U.S., such as Huawei. Custom-silicon wireless solutions offer greater range and reliability in a smaller, lighter form factor. Congress should ensure that the DOD supports the development of a silicon-based wireless solution for small drones and other robotics. Those solutions would benefit the entire drone and robotics ecosystem—not just a single company—and would enable a key enhancement in autonomous military systems for our nation's warfighters.

3. *Support the use of existing and novel acquisition authorities and pathways.* Drones and robotic systems improve at a stunningly rapid pace. Acquisition practices need to keep up. Acquisition pathways that provide for speed and flexibility should always be a highest priority when integrating these capabilities throughout the force.
  - a. *Use the fastest existing pathways.* Defense Logistics Agency's Tailored Logistics Support (TLS) Program represents a promising, rapid pathway for drone acquisition. This \$33 billion indefinite delivery, indefinite quantity (IDIQ) provides optionality for specific capabilities, rapid obligation of funds and 4-6 weeks in average processing time. It can also be used across procurement, operations and maintenance (O&M), and research and development accounts.
  - b. *Leverage O&M funding for Group 1 sUAS.* Authorizing O&M dollars for drone purchases will facilitate system replacement for operating forces, expanded training with small drones, and ensure that units can adopt drone capabilities across use cases, such as base security and asset inspection and maintenance.
  - c. *Adopt portfolio-based acquisition.* Over time, DOD should consider adopting portfolio based acquisition practices. Commercial off-the-shelf (COTS) technologies, like drones, represent a potential area to focus on first. As drone technology continues to advance, portfolio-based acquisition would provide the services with far greater flexibility, allowing units to onramp and offramp technology at speed and scale. If something works well and serves key operational needs within the portfolio, DOD would buy more. If it doesn't work well or no longer meets a need, DOD could easily cancel it. This is not to suggest there is no place for programs of record. They can play a valuable role, but need not govern every mission requirement and technology area. In areas with fast-moving technology, portfolio-based practices would enable the Department to equip forces at the speed of innovation.

#### **Conclusion**

The best day to begin preparing for the future is today. To ensure our nation deters or prevails in a great power conflict, we should surge American drones to support our Ukrainian allies, scale drones capable of performing in a contested environment across our own military, and adopt accelerated acquisitions pathways. In 27 years of military service, I watched our nation rise to the occasion countless times. I am confident we will do it again.



## W. Mark Valentine



Mark Valentine is the President and GM of Skydio Global Government where he focuses on delivering autonomous aerial capabilities to national governments around the world to make them more productive, creative and safe.

Prior to joining Skydio in 2023 he was the SVP/GM for Scale AI's Federal Team and the GM of Microsoft's National Security Team. In those roles he focused on delivering advanced technologies such as AI/ML, cloud computing and mixed reality to warfighters and analysts across the US Federal Government. Prior to his time in industry, he served in the US Air Force for over 25-years as a combat veteran fighter pilot (F-16), commander, and staff officer at Headquarters US Air Force and the Joint Staff.

Mark holds a Bachelor of Science in Astronautical Engineering from the United States Air Force Academy and a Master of Arts in International Security Policy from Georgetown University. Additionally, he attended the University of Virginia's Darden Graduate School of Business as a Secretary of Defense Fellow. He is also a graduate of the US Air Force Weapons School, NATO Tactical Leadership Program, the National Emergency Management Executive Academy (joint program of the Emergency Management Institute and Harvard University) and the Foreign Service Institute's National Security Executive Leadership Seminar.

Mark currently lives in Fairhope, Alabama where he is active in the American Legion Boys State program and several non-profit boards. He and his wife, Moira, have two children and have recently transitioned to empty nesters.

**DISCLOSURE FORM FOR WITNESSES  
COMMITTEE ON ARMED SERVICES  
U.S. HOUSE OF REPRESENTATIVES**

**INSTRUCTION TO WITNESSES:** Rule 11, clause 2(g)(5), of the Rules of the House of Representatives for the 118<sup>th</sup> Congress requires nongovernmental witnesses appearing before House committees to include in their written statements a curriculum vitae and a disclosure of the amount and source of any federal contracts or grants (including subcontracts and subgrants), and contracts or grants (including subcontracts and subgrants), or payments originating with a foreign government, received during the past 36 months either by the witness or by an entity represented by the witness and related to the subject matter of the hearing. Rule 11, clause 2(g)(5) also requires nongovernmental witnesses to disclose whether they are a fiduciary (including, but not limited to, a director, officer, advisor, or resident agent) of any organization or entity that has an interest in the subject matter of the hearing. As a matter of committee policy, the House Committee on Armed Services further requires nongovernmental witnesses to disclose the amount and source of any contracts or grants (including subcontracts and subgrants), or payments originating with any organization or entity, whether public or private, that has a material interest in the subject matter of the hearing, received during the past 36 months either by the witness or by an entity represented by the witness. Please note that a copy of these statements, with appropriate redactions to protect the witness's personal privacy (including home address and phone number), will be made publicly available in electronic form 24 hours before the witness appears to the extent practicable, but not later than one day after the witness's appearance before the committee. Witnesses may list additional grants, contracts, or payments on additional sheets, if necessary. Please complete this form electronically.

**Hearing Date:** September 16, 2024

**Hearing Subject:**

**Fielding Technology and Innovation: Industry Views on Department of Defense Acquisition**

**Witness name:** Mark Valentine

**Position/Title:** President and General Manager of Global Government

**Capacity in which appearing:** (check one)

Individual       Representative

**If appearing in a representative capacity, name of the organization or entity represented:** Skydio

**Federal Contract or Grant Information:** If you or the entity you represent before the Committee on Armed Services has contracts (including subcontracts) or grants (including subgrants) with the federal government, received during the past 36 months and related to the subject matter of the hearing, please provide the following information:

\*\*\* See Attached Document – Appendix A

Breakout By Customer (\$M)	2021	2022	2023	2024 (YTD)
DOD	35.1	23.8	30.2	33.9
FED CIV	4.6	12.8	19.3	11.8
Total	39.7	36.6	49.5	45.7

**Foreign Government Contract, Grant, or Payment Information:** If you or the entity you represent before the Committee on Armed Services has contracts or grants (including subcontracts or subgrants), or payments originating from a foreign government, received during the past 36 months and related to the subject matter of the hearing, please provide the following information:

\*\*\* See Attached Document – Appendix B

International Sales by Region (\$M)	2021	2022	2023	2024 (YTD)
Americas	0.9	0.1	0.7	1
Europe	0.04	7.3	4.2	1.7
Middle East	0.02	0.1	3.8	3.1
APAC	0.3	0.5	1.4	18
Total	1.26	8	10.1	23.8

**Fiduciary Relationships:** If you are a fiduciary of any organization or entity that has an interest in the subject matter of the hearing, please provide the following information:

Organization or entity	Brief description of the fiduciary relationship

**Organization or Entity Contract, Grant or Payment Information:** If you or the entity you represent before the Committee on Armed Services has contracts or grants (including subcontracts or subgrants) or payments originating from an organization or entity, whether public or private, that has a material interest in the subject matter of the hearing, received during the past 36 months, please provide the following information:

2024

Contract/grant/ payment	Entity	Dollar value	Subject of contract, grant, or payment

2023

Contract/grant/ payment	Entity	Dollar value	Subject of contract, grant, or payment

2022

Contract/grant/ payment	Entity	Dollar value	Subject of contract, grant, or payment

2021

Contract/grant/ payment	Entity	Dollar value	Subject of contract, grant, or payment

U.S. House Armed Services Committee

Hearing: Fielding Technology and Innovation: Industry Views on Department of Defense

September 16, 2024

Hearing Written Statement:

Brandon Tseng, Co-Founder and President, Shield AI

Chairman Rogers, Ranking Member Smith, and HASC members:

**Intro and Background**

Thank you for hosting this fielding hearing on acquisition. The legislative work you are doing is vital, and I appreciate your consideration and swift action. Thank you for your service.

My name is Brandon Tseng. I am the Co-founder and President of Shield AI, a nine-year old, multi-billion-dollar defense technology company I founded with my brother in 2015. I am an engineer and a former Navy SEAL and Surface Warfare Officer with deployments to the Pacific, and the Arabian Gulf, and twice to Afghanistan. Shield AI's mission is to protect service members and civilians with artificially intelligent systems.

To achieve this mission, we are building the world's best AI pilot, which is self-driving autonomy technology for aircraft. This technology enables drones to execute a mission without GPS, communications, or remote pilots. It also enables the concept of swarming. AI pilots that enable edge autonomy are critically important because Russia, China, and Iran are jamming GPS and communication links to stop our legacy drones and weapons that rely on GPS or communications, and have proliferated surface to air missile systems to stop our manned fighter jets. Air superiority – America's most important conventional deterrent – has been eliminated.

One way we offset this is through the use of AI pilots. AI pilots enable swarms of drones to work together, decoupling military power from manpower. Soon, a single person will be able to effectively command and maneuver thousands of drones on the battlefield. An adversary military with a budget of \$25 billion that effectively employs lower cost drones and autonomy will be able to decimate a military with an \$800 billion budget without drones and autonomy.

In the same way naval aviation transformed the naval force structures, shifting from battleship formations to carrier strike groups, autonomy and low-cost drones will transform existing military force structures.

Shield AI won the DARPA Alpha Dogfight in 2020, beating all other AIs and human pilots in simulation, and has been flying actual F-16s autonomously since 2022. We have more flight hours than any company in the world flying jet aircraft autonomously. The Secretary of the Air Force flew in one of our AI-piloted F-16 flights in May. We also build and manufacture an AI-piloted, vertical take-off launch and land drone, the MQ-35 V-BAT, that accomplishes the same mission as \$40 million and \$100 million aircraft at a fraction of the cost. The V-BAT is a U.S.

Special Operations Command (USSOCOM) and U.S. Coast Guard Program of Record. It has interdicted billions of dollars of drugs in the Caribbean Sea, and found targets in the Indo-Pacific and Central Command theatres with our Navy and Marine Corps. Most recently, it has been used by the Ukrainian military to successfully execute a first of its kind deep penetration targeting mission while GPS and communications were jammed, resulting in strategic effects for the Ukrainians. Our autonomous, AI-piloted indoor quadcopter, NOVA, has brought service members home safely to their families and played a life-saving role in hostage rescue operations in Israel.

My perspectives on acquisition in the Department of Defense (DoD) is informed by my experiences working through acquisition problems every single day for the past nine and a half years. I have personally led the effort to scale revenues from zero to hundreds of millions of dollars in the defense sector, something maybe only three to five people have achieved in the past 30 years. This experience has shaped my view on DoD acquisition.

**Acquisition Reform: Requirements-based vs. Problems-based Acquisition**

Henry Ford once stated, "If I asked people what they wanted, they would ask for faster horses." The DoD, quite literally, has been buying faster horses for the past 60 years, and still loves to buy a faster horse. The F-22 is faster than the F-16; hypersonic missiles are faster than Tomahawks, the MV-22 Osprey is faster than the MH-60 Blackhawk. Some of these horses can run longer and carry more, and some are harder to see and come with special saddles and reins, but the general point remains. This is because the DoD acquisition process is not built to solve problems or innovate for the warfighter. It is built to fulfill requirements, and the DoD budget follows those requirements.

To remain relevant and competitive, the DoD must change from a requirements-based acquisition system to a problem-based acquisition system. Today, requirements documents and operational needs statements mandate that the warfighter propose the solution to a given problem. If this occurs, the proposed solution goes through tens of levels of consideration and validation before it even becomes a requirement. The requirement must then go through years of planning, budgeting, and staffing before a solution can be delivered to the warfighter. Sometimes this can take three years, other times it can take 20, just to get a faster horse

This requirements framework and lengthy process disincentivizes companies from innovating. "We don't lift a pen until the requirement is validated and budgeted," is a phrase I have heard too many times from many traditional defense contractors. And why would they? They could build an engine that defies physics and allows an aircraft to carry one million tons, but if its speed doesn't meet the requirement, it won't be purchased until a new requirement is validated and budgeted in ten years.

If the U.S. Army of 1908 had the same DoD requirements-based acquisition system we have today in 2024, Henry Ford would have been presented with the requirement that, the horse must only require 15 pounds of hay per day. He would never have been able to meet this requirement, and cars would never have been introduced to soldiers. Further, how many Army requirements writers in 1908, the year that Model T was introduced, could write a requirement for an internal

combustion engine? In 2024, how many DoD requirements writers can write a requirement around an AI-algorithm? They can't, so they ask for faster horses.

No one at NASA wrote a requirement that the rocket must land. This is probably because they didn't think it was possible or cost-feasible, because so many defense contractors had told them so. SpaceX recognized that the root problem of space exploration was cost of launch, and came up with novel hardware-software solutions to launch and land rockets. They brought cost down by 100x.

No one has written a requirement that a 120-pound drone must accomplish the same effects of a 10,000 pound drone that costs \$40M and have AI onboard capable of piloting without GPS or communications and costs less than the surface to air missiles that are shooting it. But Shield AI has recognized the root problems of electronic warfare countermeasures, surface to air missile systems, and cost asymmetries between exquisite platforms and cheap missiles have denied U.S. air superiority; and we have built and deployed AI-piloted drones that solve this problem.

Unfortunately, 99% of DoD dollars continue to flow to existing and faster horses because that is what the requirements request. The DoD needs to shift funding and priorities toward solving problems instead of fulfilling requirements. To do this, we must transition from a requirements-based acquisition system to a problem-based acquisition system. The customer, i.e. the warfighter, should tell industry about their problems in the most intimate detail, then industry develops a novel solution. Instead of budgets being driven by requirements, budgets are driven by the problem-solving solution.

**Software acquisition: Wins**

Outside of major acquisition reform that moves away from requirements-based acquisition to problem-based acquisition, the DoD has experienced pockets of success because there are clever, smart, driven people who find and take advantage of the authorities already granted to them by Congress. This is not happening at scale and is certainly not institutionalized inside the DoD, but it is worth applauding the wins as good examples.

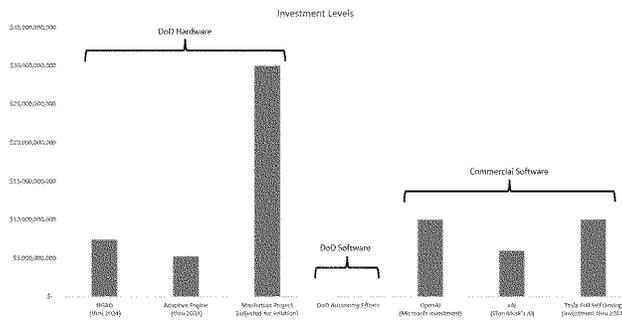
One example is the Air Force's Collaborative Combat Aircraft program, which has bifurcated the acquisition process into hardware and software pathways. This acquisition strategy enables companies to focus on what they do best and brings non-traditional, software-first companies to the table. Equally important is that the program is structured around regular, incremental buys of hardware and software, keeping all vendors on contract and incrementally issuing task orders. This structure keeps vendors competing, producing actual products, and incentivized to perform. In many "traditional" programs where the vendor has won the whole program, the government is stuck with a system for 40 years despite poor performance, delays, cost overruns etc.

On the legislative side, one provision in the current House National Defense Authorization Act that I would highlight is Section 833, Autonomous Unmanned Aerial System Acquisition Pathways. This would create a contracting preference for the DoD to use this dual acquisition pathway for integrating autonomy onto new and existing military aircraft. The old model is a hardware focused competition, where the software is not selected as the best software, but often just happens to be the one subcontracted to a hardware prime. This usually delivers sub-par

software. Instead, the new model competes hardware and software independently and simultaneously, allowing for a competitive process that reveals the best option for both, then integrates the hardware and software. It will deliver the best product for the warfighter, while increasing competition. This section builds upon the good efforts to integrate autonomous technology onto the new and existing aircraft, enabling these aircraft to be fundamentally survivable in the future fight. The DoD must enable aircraft with new autonomy capabilities that will be necessary to dominate on the battlefield, such as operations in GPS and comms denied environments. Lastly, I think Section 833 is complimentary to the committee's language in the previous year's NDAA around next generation jet aircraft programs in the U.S. Air Force and Navy. It's worth noting there is similar language in the Senate bill, which will surely be conferenced.

**Software acquisition: Challenges**

While these are steps in the right direction that recognize the strategic importance of software in these programs, there are still major issues. The principal issue, once again, stems from misplaced budget priorities stemming from legacy requirements. Additionally, there is still a massive cultural misconception in the DoD that software is "cheap." "It's just software." "The cost to print software is free." "Microsoft 365 is just \$50/month." These are just a few examples of phrases heard from the DoD that fail to recognize the value, and costs, associated with software. Below is a visual representation of some of the investment levels for strategic capabilities from the DoD versus investment for select AI-products from commercial ventures.



Autonomy software will enable swarms of highly intelligent unmanned systems to operate in a dynamic battlefield environment. It resolves military personnel constraints by enabling a small four-person element to employ and effectively command thousands to millions of drones. Autonomy software is more important than stealth technology or GPS satellites were. "Autonomy is the hard part about what we're doing...autonomy will pace how we think about China," is how one senior DoD acquisition leader described it. But because autonomy is not hardware, the budget for these capabilities is not serious. This must change if the U.S. is to lead.

**Closing**

Many of the capabilities that are required to deter our adversaries will stem from software-first capabilities like edge autonomy or battle management systems. DoD requirements writers do not know how to write software requirements, and the requirements process is too lengthy to deliver the capabilities needed by our warfighter. There have been wins in bifurcating programs between hardware and software acquisition and buying regularly; but the software budgets pale to their value delivery and must be increased and scrutinized.

There are hard problems to solve, and I applaud leaders in Congress, the DoD, and industry, like Shield AI and the other companies present at this hearing, that are committed to solving these problems. As a Navy SEAL, I have personally experienced the hard work and dedication exhibited by our servicemembers to deter conflict, protect the downtrodden, and bring stability to the world. The United States continues to be a beacon of hope and light for the rest of the world, built on enduring values that all are created equal and endowed with the unalienable rights of life, liberty, and the pursuit of happiness. I can think of no mission more honorable and noble, than making sure that beacon continues to burn bright. Thank you for having me before the committee today.

**Primary Recommendation:**

1. Establish a new problem-based acquisition system outside and distinct from the Joint Capabilities Integrations and Development System.
  - a. Center a problem-based acquisition system around problems to be solved and evaluation criteria around solutions without dictating specific requirements.
  - b. Provide flexible budgeting and resourcing and center principally around value provided (instead of cost).
  - c. Set a target of 25% adoption of major acquisition efforts in three years under a problem-based acquisition system.

**Other Recommendation:**

1. Establish pre-deployment training policy that mirrors the current and future battlefield by ensuring that all major deploying units execute at least two full mission profiles and major squadron/combined arms integration exercises under electronic warfare environmental conditions (GPS jamming/spoofing; Communications jamming). Reports on the survivability of U.S. weapons, ISR, C2 systems shall be generated within 30 days of said exercises.



## Brandon Tseng

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### PRESIDENT AND CO-FOUNDER

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Brandon Tseng is Shield AI's President & Cofounder. Previously, Brandon proudly served in the Navy for seven years as a SEAL and Surface Warfare Officer aboard USS Pearl Harbor (LSD 52). He founded Shield AI – with the mission to protect service members and civilians with intelligent systems – driven by firsthand experiences during deployments to Afghanistan (x2), the Pacific Theater, and the Arabian Gulf. At Shield AI, Brandon leads all aspects of growth – business development, corporate development, strategy, marketing, and government relations – to help Shield AI achieve its mission at a global scale. Brandon earned his B.S. in Mechanical Engineering from the U.S. Naval Academy and his MBA from Harvard Business School.

#### Company Overview

Founded in 2015, Shield AI is a venture-backed defense technology company whose mission is to protect service members and civilians with intelligent systems. In pursuit of this mission, Shield AI is building the world's best AI pilot. Its AI pilot, Hivemind, has flown a fighter jet (F-16), a vertical takeoff and landing drone (V-BAT), and a quadcopter (Nova). The company has offices in San Diego, Dallas, Washington, D.C., and abroad. Shield AI's products and people are currently in the field actively supporting operations with the U.S. Department of Defense and U.S. allies. For more information, visit [www.shield.ai](http://www.shield.ai). Follow Shield AI on LinkedIn, Twitter, and Instagram.

**DISCLOSURE FORM FOR WITNESSES  
COMMITTEE ON ARMED SERVICES  
U.S. HOUSE OF REPRESENTATIVES**

**INSTRUCTION TO WITNESSES:** Rule 11, clause 2(g)(5), of the Rules of the House of Representatives for the 118<sup>th</sup> Congress requires nongovernmental witnesses appearing before House committees to include in their written statements a curriculum vitae and a disclosure of the amount and source of any federal contracts or grants (including subcontracts and subgrants), and contracts or grants (including subcontracts and subgrants), or payments originating with a foreign government, received during the past 36 months either by the witness or by an entity represented by the witness and related to the subject matter of the hearing. Rule 11, clause 2(g)(5) also requires nongovernmental witnesses to disclose whether they are a fiduciary (including, but not limited to, a director, officer, advisor, or resident agent) of any organization or entity that has an interest in the subject matter of the hearing. As a matter of committee policy, the House Committee on Armed Services further requires nongovernmental witnesses to disclose the amount and source of any contracts or grants (including subcontracts and subgrants), or payments originating with any organization or entity, whether public or private, that has a material interest in the subject matter of the hearing, received during the past 36 months either by the witness or by an entity represented by the witness. Please note that a copy of these statements, with appropriate redactions to protect the witness's personal privacy (including home address and phone number), will be made publicly available in electronic form 24 hours before the witness appears to the extent practicable, but not later than one day after the witness's appearance before the committee. Witnesses may list additional grants, contracts, or payments on additional sheets, if necessary. Please complete this form electronically.

**Hearing Date:** 9/16/2024

**Hearing Subject:**

Fielding Technology and Innovation: Industry Views on Department of Defense Acquisition

**Witness name:** Mr. Brandon Tseng

**Position/Title:** Co-Founder, President, and Chief Growth Officer

**Capacity in which appearing:** (check one)

- Individual       Representative

**If appearing in a representative capacity, name of the organization or entity represented:**

Shield AI

**Federal Contract or Grant Information:** If you or the entity you represent before the Committee on Armed Services has contracts (including subcontracts) or grants (including subgrants) with the federal government, received during the past 36 months and related to the subject matter of the hearing, please provide the following information:

## 2024

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
70Z02324F9313	USCG	\$12.8M	USCG ISR Missions
N00421219002	NAVAIR	\$4.2M	MTUAS
Classified	DoD	Classified	Classified
47QFCA21F0081	GSA	\$15M	C4ISR
N000192490020	NAVAIR	\$11	Autonomous pilots

## 2023

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
N004212190022	NAVAIR	\$26+M	MTUAS
SPE8EL23FJ0Y1	DLA	\$12M	MQ-35 V-BAT Hardware
FA228023C0008	AFRL	\$4.25M	Autonomous pilots
47QFCA21F0081	GSA	\$11M	C4ISR

## 2022

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
N004212190022	NAVAIR	\$22M	MTUAS
47QFCA21F0081	GSA	\$17.7M	C4ISR
W911QY-21-9-0031	DoD	\$11	iPRD
SPE8EL22FJ172	DLA	\$9.3	V-BAT

## 2021

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
W911QY-21-9-0031	DoD	\$14M	iPRD
FA864920C0158	USAF	\$17M	AI pilots
HQ00342190013	DoD	\$4M	AISUM

**Foreign Government Contract, Grant, or Payment Information:** If you or the entity you represent before the Committee on Armed Services has contracts or grants (including subcontracts or subgrants), or payments originating from a foreign government, received during the past 36 months and related to the subject matter of the hearing, please provide the following information:

**2024**

Foreign contract/ payment	Foreign government	Dollar value	Subject of contract, grant, or payment
8500015272	Dutch MoD	Less than \$1M	Demonstration

**2023**

Foreign contract/ payment	Foreign government	Dollar value	Subject of contract, grant, or payment
N/A			

**2022**

Foreign contract/ payment	Foreign government	Dollar value	Subject of contract, grant, or payment
N/A			

**2021**

Foreign contract/ payment	Foreign government	Dollar value	Subject of contract, grant, or payment
N/A			

**Fiduciary Relationships:** If you are a fiduciary of any organization or entity that has an interest in the subject matter of the hearing, please provide the following information:

Organization or entity	Brief description of the fiduciary relationship
N/A	N/A

**Organization or Entity Contract, Grant or Payment Information:** If you or the entity you represent before the Committee on Armed Services has contracts or grants (including subcontracts or subgrants) or payments originating from an organization or entity, whether public or private, that has a material interest in the subject matter of the hearing, received during the past 36 months, please provide the following information:

2024

Contract/grant/ payment	Entity	Dollar value	Subject of contract, grant, or payment
N/A			

2023

Contract/grant/ payment	Entity	Dollar value	Subject of contract, grant, or payment
Partnership	Kratos	N/A	AI pilots

2022

Contract/grant/ payment	Entity	Dollar value	Subject of contract, grant, or payment
N/A			

2021

Contract/grant/ payment	Entity	Dollar value	Subject of contract, grant, or payment
N/A			

STATEMENT BY SHYAM SANKAR  
CHIEF TECHNOLOGY OFFICER  
PALANTIR TECHNOLOGIES INC.

BEFORE THE 118TH CONGRESS  
COMMITTEE ON ARMED SERVICES  
U.S. HOUSE OF REPRESENTATIVES

16 SEPTEMBER 2024

## Introduction

Chairman Rogers, Ranking Member Smith, distinguished members of the Committee, thank you for the opportunity to discuss one of the most important tasks ahead of us all today: How to drastically improve the ability of the Department of Defense (DoD) to adopt and field emerging technologies at speed, at scale, and with maximum operational effectiveness.

We are long past debating whether software and AI-enabled technologies are essential to America's ability to deter, and if necessary, defeat its adversaries. Today, we all agree that it is only through the deep integration of hardware and software that America can gain and sustain its unmatched advantage on the battlefield.

Through real-world testing, evaluation, and military exercises — like Valiant Shield, Scarlet Dragon, and the Global Information Dominance Experiments (GIDE) — we have already seen the foundations of a truly operational Combined Joint All-Domain Command and Control (CJADC2) capability, where advanced software and AI-enabled capabilities are fueling an unparalleled degree of integration and interoperability. AI-enabled software is helping weave together disparate data sources, sensors, platforms, and operators across all domains, giving the United States and its allies the ability to visualize the battlefield — and act on what they see — far better than ever before.

There is no doubt that key leaders in the Pentagon — including Secretary of Defense Lloyd Austin III, Deputy Secretary of Defense Dr. Kathleen Hicks, Director of the Defense Innovation Unit Doug Beck, and Chief Digital and Artificial Intelligence Officer Dr. Radha Plumb — recognize this necessity and have become champions of innovative acquisition.

But our initial progress is not enough. We are in a state of emergency. America's Armed Forces face complex operating theaters with adversaries who enjoy unique geographic and military advantages. In this environment, the only way for the United States to win is to leverage the strongest technological assets at its disposal. We — government and industry together — must determine how to do this.

As we face these challenges, we must accept that winning is the only requirement. And we must accept that speed has a quality all its own. To prevail in the next great war, the U.S. must have the capacity to develop, procure, field, and scale technological solutions at a pace that far exceeds its adversaries.

Specifically, to achieve needed levels of speed and effectiveness, we must:

1. Empower America's defense and commercial industrial base, including non-traditional software and defense technology providers, to build and sell their capabilities to the Defense market;
2. Ensure that the procurement community deploys every creative authority, pathway, and acquisition tool available to adopt mission-critical technologies at speed; and
3. Take a "field-to-learn" approach to software adoption by rapidly deploying, testing, and iterating on software in real-world conditions so that it is battle-ready.

More broadly, we must also encourage our political and military leaders to view innovative heretics — within government, the military, and industry — not as pesky disruptors, but as heroes who are eager and able to help fuel "[Freedom's Forge](#)."

I am honored that the Committee on Armed Services has invited me to share my views on these challenges, and importantly, on how we can address them through decisive action today.

### **Strengthening and Buying from the American Industrial Base**

A little over thirty years ago, William Perry hosted a dinner that we now call the "Last Supper." Foreseeing a world in which defense industrial production would exceed America's military need, he encouraged the robust community of commercial defense vendors to consolidate. We are here today because the Department of Defense believes it has the opposite problem — a sluggish industrial base that may be unable to sustain the levels of production required to meet the next generation of defense needs.

In my view, this perception is wrong: Today, we are witnessing what I like to call a "[First Breakfast](#)" across America's commercial defense base. Thanks in part to the marriage of software and hardware, the private sector is already re-industrializing and diversifying at an incredible pace, and new companies are eagerly striving to bring their most cutting edge technologies to the government market. While the Last Supper caused what was once a dynamic industry of creatives to become a stagnant industry of conformity, First Breakfast is now reversing this decades-long trend.

The challenge, therefore, is not that America's industrial base is too small or too slow, but that government is unable to harness its full potential. Fortunately, the set of actions and policies that are going to have the greatest impact on the Pentagon's ability to acquire critical capabilities at speed and scale are also the simplest: Allow the free market to build commercial solutions that meet government needs, and then actually purchase those solutions from commercial vendors who can deploy mission-critical capabilities at greater effect, speed, and cost than solutions built in-house.

More specifically, I can offer the following recommendations:

**First**, and most importantly, the government must **buy commercially-available solutions** that can provide capability on day one. The commercial sector is capable of providing the most effective software and AI-enabled solutions on the quickest timelines and at the lowest prices. But program offices will often opt to build software-centric platforms in-house, even after they have been exposed to readily-available commercial solutions. This impulse by the procurement community to build in-house is driven by a number of factors, including: (a) a fear of “vendor lock;” (b) the belief that every solution for the DoD must be customized, and (c) sticker shock at the initial amount of a fixed-price package, service, or license.

Yet the decision to eschew commercial solutions due to these fears is both wasteful and, often, against the law. Despite the fact that commercial solutions are built for maximum flexibility and interoperability, building in-house solutions from scratch, rather than buying commercially-available software, delays the delivery of mission-critical technologies — sometimes by years — and further wastes taxpayer dollars and DoD time on solutions that cannot match the quality of commercial offerings. While industry leaders understand DoD concerns, the Department often seeks to avoid any form of lock-in at all costs, and I would argue that doing so actually locks warfighters *out* of access to the very tools they need, while locking in subpar solutions. Congress introduced commercial item preference — as inscribed by FAR Part 12 and 10 USC § 3453 — for good reason, and it must ensure that the DoD upholds it.

**Second**, the Department of Defense should **drop its insistence on custom solutions procured via Cost-Plus contracting** as a default. Although procurement offices may believe that cost-plus contracts can help avoid undue profiteering — by placing limits on contractor margins — the practice of pushing cost-plus for all procurements undermines the DoD’s ability to adopt best-in-class capabilities in two ways. First, for those traditional companies who will compete for those contracts, it encourages them to forgoe ground-breaking R&D and embrace a system of building for rigid requirements that unfold over lengthy development timelines and ultimately drive up government spending. Second, because cost-plus frameworks are completely incompatible with the business model of most non-traditional defense tech providers — who instead require Firm-Fixed Price or other models — the insistence on cost-plus is driving innovative commercial tech firms away from the government market. The reason is that while commercial technology firms rely on large-scale, early-stage private capital investments to fund the hiring of world-class talent and ground-breaking R&D, cost-based pricing drastically undervalues these full lifecycle costs of commercial innovation and leads to contracts that limit firms’ abilities to safeguard returns on their investments. As a result, non-traditional firms that want to survive will either have to split their commercial and government businesses apart to adopt the business model of the traditional defense community, or have no choice but to eschew the government as a customer altogether. This is bad for the warfighter, it is bad for taxpayers, and it is bad for the broader health of the industrial base. As such, I strongly encourage Congress to help ensure that built-from-scratch solutions and cost-plus contracting are only used as a last resort.

**Third**, Congress and the Department of Defense must **streamline the overly complex and costly accreditation process**. Many members of the defense industrial base simply do not have the resources to apply and comply with different Authorities to Operate (ATOs) every time they seek a contract. One long-term solution would be to further centralize and standardize the ATO

process across the DoD and even the entire U.S. government. Other solutions could include creating pre-approved platforms and marketplaces where vendors can offer their solutions. The CDAO's Open DAGIR ecosystem is a strong example of creative problem solving in this domain.

In short, the key to unlocking the necessary speed of capability delivery and impact is to field and adopt solutions that work today, not tomorrow. To do so, the DoD must follow its own guidance and U.S. law, which encourages the procurement of commercial solutions that are ready to help win the fight tonight. The defense tech ecosystem is eager to sell its solutions to the government, but this essential pillar of the defense industrial base will only survive if the U.S. government is also eager to adopt their solutions, unburdened by policies that hinder free market forces.

### **Improving Procurement by Using All Acquisition Authorities**

Congress must also work with the Pentagon to improve the acquisition process, namely by making sure that the acquisition community is making the most of the diverse procurement tools that are already available to adopt new technology quickly and flexibly. Not only do most early-stage tech companies wither in the face of two-year budget cycles — the commercial sector now operates on a quarterly budget basis — warfighters themselves cannot afford a two-year gap between identifying a need and receiving it. Fortunately, the DoD doesn't have to operate at its current pace.

**First**, procurement officers already have a wide range of tools available to speed up procurement timelines — from OTAs and MTAs to Software Acquisition Pathways and other creative authorities — that are not utilized often enough. For example, Joint Urgent/Emergent Operational Needs (JUON/JEONs) and Operational Needs Statements (ONS) are valuable tools for capability delivery that could be used at a much higher rate. I can say from personal experience that without the use of JUON or ONS's, Palantir would not have been able to deliver essential support to units on the battlefield in Afghanistan and Iraq when warfighters needed it. In fact, I would argue that Palantir as a company would not have been able to stay in business without contracting from JUON/JEONs pathways. Simply put, when the DoD's normal planning process is too slow, too top-down, and too deductive to meet all warfighter needs, these unique acquisition tools provide the type of inductive problem solving that defines the American spirit and enables victory. As such, these procurement authorities should be viewed as a feature — not a bug — which are simply not used at the scale we need to deter and win.

To be clear, one cannot fully blame program officers for shying away from creative solutions as they are trained to be risk-averse, and so naturally view these pathways as exceptions to avoid. However, the simplest solution is for Congress and Pentagon leadership to **actively encourage procurement and program officers to use every available acquisition tool at their disposal** to ensure the best capabilities are being delivered at the pace warfighters deserve and expect.

**Second**, additional tactical solutions can be found in the recently completed final report of

Commission on Planning, Programming, Budgeting, and Execution (PPBE) Reform, which offers numerous recommendations for how the DoD can help ensure warfighters are getting what they need, when they need it. In particular, I can suggest that the Committee **examine Recommendations 5 (“Consolidate RDT&E Budget Activities”), 6 (“Increase Availability of Operating Funds”), 7 (“Modify Internal DoD Reprogramming Requirements”), 8 (“Update Values for Below Threshold Reprogrammings”), and 11 (“Address Challenges with Colors of Money”) of the PPBE Reform Commission’s final report** as opportunities to accelerate commercial software adoption.

In sum, for capabilities to be effective, they have to be in the hands of warfighters at the very moment they need them. No matter how critical a capability, if it is stuck in a two-year Program Objective Memorandum (POM) budgeting cycle, its effectiveness today is *zero* and the opportunity costs — in meeting mission needs, ensuring national security, and safeguarding American lives — are exponential.

### **Field-to-Learn-to-Win: Deploying Capabilities in Real-World Conditions**

Identifying and procuring the right solution is never the last step in the process of delivering world-class capabilities to service members who need them. As the DoD has long recognized, “software is never done,” requiring continuous innovation, integration, and delivery. And the only way to build that feedback loop is to **embrace a “field-to-learn” approach** of rapidly fielding software to end-users, having them deploy it in real-world conditions, and then taking the lessons from contact with reality to immediately fix bugs and develop new tools. This approach is the only way to ensure that software is battle-ready.

What I am describing is more than just end-user touch points, which are themselves incredibly valuable in earlier production stages. I am talking about the value of real-world, combined, joint, all-domain exercises in which end-users deploy the capabilities as they are intended, and under the most strenuous conditions possible. What fails will be fixed, what works will be scaled, and what remains unknown will be probed.

As noted above, there are already powerful examples of such exercises providing immediate value to defense readiness. I therefore strongly encourage Congress to **provide the DoD with additional funding for more “field-to-learn” exercises**, so more units across the Services and Combatant Commands (CCMDs) can take advantage of this process and at a greater frequency.

The NGA Maven program, arguably the most successful and sought-after AI program across the defense and intelligence communities, exemplifies the benefits of a field-to-learn approach. Since its inception in 2017, Maven has grown from helping with computer vision and algorithm development to what is now a complete AI-enabled platform (Maven Smart System, or “MSS”) serving as the foundational technology supporting America’s CJADC2 capability. What started as an experiment with the special operations community and the XVIII Airborne Corps is today a fully-fielded decision support system that enables tens of thousands of users — across multiple CCMDs and the Joint Staff — in real-world scenarios and on the frontlines of major crises.

Maven grew more robust over time because Congress, the DoD and CDAO, and the National Geospatial-Intelligence Agency (NGA) committed to a field-to-learn development and deployment process, in which service members and industry engineers partnered from day one to ensure continuous delivery, innovation, and growth.

To better understand the conditions that enabled Maven's success, I encourage you to read a recent report from Georgetown University's Center for Security and Emerging Technology, "[Building the Tech Coalition](#)." The report's findings include many of the recommendations made above as lessons learned. For example, the report highlights that "embedding engineers and developers with military operators in their everyday work and for wargaming exercises helped to avoid misunderstandings and realize new opportunities in the development of MSS. Developers came to better understand the needs of soldiers and soldiers came to see new opportunities to operate more efficiently." Furthermore, the report identifies the importance of onboarding new vendors with speed and ease, arguing that "public network enclaves supported faster onboarding times for new companies looking to contribute to MSS." And importantly, the report argues that "the common thread among the contracting mechanisms supporting MSS is flexibility. That flexibility enabled experimentation and innovation within the DevSecOps process."

Given this clear and highly impactful example in the NGA Maven program, I can thus make two additional recommendations to the Committee. First, to further scale Maven's impact, Congress should **provide funding to expand the scope of users across the Joint Force and CCMDs who will have access to MSS** as a fully operational and continuously improving warfighting resource. Continued Congressional and DoD support for Maven outlines a path forward for software acquisition and incentivizes other commercial companies to supply to the government. Second, another pathway to leverage the program's success is to encourage the DoD to **scale the lessons learned from NGA Maven to the development and delivery of other critical capabilities**.

Finally, since it is ultimately the CCMDs who are responsible for deploying capabilities and warfighters on the battlefield, Congress should **empower the CCMDs as buyers and provide them with a budget** to procure what they need and inject necessary signals to the rest of the system. The Services strive to acquire capabilities that the CCMDs want to buy, but sometimes what the Services acquire is simply not what the CCMDs need, both in terms of capability and scale. While it would be unnecessary to shift the full burden of procurement onto the CCMDs, moving even 5% of the budget will allow the CCMDs to find alternative capabilities when they are in need, as well as generate some space for healthy competition between the Services and CCMDs to be the most effective and efficient providers of solutions to warfighters.

All of the above recommendations — using and strengthening every corner of the defense industrial base, improving the acquisition process, and taking a field-to-learn approach to capability development and delivery — are collectively essential to ensure the delivery of mission-critical capabilities at a speed and scale that the current geopolitical threat environment demands.

## Conclusion

Esteemed Committee Members, we have no time to waste. Mobilization Day was yesterday, and we must use every ounce of effort to ensure the U.S. military has access to every tool our society can offer to meet the challenges ahead.

I am here to say, on behalf of so many colleagues across industry, that we are not just ready — we are painfully eager to do our part to ensure America's warfighters will want for nothing. That our country's brave service members will have access to the world's best technological capabilities and wield an unrivaled advantage in the fusion of software and hardware.

To do so, however, we need the freedom to do what industry does best: Build. And we can only do so at the pace and rigor this moment commands in partnership with the government. This partnership does not require a new process, or a massive overhaul of an existing program. What we need is simply to commit to winning above all else, and the willingness to jettison old rules, regulations, and norms when they are standing in the government's own way — the kind of healthy rule-breaking that crisis often requires.

Furthermore, we need to reclaim the courage to empower innovative leaders across government, industry, academia, and civil society who are willing to push boundaries and break processes that stand in the way of building capabilities at the speed and scale required to keep our country safe. In short, we need to unleash and empower what I like to call America's "Heretics and Heroes." These are the leaders who have the discretion to take stakes, make bets, and build big, as well as the gall to push through any barrier that stands in their way. Former Secretary of Defense William Perry was one of these heretical heroes — he pushed through stealth and GPS technology, not by diligently working the PPBE process, but by going around it. As was Admiral Hyman G. Rickover, who bulldozed every bureaucratic roadblock to build America's nuclear Navy, and who would not have survived without Congressional support.

Our country is filled with nascent Heretics and Heroes — in government, industry, and in fact, across all sectors of our society — who can bring about rapid change to Defense readiness, if only we'd let them.

Thank you and I look forward to your questions.



## Shyam Sankar Chief Technology Officer, Palantir Technologies

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### PROFILE Shyam Sankar



### PROFESSIONAL BIOGRAPHY

Shyam Sankar is the Chief Technology Officer and Executive Vice President of Palantir Technologies. A seasoned technologist, he's spent over two decades building and delivering disruptive software and AI solutions for both government and private sector institutions.

Joining Palantir in 2006 as employee #13, Shyam envisaged the role of the Forward Deployed Engineer, pioneering the company's definitional engineering model. Under his leadership, Palantir transformed from a Silicon Valley startup to a global, industry leading software and AI company.

Shyam is also a thought leader, prolific author, and frequent speaker. He routinely leads strategic sessions with elected officials, and has appeared before the House Select Committee and the Senate Armed Services Subcommittee on Cybersecurity. A frequent guest on CNBC and Bloomberg, his work has been featured in numerous publications, including American Affairs, the Wall Street Journal, and the Washington Post. In 2023, he launched the First Breakfast initiative, where he regularly publishes his thought leadership. He has also appeared on a variety of podcasts, including This Week in Startups and The Arsenal of Democracy. In 2024, he was named as one of The Top 7 People in AI Defense Tech.

He holds a B.S. in Electrical and Computer Engineering from Cornell University and an M.S. in Management Science and Engineering from Stanford University.

In addition to his work at Palantir, Shyam also serves as the Chairman of Ginkgo Bioworks.

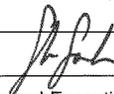
**DISCLOSURE FORM FOR WITNESSES  
COMMITTEE ON ARMED SERVICES  
U.S. HOUSE OF REPRESENTATIVES**

**INSTRUCTION TO WITNESSES:** Rule 11, clause 2(g)(5), of the Rules of the House of Representatives for the 118<sup>th</sup> Congress requires nongovernmental witnesses appearing before House committees to include in their written statements a curriculum vitae and a disclosure of the amount and source of any federal contracts or grants (including subcontracts and subgrants), and contracts or grants (including subcontracts and subgrants), or payments originating with a foreign government, received during the past 36 months either by the witness or by an entity represented by the witness and related to the subject matter of the hearing. Rule 11, clause 2(g)(5) also requires nongovernmental witnesses to disclose whether they are a fiduciary (including, but not limited to, a director, officer, advisor, or resident agent) of any organization or entity that has an interest in the subject matter of the hearing. As a matter of committee policy, the House Committee on Armed Services further requires nongovernmental witnesses to disclose the amount and source of any contracts or grants (including subcontracts and subgrants), or payments originating with any organization or entity, whether public or private, that has a material interest in the subject matter of the hearing, received during the past 36 months either by the witness or by an entity represented by the witness. Please note that a copy of these statements, with appropriate redactions to protect the witness's personal privacy (including home address and phone number), will be made publicly available in electronic form 24 hours before the witness appears to the extent practicable, but not later than one day after the witness's appearance before the committee. Witnesses may list additional grants, contracts, or payments on additional sheets, if necessary. Please complete this form electronically.

**Hearing Date:** 9/16/2024

**Hearing Subject:**

Fielding Technology and Innovation: Industry Views on Department of Defense Acquisition

**Witness name:** Mr. Shyam Sankar 

**Position/Title:** Chief Technology Officer and Executive Vice President

**Capacity in which appearing:** (check one)

Individual       Representative

**If appearing in a representative capacity, name of the organization or entity represented:** Palantir Technologies Inc.



**Federal Contract or Grant Information:** If you or the entity you represent before the Committee on Armed Services has contracts (including subcontracts) or grants (including subgrants) with the federal government, received during the past 36 months and related to the subject matter of the hearing, please provide the following information:

2024

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
Please see Disclosure Materials, Attachment A			

2023

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
Please see Disclosure Materials, Attachment A			

2022

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
Please see Disclosure Materials, Attachment A			

2021

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
Please see Disclosure Materials, Attachment			

A			

**Foreign Government Contract, Grant, or Payment Information:** If you or the entity you represent before the Committee on Armed Services has contracts or grants (including subcontracts or subgrants), or payments originating from a foreign government, received during the past 36 months and related to the subject matter of the hearing, please provide the following information:

2024

Foreign contract/ payment	Foreign government	Dollar value	Subject of contract, grant, or payment
NONE			

2023

Foreign contract/ payment	Foreign government	Dollar value	Subject of contract, grant, or payment
NONE			

2022

Foreign contract/ payment	Foreign government	Dollar value	Subject of contract, grant, or payment
NONE			

2021

Foreign contract/ payment	Foreign government	Dollar value	Subject of contract, grant, or payment
NONE			

**Fiduciary Relationships:** If you are a fiduciary of any organization or entity that has an interest in the subject matter of the hearing, please provide the following information:

Organization or entity	Brief description of the fiduciary relationship
Palantir Technologies Inc.	Chief Technology Officer and Executive Vice President
Ginkgo Bioworks Holdings, Inc.	Chair of the Board

**Organization or Entity Contract, Grant or Payment Information:** If you or the entity you represent before the Committee on Armed Services has contracts or grants (including subcontracts or subgrants) or payments originating from an organization or entity, whether public or private, that has a material interest in the subject matter of the hearing, received during the past 36 months, please provide the following information:

2024

Contract/grant/payment	Entity	Dollar value	Subject of contract, grant, or payment
See footnote (1) below	Palantir Technologies Inc.		
See footnote (2) below	Ginkgo Bioworks Holdings, Inc.		

(1) Please see Disclosure Materials, Attachment A regarding contracts (including subcontracts) or grants (including subgrants) received by Palantir Technologies Inc. ("Palantir") from the federal government. Please also note that the witness currently serves as the Chief Technology Officer and Executive Vice President of Palantir and receives associated compensation from Palantir. As the fiscal year 2024 is not yet completed, Palantir's proxy statement covering compensation during such year is not yet available, but, as of the date of this disclosure form, the witness' compensation is anticipated to be comparable to the compensation disclosed for prior years (please see footnote (3) below for more details).

(2) The witness is not representing Ginkgo Bioworks Holdings, Inc. ("Ginkgo") before the committee, but, in the interest of full disclosure, please note that Ginkgo has received contracts (including subcontracts) or grants (including subgrants) from the federal government, including from the Department of Defense. Please also note that the witness currently serves as the Chair of the Board of Ginkgo and receives associated compensation from Ginkgo. As the fiscal year 2024 is not yet completed, Ginkgo's proxy statement covering compensation during such year is not yet available, but, as of the date of this disclosure form, the witness' compensation is anticipated to be comparable to the

compensation disclosed for prior years (please see footnotes (4), (5) and (6) below for more details).

2023

Contract/grant/ payment	Entity	Dollar value	Subject of contract, grant, or payment
See footnote (3) below	Palantir Technologies Inc.		
See footnote (4) below	Ginkgo Bioworks Holdings, Inc.		

(3) Please see Disclosure Materials, Attachment A regarding contracts (including subcontracts) or grants (including subgrants) received by Palantir from the federal government. Please also note that, the witness currently serves as the Chief Technology Officer and Executive Vice President of Palantir and receives associated compensation from Palantir. For more information regarding such compensation for the fiscal years 2021 to 2023, inclusive, please see Palantir’s proxy statement, as filed with the U.S. Securities and Exchange Commission (“SEC”) on April 26, 2024, which is available here: <https://www.sec.gov/ix?doc=/Archives/edgar/data/1321655/000132165524000059/pltr-20240426.htm>

(4) The witness is not representing Ginkgo before the committee, but, in the interest of full disclosure, please note that Ginkgo has received contracts (including subcontracts) or grants (including subgrants) from the federal government, including from the Department of Defense. Please also note that, the witness currently serves as the Chair of the Board of Ginkgo and receives associated compensation from Ginkgo. For more information regarding such compensation for the fiscal year 2023, please see Ginkgo’s proxy statement, as filed with the SEC on April 29, 2024, which is available here: <https://www.sec.gov/ix?doc=/Archives/edgar/data/1830214/000162828024018970/dna-20240429.htm>

2022

Contract/grant/ payment	Entity	Dollar value	Subject of contract, grant, or payment
See footnote (3) above	Palantir Technologies Inc.		
See footnote (4) above and footnote (5) below	Ginkgo Bioworks Holdings, Inc.		

(5) For more information regarding compensation from Ginkgo for the fiscal year 2022, please see Ginkgo’s proxy statement, as filed with the SEC on April 28, 2023, which is available here: <https://www.sec.gov/ix?doc=/Archives/edgar/data/1830214/000095017023015942/dna-20230428.htm>

2021

<b>Contract/grant/ payment</b>	<b>Entity</b>	<b>Dollar value</b>	<b>Subject of contract, grant, or payment</b>
See footnote (3) above	Palantir Technologies Inc.		
See footnote (4) above and footnote (6) below	Ginkgo Bioworks Holdings, Inc.		

(6) For more information regarding compensation from Ginkgo for the fiscal year 2021, please see Ginkgo's proxy statement, as filed with the SEC on April 26, 2022, which is available here: <https://www.sec.gov/Archives/edgar/data/1830214/000119312522120186/d352792ddef14a.htm>



*For submission*

“Fielding Technology and Innovation: Industry Views on Department of Defense Acquisition”  
Hearing before the House Committee on Armed Services

Statement of Mr. Peter Ludwig  
Co-Founder and Chief Technology Officer, Applied Intuition

### **Introduction**

Thank you Chairman Rogers, Ranking Member Smith, and the distinguished Members of this Committee for holding this important hearing, and thank you for the opportunity to testify. As co-founder and chief technology officer of Applied Intuition (Applied), I am thrilled to welcome you to Silicon Valley. We are grateful for your steadfast leadership on defense acquisition reform and your willingness to highlight the important national security work occurring right here in the technology capital of the world. The Committee may recall that it was funding from the Department of Defense (DOD) and the National Aeronautics and Space Administration during the Cold War era that created this special fount of innovation.

I am honored to testify before this prestigious Committee. As a third-generation automotive engineer born and raised in Detroit, I know first-hand the importance of American manufacturing and the close ties between our domestic industrial base and national security. Just as the automotive industry mobilized during World War II to lead what President Roosevelt called the “great arsenal of democracy,”<sup>1</sup> we must again “harness the complete capacity of American industry”<sup>2</sup> in the 21st Century. This time however, we must look to combine Silicon Valley software with America’s industrial prowess to build a new software-defined arsenal of democracy to ensure that our service members have the cutting-edge technology they need. Just as trucks, tanks, and planes roll off the assembly lines, so too must lines of code flow into American software.

Part of our ethos at Applied is to provide “radical candor.” In this vein, I would like to emphasize three main points. First, in order to effectively compete with China’s significant military buildup and technological advances, DOD should encourage thoughtful program design that incorporates continuous development and integration of software. Our warfighters and our allies need seamless software updates to create asymmetrical advantages to deter our adversaries. Software is never finished, and it becomes obsolete if it does not evolve at the speed of relevance.<sup>3</sup>

<sup>1</sup> Franklin D. Roosevelt, “Arsenal of Democracy,” December 29, 1940, Miller Center, University of Virginia, <https://millercenter.org/the-presidency/presidential-speeches/december-29-1940-first-ide-chat-16-arsenal-democracy>.

<sup>2</sup> A.J. Baime, *The Arsenal of Democracy: FDR, Detroit, and an Epic Quest to Arm an America at War* (Boston: Houghton Mifflin Harcourt, 2014), xviii.

<sup>3</sup> U.S. Department of Defense, *Summary of the 2018 National Defense Strategy of The United States of America*, January 19, 2018, <https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf>.

Second, program managers should embrace “buy before build” and pursue commercial solutions to ensure access to the latest software and best practices. Finally, DOD program managers should expand the use of the Software Acquisition Pathway to capture this commercial innovation and enable continuous software updates.

#### **Background on Applied Intuition**

Applied is a defense tech success story. Thanks to Congressional reforms and funding support spearheaded by this Committee, Applied is leveraging its commercially-proven artificial intelligence (AI) software and automation technology to help DOD achieve several goals in the 2022 National Defense Strategy (NDS). In fact, the 2022 NDS compels DOD to be a “fast-follower where market forces are driving commercialization of military relevant capabilities in trusted artificial intelligence and autonomy.”<sup>4</sup> Applied’s go-to-market approach in defense provides key insights to the Committee about which policy and funding actions are necessary from Congress to ensure that DOD is a “fast-follower.”

Seven years ago, Qasar Younis and I founded Applied as a high-growth, venture-backed startup with the goal of accelerating the adoption of safe and intelligent machines. Applied’s solutions include a software development and test and evaluation toolchain, an off-road ground autonomy stack, as well as the vehicle architecture to enable rapid updates. In other words, we write the software that supports seamless updates for autonomous vehicles (AVs), similar to the way that Apple provides seamless software updates for your iPhone.

Since our founding in 2017, Applied’s efforts have led to significant commercial success. We started in the automotive industry, and we are proud to work with eighteen of the top twenty global, non-Chinese automotive companies as customers. From these automotive beginnings, we rapidly expanded to other use cases like agriculture, mining, construction, aerospace, trucking, off-road, and defense. We quickly realized that our software has critical applications, particularly for national security consumers including the Army and defense primes.

#### **Engagement with DOD**

Beginning in 2021, as a part of our initial direct DOD engagements, Applied competed for and won three Small Business Innovation Research (SBIR) contracts in 2022<sup>5</sup> and 2023,<sup>6</sup> along with a Tactical Funding Increase (TACFI) in 2024. These awards gave us the necessary signal to adapt our commercial tech to better suit military applications. They helped us develop a relationship

<sup>4</sup>U.S. Department of Defense, *2022 National Defense Strategy, Nuclear Posture Review, and Missile Defense Review*, October 27, 2022, <https://media.defense.gov/2022/Oct/27/2003103845/-1/-1/1/2022-NATIONAL-DEFENSE-STRATEGY-NPR-MDR-PDF>.

<sup>5</sup>U.S. Small Business Administration, “SBIR Award: 198258,” SBIR.gov, 2024, <https://www.sbir.gov/awards/198258>.

<sup>6</sup>U.S. Small Business Administration, “SBIR Award: 204599,” SBIR.gov, 2024, <https://www.sbir.gov/awards/204599>.

<sup>7</sup>U.S. Small Business Administration, “SBIR Award: 206049,” SBIR.gov, 2024, <https://www.sbir.gov/awards/206049>.

with operationally focused program offices in both the Army and Air Force who are able to test our commercial technology at low risk.

A good example of this symbiotic partnership is our SBIR contract with the Air Force to provide synthetic datasets for aerial autonomy development. Synthetic data mimics real-world, physics-based scenarios, but it is artificially generated instead of captured via sensors. As the Committee may know, DOD lacks access to and management of quality test and operational data, including synthetic datasets.<sup>8</sup> This lack of data creates significant gaps between operational needs and developmental environments – think of the inability to artificially simulate different amounts of snow on a mountain road. Unlike DOD, the commercial industry has made significant advances to enhance autonomy models through synthetic data. Thankfully, Applied's SBIR has allowed DOD to catch up by giving it access to this critical technology which will reduce costs and allow DOD to field systems faster. The contract will also allow DOD to rapidly assess the safety and lethality of various capabilities.

While SBIRs are a good entry point for startup companies, the key measuring stick of Congress' acquisition reform is how quickly the DOD enterprise adopts and scales proven transformational technologies. The Defense Innovation Unit (DIU), led by Director Doug Beck, has played a critical role aligning commercial technology to programs of record. Through a DIU "Other Transaction" contract and the Software Acquisition Pathway, the Army's Robotic Combat Vehicles program is leveraging Applied's test and evaluation modeling and simulation toolchain to evaluate the performance of AV software stacks. This program has been a pioneer in its use of the Agile Acquisition Frameworks—using the Software Acquisition Pathway to acquire software and Middle Tier Acquisition for the hardware. Thankfully, Congress established the Software Acquisition Pathway framework in the 2020 National Defense Authorization Act (P.L. 116-92, Section 800), and the Middle Tier Acquisition authority in the 2016 National Defense Authorization Act (P.L. 114-92, Section 804).

#### **Non-Traditional Observations**

China is poised to leapfrog the United States and Europe in autonomy in both the commercial and defense sectors.<sup>9</sup> Their commercial autonomous vehicle sector currently produces connected electric vehicles, sold for as low as \$10,000,<sup>10</sup> around a third of the price of comparable American vehicles. We assume that any commercial, best-in-class technology in civilian China is subsidized and supported by the Chinese Communist Party, and could be adopted into military operations by the People's Liberation Army. In response to these challenges, traditional

<sup>8</sup> Sydney J. Freedberg Jr., "Becoming Data Fluent: Navy Rolls Out Updated Information Superiority Vision," *Breaking Defense*, August 15, 2024, <https://breakindefense.com/2024/08/becoming-data-fluent-navy-rolls-out-umdted-information-superiority-vision/>.

<sup>9</sup> Graham Webster et al., "Full Translation: China's 'New Generation Artificial Intelligence Development Plan (2017).'" *New America*, August 1, 2017, <https://www.newamerica.org/cybersecurity/initiative/djicchina/blog/full-translation-chinas-new-generation-artificial-intelligence-development-plan-2017/>.

<sup>10</sup> Tom Krisher and Ken Moritsugu, "Small, Well-Built Chinese EV Called the Seagull Poses a Big Threat to the US Auto Industry," *Associated Press*, September 7, 2024, <https://apnews.com/article/china-byd-auto-seagull-auto-ev-cae20e92437b74e95c234493ec1df400>.

American and European automotive industries, leveraging Silicon Valley software companies like Applied, are sprinting to catch up with China's pace of innovation. While automakers are surely making progress, DOD must double-down on its efforts in automation in order to capture and build on the commercial innovation from Silicon Valley and in the automotive sector.

In the future, any high-end fight with a near-peer adversary will involve a rapidly changing battlespace, a vast number of targets, and new, never-before-seen autonomous platforms with software deployed to the edge.<sup>11</sup> Many cutting-edge autonomy technologies can greatly benefit the warfighter; whether its capabilities such as Automatic or Aided Target Recognition, multi-modal sensor fusion, or collaborative autonomy. A key example of software's current impact is the war in Ukraine. Russian forces placed tires on their aircraft in an attempt to spoof loitering munitions.<sup>12</sup> Without a rapid retraining pipeline, Ukraine's perception software would be unable to recognize and destroy Russian assets.

Given the importance of software in the modern battlefield, it is critical that DOD not treat software the same as hardware. Software is never finished. It continues to live and grow as conditions rapidly change. Unlike hardware, its evolutions occur in weeks, not years, and if the software does not evolve at this speed of relevance, it becomes obsolete. DOD recognizes this fact in its Software Modernization Strategy, which states: "fighting and winning on the next battlefield will depend on DOD's proficiency to rapidly and securely deliver resilient software capabilities."<sup>13</sup> Meanwhile, many of DOD's largest legacy investments are dependent on a single vendor. As a result of past issues with "vendor-lock," DOD often seeks to own the software it procures. This overreaction is counterproductive because the agency lacks the incentive to continuously improve and innovate the software it owns and thus relies on outdated software.

Finally, DOD's prolonged contract timelines are not compatible with capturing the rapid innovation in the commercial industry and delivering this capability to the warfighter. A recent Government Accountability Office report highlights that DOD is struggling to capture innovation through the Agile Acquisition Pathways.<sup>14</sup> At Applied, we operate on a five-week release cycle – we are constantly releasing new products, capabilities, and features that program offices can leverage through agile acquisition methodologies. We save money by moving quickly. Bureaucratic delays consume time and lead to increased costs, including opportunity costs yielded to one's competitors. The same is true for DOD, its programs, and those of our adversaries. The success of DOD programs should be measured by the speed at which they are able to bring capability onto contract.

<sup>11</sup> U.S. Department of Defense, *2022 National Defense Strategy, Nuclear Posture Review, and Missile Defense Review*, 4.

<sup>12</sup> Helen Regan and Irene Nasser, "Russia Is Putting Car Tires on Aircraft to Protect Them from Ukrainian Drone Attacks," *CNN*, September 6, 2023, <https://www.cnn.com/2023/09/06/europe/russia-aircraft-car-tires-ukraine-drones-intl-hnk/index.html>.

<sup>13</sup> U.S. Department of Defense, *Department of Defense Software Modernization Strategy*, February 3, 2022, <https://media.defense.gov/2022/Feb/03/2007932833/-1/-1/1/DEPARTMENT-OF-DEFENSE-SOFTWARE-MODERNIZATION-STRATEGY.PDF>.

<sup>14</sup> U.S. Government Accountability Office, "Weapon Systems Annual Assessment: DOD Is Not Yet Well-Positioned to Field Systems with Speed," GAO-24-106831, June 17, 2024, <https://www.gao.gov/products/gao-24-106831>.

**Recommendations:**

- 1 **Thoughtful Program Design:** Programs must be designed in a thoughtful way that incorporates rapid updates and improvements in the future. While it may be too late for some programs that are already in production, Congress can ensure that current signature initiatives like Collaborative Combat Aircraft or Replicator fully leverage commercial best practices such as the continuous integration of hardware and software while performing test and evaluation.
  - a. **Avoid Waterfall Autonomy Requirements:** DOD must also change its mindset and move away from a waterfall approach to autonomy requirements. In other words, program managers must set up their programs that enable continual, cyclical improvements rather than linear production milestones with sequential block upgrades. The autonomy requirements that drive program development should encourage continuous test and evaluation of software rather than solely evaluating inputs and outputs. Some DOD autonomy programs fail to deliver the results they promise because they depend on static government-off-the-shelf solutions or their program design fails to account for commercial best practices that have been refined over a decade. The key objective for DOD is to more rapidly deploy autonomous systems that the warfighter, DOD, Congress, and the public can trust.
- 2 **Encourage Commercial Collaboration and “Buy Before Build”:** While the law clearly states DOD should maintain a commercial preference (10 U.S.C. 3453), implementation continues to be a challenge. Too often, DOD programs would rather build and own their own software rather than conduct the commercial research needed to fully understand technology. While the government can create internal reference models in its Science and Technology portfolio to better understand technology, programs should leverage these lessons-learned through commercial engagement. The Committee should continue to reinforce commercial preference in their oversight of key modernization programs.
  - a. **Enhance SBIRs:** The Strategic Funding Increase/Tactical Funding Increase (STRATFI/TACFI) program is a key mechanism to scale SBIRs and should be expanded. A core element of SBIR success is the ability to align the capability with the requirement owner and program office. Increased resourcing for STRATFI/TACFI can serve as an incentive for both government and small business participants to align technology with longer-term operational priorities and budget planning. While the Air Force has pioneered the use of this funding mechanism, these efforts should be expanded across services. Further, the Other Transactions Authority for prototypes (under 10 U.S.C. 4022) has been used extensively and successfully by DOD to bring in technology that originates from “non-traditional” defense contractors and small businesses. We recommend that Congress continue to encourage the use of Other Transactions.
  - b. **Empower and Provide Increased Resources to DIU:** This Committee, along with the Appropriations Committees, has been a champion for DIU. DIU is a key

enabler for the commercial industry to work with DOD. Increased resources and enhanced authorities in last year and this year’s National Defense Authorization Act leveled up what DIU will hopefully be able to do in the future. Additionally, the DIU hedge fund is a critical step forward to de-risk and scale technologies originating in the commercial market. The fund will enable rapid transformation of this technology into programs of record and into the hands of operators at combatant commands. We applaud this Congressional support for DIU and hope it continues.

**c. License Software, Own Data:** Instead of owning the software, we recommend that DOD own the “data” it collects from its sensors. This data will enable DOD to develop a common operating picture that can be shared across domains and areas of responsibility. Conversely, DOD should license software from multiple commercial vendors to ensure that DOD gets the best software based on evolving battlefield conditions, while also ensuring interoperability between stacks.

**3 Software-Centric Acquisition Frameworks:** In order to most effectively capture commercial technology, program managers should more aggressively expand the use of the Software Acquisition Pathway. Rather than following traditional linear milestones, cyclical software development is central to this pathway.

**a. Expand the Agile Acquisition**

**Frameworks:** The Agile Acquisition Frameworks, particularly the Software Acquisition Pathway and Middle Tier of Acquisition, reduce cumbersome bureaucracy and are critical to leveraging commercial technology. Unfortunately, adoption of these important acquisition tools is inconsistent across the Department. In fact, according to the August 2024 Innovation Fact Sheet recently unveiled by Deputy Secretary of Defense Kathleen Hicks, DOD appears to be lagging in utilizing the SWP acquisition framework (Figure 1),<sup>15</sup> only using it half as much as the MTA authority. We urge the Committee to provide political support and greater incentives for programs that use these pathways more creatively.

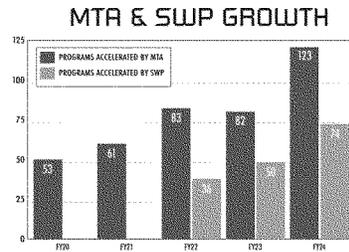


Figure 1: Middle Tier of Acquisition Pathway (MTA) vs. Software Acquisition Pathway (SWP) Programs FY 2020-2024; Source: U.S. Department of Defense

<sup>15</sup> U.S. Department of Defense, *Structuring Change to Last: An Update on Innovation at the Department of Defense*, August 7, 2024, <https://media.defense.gov/2024/Aug/07/2003519333/-1/-1/0/DOD-INNOVATION-FACT-SHEET-AUGUST-2024.PDF>.

- b. Support Firm Fixed-Price Contracts:** The easiest way to adopt commercial software technology is through firm-fixed-price contracts versus service contracts. While service-based contracts seem an easy way to ensure iterative software development, they fail to scale and do not incentivize continuous improvement to software. Rather, they incentivize the contractor to charge more time and materials to the government rather than focus on the quality of the software production. Fixed-priced contracts enable the program to acquire commercially proven software products that are continuously updated and improved based on warfighter and program feedback. These contracts should be outcomes-driven with key deliverables and a roadmap for the development of features in products.

In an increasingly dangerous world where the speed of relevance continues to accelerate, we firmly believe that DOD must fully leverage commercially proven technologies. This approach is the cheapest, quickest, and most effective way to field new capabilities and get them into the hands of our servicemembers, a key priority for “data-driven technologies” within the 2022 National Defense Strategy.<sup>16</sup> These new software-defined capabilities – and the pace at which we deliver them – will be among the most powerful ways to both deter our adversaries and reassure our allies. Deterrence fails when our adversaries believe they can move faster than we can; it succeeds when we remind them of what made Silicon Valley a leader in technology and the United States the leader of the free world.

I thank the Committee for creating opportunities for Applied Intuition to help the U.S. address our most serious national security problems. We are proud to accelerate the software-defined force and ensure our warfighters have the technology they need to protect democracy, liberty, and the rules-based international order.

Thank you again for the opportunity to testify, and I look forward to your questions.

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<sup>16</sup> U.S. Department of Defense, *2022 National Defense Strategy, Nuclear Posture Review, and Missile Defense Review*.

## Applied Intuition Defense



**Peter Ludwig** is co-founder and chief technology officer of Applied Intuition, which he founded with Qasar Younis in 2017. Before Applied, Peter worked at both NVIDIA and Google, where he led efforts on Google Maps and Android Automotive.

A third-generation automotive engineer born and raised in Detroit, Peter earned his undergraduate and graduate degrees in computer science at the University of Michigan.

Peter's technical expertise has helped position Applied Intuition and Applied Intuition Defense to provide best-in-class autonomy software. 18 of the top 20 global, non-Chinese automakers and customers across sectors, including agriculture, defense, construction, mining, and aerospace, rely on Applied Intuition's solutions to develop, test, and deploy autonomous systems at scale.

**DISCLOSURE FORM FOR WITNESSES  
COMMITTEE ON ARMED SERVICES  
U.S. HOUSE OF REPRESENTATIVES**

**INSTRUCTION TO WITNESSES:** Rule 11, clause 2(g)(5), of the Rules of the House of Representatives for the 118<sup>th</sup> Congress requires nongovernmental witnesses appearing before House committees to include in their written statements a curriculum vitae and a disclosure of the amount and source of any federal contracts or grants (including subcontracts and subgrants), and contracts or grants (including subcontracts and subgrants), or payments originating with a foreign government, received during the past 36 months either by the witness or by an entity represented by the witness and related to the subject matter of the hearing. Rule 11, clause 2(g)(5) also requires nongovernmental witnesses to disclose whether they are a fiduciary (including, but not limited to, a director, officer, advisor, or resident agent) of any organization or entity that has an interest in the subject matter of the hearing. As a matter of committee policy, the House Committee on Armed Services further requires nongovernmental witnesses to disclose the amount and source of any contracts or grants (including subcontracts and subgrants), or payments originating with any organization or entity, whether public or private, that has a material interest in the subject matter of the hearing, received during the past 36 months either by the witness or by an entity represented by the witness. Please note that a copy of these statements, with appropriate redactions to protect the witness's personal privacy (including home address and phone number), will be made publicly available in electronic form 24 hours before the witness appears to the extent practicable, but not later than one day after the witness's appearance before the committee. Witnesses may list additional grants, contracts, or payments on additional sheets, if necessary. Please complete this form electronically.

**Hearing Date:** 9/16/2024

**Hearing Subject:**

Fielding Technology and Innovation: Industry Views on Department of Defense Acquisition

**Witness name:** Mr. Peter Ludwig

**Position/Title:** Co-Founder and Chief Technology Officer

**Capacity in which appearing:** (check one)

Individual       Representative

**If appearing in a representative capacity, name of the organization or entity represented:**

Applied Intuition

**Federal Contract or Grant Information:** If you or the entity you represent before the Committee on Armed Services has contracts (including subcontracts) or grants (including subgrants) with the federal government, received during the past 36 months and related to the subject matter of the hearing, please provide the following information:

2024

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
Contracts	DoD	\$31 Million	DoD Research and Development

2023

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
Contracts	DoD	\$20 Million	DoD Research and Development

2022

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
Contracts	DoD	\$8 Million	DoD Research and Development

2021

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant

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2024

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2023

Foreign contract/ payment	Foreign government	Dollar value	Subject of contract, grant, or payment

2022

Foreign contract/ payment	Foreign government	Dollar value	Subject of contract, grant, or payment

2021

Foreign contract/ payment	Foreign government	Dollar value	Subject of contract, grant, or payment

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Organization or entity	Brief description of the fiduciary relationship

**Organization or Entity Contract, Grant or Payment Information:** If you or the entity you represent before the Committee on Armed Services has contracts or grants (including subcontracts or subgrants) or payments originating from an organization or entity, whether public or private, that has a material interest in the subject matter of the hearing, received during the past 36 months, please provide the following information:

2024

Contract/grant/ payment	Entity	Dollar value	Subject of contract, grant, or payment

2023

Contract/grant/ payment	Entity	Dollar value	Subject of contract, grant, or payment

2022

Contract/grant/ payment	Entity	Dollar value	Subject of contract, grant, or payment

2021

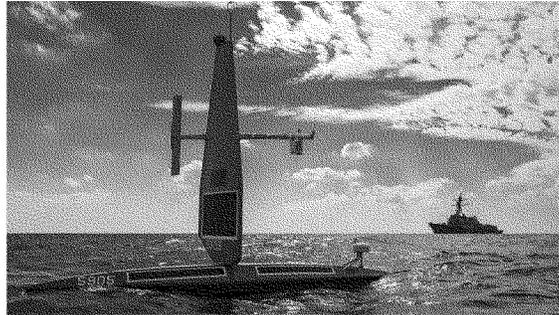
Contract/grant/ payment	Entity	Dollar value	Subject of contract, grant, or payment

Statement of  
Mr. Richard Jenkins,  
Founder and Chief Executive Officer, Saildrone, Inc.

Before the  
House Armed Services Committee  
U.S. House of Representatives

Hearing on  
“Fielding Technology and Innovation: Industry Views on Department of  
Defense Acquisition”

September 16, 2024



Introduction

Chairman Rogers, Ranking Member Smith, and Members of the Committee, thank you for the opportunity to testify today on the Department of Defense's (DOD) ability to effectively field technology and innovation. Today, I am pleased to offer my thoughts on the Defense Department's acquisition apparatus from the perspective of a small business transitioning its products from demonstrated operational success to large scale fleet operations. My testimony will highlight a few observations based on my experience and offer solutions that might help this Committee in identifying legislative solutions to speed the process from innovation to adoption.

I am the Founder and Chief Executive Officer of Saildrone, a U.S. company based in Alameda, California, with locations in St. Petersburg, Florida, and Washington, D.C. Saildrone is the world leader in providing oceanographic and C5ISR<sup>1</sup> solutions with autonomous uncrewed surface vehicles (USVs). Saildrone USVs have sailed more than 1.6 million nautical miles and spent over 46,000 days at sea collecting met-ocean, sea floor mapping, and maritime security data.

Saildrone USVs are: (1) primarily powered by wind and solar energy for propulsion and power; (2) scalable in size, ranging from 23 – 65 feet; and (3) purpose-built for myriad applications, including meteorological and oceanographic data collection, ocean mapping, maritime domain awareness (MDA), and intelligence, surveillance and reconnaissance (ISR). Saildrone currently employs more than 250 people and has deployed operationally with NOAA, the U.S. Geological Survey, the U.S. Coast Guard, U.S. Customs and Border Protection, the National Geospatial-Intelligence Agency, the U.S. Navy, and the Defense Intelligence Agency.

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<sup>1</sup>Command, Control, Computing, Communications, Cyber, Intelligence, Surveillance, Reconnaissance and Targeting.

To build its drones, Saildrone leverages the U.S. defense industrial base with ship manufacturing in Alabama, Mississippi, Washington, and our own facilities in California.

Saildrone data collection is cost effective and high quality as verified by U.S. government customers. As the only small autonomous USVs capable of long-endurance maritime domain awareness (MDA) missions, the technology is extremely mature and recognized as Technology Readiness Level-9 by our government customers. Saildrones are provided either as-a-service under a contractor-owned, contractor-operated model or as a fully acquired system with contractor logistics support. In both cases, the USVs are piloted and maintained by Saildrone while the customer has direct access and secure control over the data flow from the vehicle. Maintaining the sustainment and logistics of the fleet allows us to “iterate while we operate” and rapidly respond to customer feedback.

Saildrones utilize machine learning and artificial intelligence to deliver autonomous, real-time visual detection of targets, including those that are not otherwise transmitting their position. These images are fused with radar, automatic identification system (AIS), and acoustics to deliver a fully informed picture of the surrounding maritime domain and enable targeting for other lethal assets. This results in a persistent, rapidly scalable, low-cost solution to augment traditional manned maritime fleets.

#### Rapid Innovation Through Operational Experience

Saildrone has operated continuously for the Navy for nearly three years, leading to rapidly evolving solutions based on operational experience. This includes deployments to the CENTCOM, SOUTHCOM, NORTHCOM, and INDOPACOM areas of responsibility (AORs), providing maritime domain awareness where the availability of traditional manned ships has

been limited. Since 2021, saildrones have detected and classified many thousands of surface vessels in key areas of interest, allowing the Navy to greatly enhance its common operating picture while keeping sailors out of harm's way.

Saildrone began its testing with the Navy in December 2021 while assigned to Task Force 59 in CENTCOM. During that deployment, two fleets of Saildrone Explorers were stationed in the Persian Gulf and Red Sea to monitor surface traffic in a real operational environment. With our first iterations of cameras and sensors, we demonstrated the ability of an autonomous sailing platform to provide persistent coverage and reporting of surface contacts to watchstanders in near-real time. What began as a test, quickly evolved into a persistent operational capability bolstering maritime domain awareness for NAVCENT. Now with the enhanced Voyager class, Saildrone has operated in the CENTCOM AOR for nearly three years.

Operational success in the Middle East led to expansion into the SOUTHCOM and NORTHCOM AORs last year. There, a fleet of Voyagers has provided maritime ISR for counter trafficking operations continuously since September 2023. Quarterly reviews by the Office of the Undersecretary of Defense for Intelligence and Security (OUDSI) throughout the mission reported that saildrones were responsible for 96% of all surface contact detections in and around the Windward Pass and the Florida Strait with a 95% cost reduction relative to the daily operational cost of a Navy destroyer. Put another way, for the entire daily rate of one destroyer, Saildrone could provide complete maritime ISR coverage along every major Caribbean trafficking route to the United States. As in CENTCOM, our platforms have provided a decisive operational advantage in an area where demand for manned resources is high and availability is scarce. I am pleased to report that we will be doubling that fleet and expanding into INDOPACOM with additional drones this year, enabled through the DIU's fielding budget line.

In a parallel effort, we will be deploying Surveyor class drones equipped with industry-leading bathymetric sonars and acoustic arrays this year as well. The former will generate detailed ocean floor maps while the latter will locate and classify surface and subsurface vessel traffic. Both capabilities are essential for strategic overmatch in the Pacific and Atlantic theaters of operation, yet are in short supply due to limited numbers of manned assets to carry these sensors. Saildrone provides the ability to dramatically expand the deployment of these and other capabilities around the globe, at scale, more affordably, and in a persistent fashion – while also being highly adaptable to emerging challenges and lessons learned. This not only presents an extremely dynamic solution, but also has the potential to fundamentally transform our approach to naval warfare in the near term. Building and deploying these systems ahead of a high-end conflict, however, is essential.

While Saildrone USVs are highly capable, I want to emphasize that they are not a replacement for manned ships. The United States should continue to build traditional platforms crewed by our highly capable Navy sailors. Saildrones are designed to free up valuable manned assets by performing tasks that do not absolutely require people, such as persistent wide-area surveillance in remote areas. Allocating drones instead of ships increases the efficiency and effectiveness of the Navy's manned fleet by allowing it to focus on more exquisite mission sets, like ballistic missile defense.

Transformational Technology is Ready for Large Scale Operations

The commercial sector is developing and providing cost-efficient, alternative technologies to transform the battlefield. These are not futuristic concepts or theoretical warfighting strategies – they are tangible, field-ready solutions available now. Saildrone's

technology isn't just preparing for tomorrow's conflicts; it's primed and ready for the fight tonight.

I appreciate the work this Committee and DOD has done to foster this innovation. A great product of that work is the Defense Innovation Unit (DIU) which has been a tremendous partner for us. DIU's capability-focused approach to solving the warfighters' challenges allowed us to explore the military use cases for our vehicles. DIU has created an ecosystem that encourages truly innovative solutions and has been instrumental in allowing companies like Saildrone to bring creative, effective solutions to complex defense challenges. DIU contracts have allowed for the testing and fleet integration in 4th and 5th Fleets. We have also had great success with the Office of Naval Research (ONR) for experimentation.

Other Transaction (OT) agreements, another authority provided by this Committee, have been crucial to continued support of the DOD. OTs have allowed DIU to contract with us quickly, taking advantage of our mature and fleet ready capabilities. OTs are a great tool for spurring innovation rapidly.

At this point, we have proven our technology in partnership with DIU and ONR. We have deployed globally and integrated into the common operating pictures of commanders, becoming a cost-efficient operational asset. We are ready to be organically scaled and owned by the operational Navy. However, the current structures and limitations of DOD's acquisitions and budgeting processes present challenges for both the services and innovative companies like Saildrone. These challenges make it difficult to provide advanced solutions at scale within timeframes that align with the rapid pace of technological advancement. The speed of innovation and the rigidity of the budgeting process impact the timely delivery of cutting-edge technologies to the warfighter.

#### Acquisition Should Match Speed of Innovation

The speed of innovation – particularly in the unmanned space – vastly outpaces the traditional acquisition process in most cases. What is current today may be generations behind in several years' time. Consequently, the standard years-long procurement cycle that works for larger assets like aircraft, ships, and submarines is often not compatible with the speed of innovators like Saildrone who are rapidly bringing new, and highly relevant, capabilities to the front lines today.

For example, in Ukraine, we understand there is about a six week time period from when a new technology is fielded and when the Russians deploy a requisite countermeasure. Ukrainians have no choice but to continue innovating in anticipation of the next countermeasure. While the Ukrainian government has had no option but to adopt this fast innovation cycle, the takeaway is that adversaries are always close behind and technology is becoming obsolete at a record pace on the modern battlefield. Contracting vehicles must be agile to allow for rapid adjustments based on learning and evolving needs.

#### Budgeting Should Accommodate Rapid Innovation

With DIU support, Saildrone rapidly developed and demonstrated capabilities that addressed an urgent warfighter need in 4th Fleet. Our unmanned surface vehicles proved their value, underwent metric-based evaluations, and generated consistent demand from Navy Fleets for increased deployment in future years. Our unmanned surface vehicles continue to rapidly evolve their capabilities, due to high cadence, year round operations, while facing real adversaries. In my view, only in the face of real, long duration deployments will solutions reach full maturity and utility.

However, despite proven performance, demonstrated cost efficiencies, and multiple requests for Saldrone services from different fleets, the service level budget process lacks the flexibility to organically adopt and scale these new capabilities in the near term.

The current POM process requires funds to be requested multiple years in advance of the money being spent. This creates a multi-year gap between innovative solutions being validated, to when they might be deployed at scale. The classic valley of death paradigm.

#### Budgeting for Innovation Needs a Bridge

To address this challenge, I ask you to consider the creation of a dedicated “bridge fund” within a service's budget, to fund the immediate roll out of new technologies that are proven effective through existing programs like DIU, have adequate demand signals, and are being included in a service's future POM submission. DIU has greatly increased DOD's ability to rapidly find and field commercial technologies. Now, the services need an ability to immediately scale those solutions that are deemed effective and they must be able to do that ahead of dedicated appropriations arriving years later.

Critically, this fund would not be intended for research and development (R&D) or expanding funding for existing programs. A “bridge fund” instead would specifically address the valley of death years between validation of technology and the appropriation of budgets arrival two years later.

This approach would solve two of the most significant pain points of the current budgeting process. First, services would benefit from two years of additional operational experience while the budgeting process plays out. This technical de-risking is essential to enable bold budget decisions, which will be critical to modernizing the future DOD. Second, privately

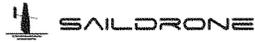
funded companies would have headlights for near term growth, enabling additional capital investment, scaling of inventory and manufacturing facilities, as well as internally resourcing continued capability development.

**Conclusion**

It is now widely accepted that commercial technologies will play a vital role in helping DOD meet the challenges of the present and future. However, without allocated funding for the time between experimentation and operations, these commercial solutions will die on the vine and never make it into service.

I would urge the committee to embrace the bridge fund concept at the service level, which could radically accelerate the fielding of new technologies, and capitalize on the good work of DIU, and other R&D organizations.

We thank Congress, the Navy, and the Defense Innovation Unit for their incredible leadership and support for fielding unmanned autonomous systems. I appreciate the opportunity to testify today and express my views on this important matter on behalf of Saildrone.



1050 W. Tower Ave.  
Alameda, CA 94501  
United States of America (USA)

**Richard Jenkins**  
**Founder and CEO**

CEO and Founder of SAILDRONE, Inc., Richard Jenkins developed SAILDRONE's core technology over a 10-year period, driven by the research he conducted to break the world speed record for wind-powered vehicles. He achieved that record in 2009, setting a speed of 126.2mph on the dry lakes of Nevada. Richard then applied the same, now patented, wing technology to unmanned sailing vehicles, which was the foundation upon which SAILDRONE Inc. was founded. The company now has 250 employees based in Alameda, California, with additional offices in Washington, District of Columbia, and St. Petersburg, Florida.

SAILDRONE designs, manufactures, and operates a global fleet of USVs with a track record of operational success over 1.6 million nautical miles sailed for customers such as NOAA, the U.S. Navy, the U.S. Coast Guard and other research institutions around the world. Richard holds a Master of Engineering degree in Mechanical Engineering from Imperial College, London and is both an avid sailor and private pilot.

**PROFESSIONAL EXPERIENCE**

**April 2012 - Present** **Founder/CEO, SAILDRONE Inc.**  
Uncrewed Surface Vehicles for ocean data collection

**Mar 2011 - Mar 2014** **President, Photon**  
**Composites**  
Carbon composite structures for marine and aerospace applications

**Oct 1999 - May 2009** **CEO, Proteus Speed Ltd**  
Owned & managed the Windjet Project, high speed wind powered vehicles, which turned into the Greenbird project with Sponsorship from Ecotricity.

**EDUCATION**

Sep 1996 - Jun 2000 **Imperial College London**



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United States of America (USA)

#### SELECTED PUBLICATIONS

Meinig, C., E.F. Burger, N. Cohen, E.D. Cokelet, M.F. Cronin, J.N. Cross, S. de Halleux, R. Jenkins, A.T. Jessup, C.W. Mordy, N. Lawrence-Slavas, A.J. Sutton, D. Zhang, and C. Zhang. "Public private partnerships to advance regional ocean observing capabilities: A Saildrone and NOAA-PMEL case study and future considerations to expand to global scale observing," August 2019. <https://www.frontiersin.org/articles/10.3389/fmars.2019.00448/full>.

Vazquez-Cuervo, J.; Gomez-Valdes, J.; Bouali, M.; Miranda, L.E.; Van der Stocken, T.; Tang, W.; Gentemann, C. "Using Saildrones to Validate Satellite-Derived Sea Surface Salinity and Sea Surface Temperature along the California/Baja Coast." August 2018. <https://doi.org/10.3390/rs11171964>

C. Meinig, N. Lawrence-Slavas, R. Jenkins and H. M. Tabisola, "The use of Saildrones to examine spring conditions in the Bering Sea: Vehicle specification and mission performance," OCEANS 2015 - MTS/IEEE Washington, Washington, DC, 2015, pp. 1-6.

#### SELECTED PATENTS

Jenkins, Richard E., and Dylan Owens. Autonomous Unmanned Sailing Vessel. Saildrone Inc, assignee. Patent 9381985. 5 July 2016. Print.

#### SELECTED POSTERS

E. Cokelet, H. Tabisola, R. Jenkins, N. Lawrence-Slavas, C. Meinig, A. DeRobertis, I. Wangen, C. Kuhn, J. Crance, C. Mordy, P. Stabeno, J. Cross, "Saildrone 2016: Simultaneously measuring the environment, fishes and marine mammals in the Bering Sea," Alaska Marine Science Symposium 2017 Poster.

Edward D. Cokelet, Christian Meinig, Richard Jenkins, Noah Lawrence-Slavas, Calvin W. Mordy, Heather M. Tabisola, Phyllis J. Stabeno and Jessica N. Cross, "The First Saildrone Scientific Mission: The Bering Sea," Ocean Sciences Meeting 2016 Poster IS44A-2357, Abstract 93075.

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**Hearing Date:** 9/16/2024

**Hearing Subject:**

Fielding Technology and Innovation: Industry Views on Department of Defense Acquisition

**Witness name:** Mr. Richard Jenkins

**Position/Title:** Founder and Chief Executive Officer

**Capacity in which appearing:** (check one)

Individual       Representative

**If appearing in a representative capacity, name of the organization or entity represented:**

Saildrone, Inc.

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**2024**

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
Contract	U.S. Navy	\$23,639,981.34	Maritime Domain Awareness and Bathymetry
Contract	U.S. Navy	\$30,079,850.00	Maritime Domain Awareness

**2023**

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
Contract	U.S. Navy	\$5,716,650.00	Maritime Domain Awareness
Contract	U.S. Navy	\$14,405,000.00	Maritime Domain Awareness
Contract	U.S. Navy	\$5,977,452.00	Maritime Domain Awareness and METOC
Contract	U.S. Navy	\$3,472,116.00	Maritime Domain Awareness
Contract	U.S. Navy	\$60,104.00	Maritime Domain Awareness
Contract	DIA	\$125,000.00	Maritime Domain Awareness

**2022**

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
Contract	NGA	\$4,651,482.39	Bathymetry
Contract	DIA	\$1,251,480.00	Maritime Domain Awareness
Contract	U.S. Navy	\$4,332,399.48	Bathymetry
Contract	U.S. Navy	\$1,553,328.00	Maritime Domain Awareness
Contract	U.S. Navy	\$1,967,040.00	Maritime Domain Awareness

**2021**

Federal grant/ contract	Federal agency	Dollar value	Subject of contract or grant
Contract	U.S. Navy	\$750,000.00	Maritime Domain Awareness

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Contract/grant/ payment	Entity	Dollar value	Subject of contract, grant, or payment

2021

Contract/grant/ payment	Entity	Dollar value	Subject of contract, grant, or payment

