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Space Integration, Not Separation:
Aerospace Power for the Future

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About the Forum

The Mitchell Forum exists to give an open venue to authors with ideas and thoughts on national defense and aerospace power. The series features topics and issues of broad interest and significant impact on current and emerging policy debates. The views expressed in this series are those of the author, and not necessarily those of the Mitchell Institute.

Abstract

It has been widely acknowledged that American leadership in space has eroded in recent years. In response, policymakers in Congress and the Trump Administration have proposed transferring the US Air Force's space responsibilities to a separate US "Space Corps" or "Space Force" run by career space professionals.

But the US military has been down this road before. After World War I, when foreign submarines had demonstrated their superiority to American submarines, a US Senate bill was proposed to transfer the Navy's undersea responsibilities to a "submarine corps or service" under officers who were "specially trained for undersea warfare." Fortunately, this effort did not succeed, and submarines stayed in the Navy, where their increasing capability with surface combatants in the interwar years formed the integrated maritime power that was decisive in World War II.

This force operated across a continuum—from the seafloor, across a physical boundary, to the surface of the sea. Similarly, US air and space forces operate in an uninterrupted continuum between the surface of the Earth and space - with the ability to project power and create lethal and non-lethal effects against adversaries from above. Although air and space forces operate on different physical principles, both are uniquely capable of delivering the same effects against the enemy and providing support to a combatant commander.

As recent advances in reusable rockets increase the sortie rate of space operations, it will become possible to conduct operations in and through space that are more similar to current air operations. This will require more integration between US air and space power in an "Aerospace Force" rather than separation into an "Air Force" and a "Space Force."

Introduction: Separation Versus Integration

A great deal has already been written about President Donald Trump's recent direction to the Department of Defense (DOD) to stand up a separate US "Space Force."[1] Congressional efforts to create a separate "Space Corps" in the Fiscal 2018 National Defense Authorization Act have also garnered increased attention and debate. To some observers, this is "outside the box" thinking and a reasonable response to new threats in the space domain—but, in fact, this debate is a repetition of history.

In the years after World War I, when it seemed the Department of the Navy had been slow in realizing the importance and warfighting potential of the submarine, one senator tried to divide the US Navy in two. In June of 1921, Sen William King (D-Utah) introduced a resolution proposing the creation of a separate "submarine corps or service" within the US Navy. He explained his reasoning in remarks introducing the bill on the floor of the Senate:

> *"Mister President, I offer a resolution which I asked may be printed in the record and referred to the Committee on Naval Affairs. It is for the purpose of investigating the charges which have been made - I have repeated them here on the floor - that our submarines are imperfect; that the mechanism and machinery are bad; and that they are not equal to the submarines which have been constructed in Germany and other European countries."*

King's resolution of his proposal read:

> *Resolved, etc., That the Committee on Naval Affairs is hereby directed to investigate the question of the construction and mechanical effectiveness of the submarines and of their machinery and equipment, which have been and are now being constructed for the Navy, to ascertain whether or not such submarines are inferior to the submarines of other navies, and what means should be adopted for their improvement and perfection, and also to investigate the question of the policy and advantage of creating a separate bureau of submarines in the Navy department, and of the organization of a separate submarine corps or service in the Navy, and to report their findings to the Senate; and that the committee is authorized to send for persons and papers, administer oaths, and employee such clerical assistance as may be necessary."*[2]

The Navy's response was less than enthusiastic. On June 25, 1921, the *Army-Navy Register* covered the story this way:

> *"Senator King of Utah may always be depended upon to enliven the proceedings of the legislative body of which he is an active member. He is frequently a pioneer in senatorial effort and is becoming well-known for his independent and unfettered position on any question that attracts his attention and engages his comment. He is the author, for example, of a resolution which proposes in inquiry as to why the German submarine was superior to Those of American design and construction, and, apparently not satisfied with this, he has introduced a bill which contemplates The creation in the Navy Department of a bureau of submarines, a suggestion, however, which did not originate with him, but which has been more or less urged, especially in other years, by officers of the Navy who have much to do with the submarine situation, notably Captain Sterling Jr., U.S. Navy, now on duty as captain of the Navy Yard Philadelphia. It is a foregone conclusion that the Navy Department, if the views of that part of the administration are solicited from the capital, will report emphatically against Mr King's provision for a new departmental branch exclusively devoted to submarines…"*[3]

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1 Katie Rogers, "Trump Orders Establishment of Space Force as Sixth Military Branch," *The New York Times*, June 18, 2018, https://www.nytimes.com/2018/06/18/us/politics/trump-space-force-sixth-military-branch.html (all links accessed July 2018).

2 Statement of Sen William King (D-UT) Speaking on the Proposed Bureau of Submarines S. Res. 95, 67th Congress, 1st Session, *Congressional Record* 61 (June 20, 1921):S 2744 https://www.gpo.gov/fdsys/pkg/GPO-CRECB-1921-pt3-v61/pdf/GPO-CRECB-1921-pt3-v61-12-1.pdf.

3 *Army and Navy Register*, "News and Comment – New Bureau in the Navy Department," June 25, 1921, vol. 69, no. 2111, p. 618 https://babel.hathitrust.org/cgi/pt?id=coo.31924069767147;view=1up;seq=644.

Although King had the best intentions, it is now generally realized that separating the "submarine corps" from the rest of the US Navy in the interwar years would have been counterproductive. To maximize the warfighting effectiveness of maritime forces in World War II, the Navy needed unity of command between the subsurface and surface components of the maritime domain. Today, it is clear that submarines and surface combatants form a fighting "continuum" from the bottom of the seafloor, across a physical boundary, to the surface of the sea—and it is widely understood that a single naval commander should oversee these integrated operations.

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Fortunately for the future of US naval warfare, King's bill died in committee. The submarine force stayed within the Navy, working alongside the surface force in the "fleet problem" exercises of the 1920s and 1930s to lay the tactical groundwork for the integrated surface-subsurface doctrine that would help the US emerge victorious in the Pacific Theater in World War II.

In the 21st century, across the physical boundary between air and space, the United States faces a challenge analogous to the revolution in undersea warfare heralded by World War I. As in 1921, there are those who believe the solution to this new challenge is the separation of the aerospace domain into two parts, with a separate "space force" or "space corps"—as seen in the US House of Representatives' version of the FY 2018 National Defense Authorization Act (NDAA).

The House proposal directed DOD to reorganize the department's national security space structure and "create a space corps within the United States Air Force to posture and properly focus the preponderance of our military services to protect US interests in space; deter aggression in, from, and through space; and provide combat-ready forces that enable combatant commanders to fight and win wars." The proposed language also elevated national security space operations within the combatant command structure, by creating a subunified combatant command for space within US Strategic Command (STRATCOM), and strengthening operational leadership of space in DOD.[4] Although the House language did not survive the conference committee process leading to the final version of the NDAA, language diminishing the Air Force's role in space remained in the bill and is very close in intent to Senator King's plans for undersea warfare in the 1920s—it takes authority away from the parent domain and puts "professionals" specializing in the new domain in charge of research, development, acquisition and operations.[5]

Maturing Modern Aerospace Power

Today's leaders seem to be reading from the same script as Senator King. Here is the public statement from the House Armed Services Committee's Strategic Forces Subcommittee in advance of the subcommittee mark of the bill:

> *"There is bipartisan acknowledgement that the strategic advantages we derive from our national security space systems are eroding. Not only are there developments by adversaries, but we are imposing upon the national security space enterprise a crippling organizational and management structure and an acquisition system that has led to delays and cost-overruns. We are convinced that the Department of Defense*

4 H.R. 2810, National Defense Authorization Act, as referred to the House Armed Services Committee 115th Cong. (June 7, 2017), 2018 NDAA: https://www.congress.gov/115/bills/hr2810/BILLS-115hr2810rh.pdf.

5 Author's note: By examining Section 1601 of Public Law 115-91 (the 2018 NDAA), despite the proposed "space corps" language being stripped, it becomes clear the Air Force's traditional role in DOD's space enterprise was rolled back on several fronts. The commander of Air Force Space Command (AFSPC), for example is now the space acquisition executive under the Secretary of the Air Force (SECAF) – but responsibility was moved from the office of the secretary to AFSPC. The SECAF has been stripped of the title as the "principal DOD space adviser," with DOD directed to assign that responsibility elsewhere. The NDAA also eliminates the recently-established deputy chief of staff for space position on the Air Staff and renames the Air Force's Operationally Responsive Space office to the Space Rapid Capabilities Office, and moved the organization to AFSPC. The Deputy Secretary of Defense has also been directed to conduct an independent review of national security space and to hire an independent federally funded research and development center (FFRDC) not associated with the US Air Force to develop a plan to establish a separate military department. For more details, see text of signed legislation here: https://www.congress.gov/bill/115th-congress/house-bill/2810/text?overview=closed.

is unable to take the measures necessary to address these challenges effectively and decisively, or even recognize the nature and scale of its problems. Thus, Congress has to step in. The adversary will continue to build capabilities to hold our space assets at risk. For that reason, we must act now to fix national security space and put in place a foundation for defending space as a critical element of national security. Therefore, our Mark will require the creation, under the Secretary of the Air Force, of a new Space Corps, as a separate military service responsible for national security space programs for which the Air Force is today responsible. We view this as a first, but critical step, to fixing the National Security Space enterprise."[6]

This statement is correct when it comes to the threat posed by our potential adversaries. But the creation of a separate space corps (or any separation of airpower from spacepower) might be as ill-advised now as creating a "submarine corps" would have been a century ago.

As with the relationship between undersea and surface warfare, US air and space forces operate in an uninterrupted "continuum"…

As with the relationship between undersea and surface warfare, US air and space forces operate in an uninterrupted "continuum" between the surface and space—projecting power and creating lethal and non-lethal effects from above. Although air and space forces stay aloft based on different physical principles, both are uniquely capable of delivering the same effects to the adversary— and of providing similar support to the combatant commander.

Unfortunately, the doctrinal similarities between air and spacepower have been masked by the relatively crude technologies of the early space age. From 1957 until recently, the application of spacepower has been limited to intelligence, surveillance and reconnaissance (ISR); precision navigation and timing (PNT) and command, control, and communications (C3) because space platforms and space launch vehicles were expensive, expendable, and launched only a few times a year.

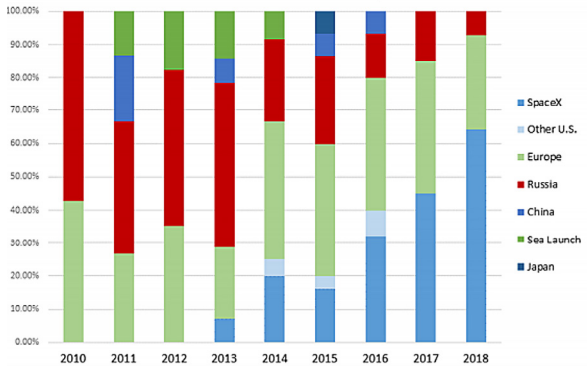

Figure 1: The awarded global commercial launch sector, as measured by market share[7]

With the advent of increasingly capable and operationally responsive rockets, this old, slow, expensive, and expendable model for space launch seems to be heading for a change. New technologies generating higher sortie rates, producing reusable launch vehicles, and exploiting better miniaturization are combining to reduce the cost of getting warfighting capability into orbit—and enabling smaller, less expensive (but very capable) satellites.

In 2017, the American company SpaceX launched a Falcon 9 rocket carrying the USAF X-37B spaceplane. After the second stage separated and carried the X-37B to orbit, the rocket's first stage maneuvered back down to Earth, eventually landing vertically on a company facility at Cape Canaveral Air Force Station.[8] Both stages will be turned around to fly again.

In 2018, SpaceX, is on track to launch over 60 percent of the commercial satellites awarded worldwide (see Figure 1)—more than Europe, Russia, and China combined. And while the company's launch rates go up, prices decline as more of these sorties are flown with reused rockets.[9] SpaceX is only the first of a number of companies

6 House Armed Services Committee, Strategic Forces Subcommittee, *Mark Release: Subcommittee on Strategic Forces*, press release, July 20, 2017, https://armedservices.house.gov/news/press-releases/mark-release-subcommittee-strategic-forces.

7 *Statement of Tim Hughes, Senior Vice President for Global Business and Government Affairs, SpaceX, Testimony before the US Senate Subcommittee on Space, Science, and Technology*, 115th Congress (July 13, 2017) (Statement of Tim Hughes, SPACEX), https://www.hq.nasa.gov/legislative/hearings/7-13-17%20HUGHES.pdf.

8 Mike Wall, "SpaceX Rocket Launches X-37B Spaceplane on Secret Mission, Aces Landing", *Space.com*, September 7, 2017, https://www.space.com/38067-spacex-launches-x-37b-space-plane.html.

9 Kenneth Chang, "*Recycled Rockets Could Drop Costs, Speed Space Travel*," *The New York Times*, March 30, 2017, https://www.nytimes.com/2017/03/30/science/space-x-reuseable-rockets-launch.html.

adopting this approach. Notably, Amazon founder Jeff Bezos' company, Blue Origin, plans to launch large, rapidly reusable rockets soon as well.

As space launches become space "sorties," the true nature of spacepower becomes more apparent as new missions become possible—missions that are much closer to the full range of airpower missions than just the traditional ISR, PNT and C3 tasks long performed in the space domain. In the near future, it is feasible space missions could include the traditional "air" missions of counter-air, strategic attack, and global mobility. SpaceX's proposed intercontinental transport, for example, would take hundreds of passengers across intercontinental distances in less than half an hour.[10] A militarized version of this vehicle would have clear implications for the Air Force's global mobility mission, and perhaps for strategic attack and other missions as well.

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As with the emergence of highly capable submarines and increasingly lethal undersea warfare during and after World War I, this new era argues for the closer integration and unity of command between air and spacepower, not the formation of a new "service" or "corps," which would have the net effect of increasing the warfighting separation between air and space capabilities, decreasing combat effectiveness.

To the Air Force's credit, it has made a significant move in the right direction with Air Force Chief of Staff Gen David Goldfein's recent focus on "multi domain command and control" (MDC2), which is aimed at improving the integration of Air Force command and control across the air, space and cyber domains.[11] In a June 2017 Mitchell Institute-sponsored talk on Capitol Hill, Goldfein's lead for this focus area, Brig Gen B. Chance Saltzman, laid out the Air Force's emerging thinking on the challenge. He said MDC2 should: "1) integrate the combat domains of ground, sea, air, space, and cyber 2) identify threats as trans-regional 3) embrace multi-service joint capabilities 4) recognize the US' ability to fight with allies in coalitions as a unique 'asymmetric advantage.' and 5) recognize the decisive importance of speed in battlefield decision-making."[12]

This is certainly a worthwhile exercise—and increasing the speed of information exchange across the three domains is a necessary precondition for true multi-domain integration. But this does not address the fundamental challenge of integrating organizations, roles, and missions across air and space as new, "space sortie" launch vehicles begin to operate across the air-space boundary on a more routine basis.

These new space and command and control capabilities will not be reserved to the United States alone. In the world we will be operating in soon, potential adversaries will soon have highly reusable vertical takeoff and landing (VTOL) "space sortie" vehicles as well, modeled on the SpaceX example. Recently, the Shanghai Academy of Spaceflight Technology (SAST), a subsidiary of the China Aerospace Science and Technology Corporation (CASC), the main contractor for the Chinese space program, announced it would be taking steps towards launch vehicle reusability.

According to the Communist party-owned *China Daily*, SAST is working hard to develop a VTOL reusable space vehicle, which is expected to reduce launch costs by more than 30 percent. SAST's Dr. Xu Taifu says 805 of their experts are working on reusable rockets and have set out a "two step" development process. First, they will validate the technology of "grid fins" (similar to those used by SpaceX to control the descent of the Falcon 9 first stage) on a Long March IV B rocket

10 Elon Musk, Chief Executive Officer, SpaceX, *Making Life Interplanetary: Presentation to 68th International Astronautical Congress* (Adelaide, Australia: September 29, 2017) http://www.spacex.com/sites/spacex/files/making_life_multiplanetary-2017.pdf.

11 Gen David Goldfein, "Enhancing Multi-Doman Command and Control… Tying it All Together" (CSAF Letter to Airmen, Washington D.C.: Office of the Chief of Staff, US Air Force, March 20, 2017), http://www.af.mil/Portals/1/documents/csaf/letter3/Enhancing_Multi-domain_CommandControl.pdf.

12 Wilson Brissett, "Prioritizing Multi-Domain Command and Control," *Air Force Magazine*, June 19, 2017, http://www.airforcemag.com/Features/Pages/2017/June%202017/Prioritizing-Multi-Domain-Command-and-Control.aspx.

flight test in 2019. This test will demonstrate accurate return flight control and safe landing technology reliability. Next, the Chinese will use a newly developed liquid oxygen (LOX)/methane engine for a full system test flight with a vertical landing and reuse of the vehicle. They plan to reuse the vehicle more than 20 times and reduce launch costs significantly.[13]

As these new space vehicles proliferate, and sortie rates of flight-experienced VTOL rockets increase, the Russians, Chinese, and others may realize the military benefit of closer integration of roles and missions across the boundary between air and space. Both countries have recently taken steps to more closely integrate their air and space forces.

Long term, the Chinese government's goal is to make their entire launch fleet reusable by 2035.[14] In Russia, a company called Cosmic Course has also begun working on a VTOL reusable rocket, ostensibly for suborbital space tourism.[15]

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This development behooves the US Air Force to make a similar level of institutional commitment to the integration of air and space. Given the threat and the rapid pace of technological change, the need is urgent.

This challenge will require significant doctrinal and organizational integration across the Air Force—taking the service beyond the "baby steps" of integrating C2 and towards the full integration of space (and cyber) forces into the mainstream of Air Force missions. The near term goal of this change will be to create lethal and non-lethal effects from air and space, from the surface of the planet all the way out to geostationary orbit and beyond.

Conclusion: Organizing a US Aerospace Force for the Future

Currently, Air Force organize, train, and equip functions for air, long range strike, space, and cyber combat operations are "stovepiped" into separate commands largely dictated by platform. For example, Air Combat Command (ACC) serves as the home for fighters, Air Force Global Strike Command (AFGSC) is where bombers and missiles are based, Air Force Space Command (AFSPC) controls launch vehicles and satellites, and 24th Air Force is the home of Air Force cyber efforts.

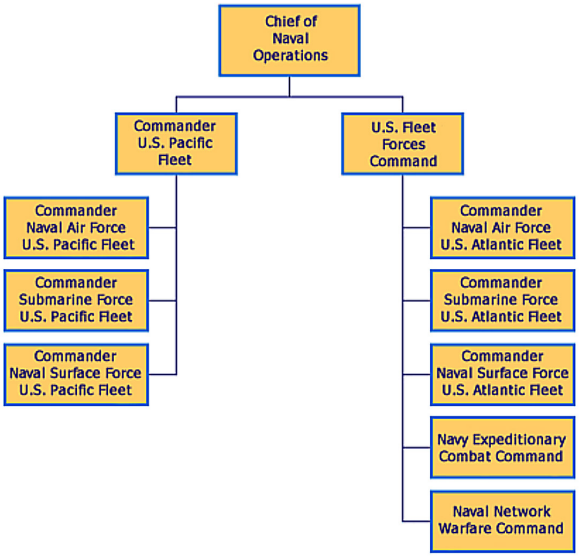

Figure 2: US Navy command structure

In the US Navy, however, organize, train, and equip functions are performed by fleet commands, and the "platform" commands (such as the surface ship command, submarine command, and naval aviation command) are subordinate to the fleet (see Figure 2).

13 "Chinese Reusable First Stage Launch Costs Expected to Drop More Than 30 Percent," China News Network, November 17, 2017, http://www.chinanews.com/gn/2017/11-17/8379117.shtml.

14 Andrew Jones, "China to Test Rocket Reusability with Planned Long March 8 Launcher," *Space News*, April 30, 2018, http://spacenews.com/china-to-test-rocket-reusability-with-planned-long-march-8-launcher/.

15 "Scheme of Flight," Cosmic Course Company web page, http://www.cosmocourse.com/sxema-polyota/.

16 "Russia Establishes Aerospace Forces as New Armed Service—Defense Minister," TASS News Agency, August 3, 2015, https://www.rbth.com/news/2015/08/03/russia_establishes_aerospace_forces_as_new_armed_service_defense_ministe_44545.

Figure 3: US Air Force command structure

The Air Force, though, divides its organize, train, and equip functions into completely separate commands, though, as seen in Figure 3.

This is one case where the US Air Force can take a lesson from the Navy. For truly effective multi-domain warfighting capability in the 21st century, the Air Force should consider merging its commands into a single aerospace "fleet," an integrated "Aerospace Combat Command"—with subordinate commands for space, air, strike, and cyber.

In a truly integrated "US Aerospace Force," the Air Force's fighters, bombers, launch vehicles, satellites, and cyber assets would be integrated in a single command—in the same way that subsurface, surface and aviation forces are integrated into US Navy fleets.

That said, because air and space power are global capabilities, a US Aerospace Force would not need separate combat force providers for the Atlantic and Pacific Oceans. In composition, it would look something like Figure 4.

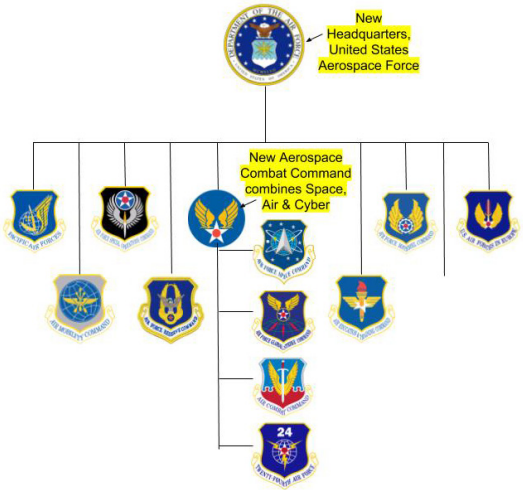

Figure 4: Proposed US Aerospace Force command structure

This structure streamlines the organize, train, and equip function for the hypothetical US Aerospace Force by combining all of its air, space, and cyber combat forces into a single command, accountable to a single general officer. This would make it much easier for the Aerospace Force to provide trained, ready, and—above all—integrated air, space, and cyber force packages to US combatant commanders in wartime.

This new "US Aerospace Combat Command" would be led by a combat-experienced space, missile, cyber, or rated officer with promotion and command opportunities based on merit—not necessarily whether the officer grew up killing targets from an airplane, a spaceplane, or from a console.

A separate "space force," on the other hand, would create a seam between air and space—just as Senator King tried to do between surface ships and submarines. This would disrupt unity of command between US military forces, and make them less effective against the aerospace forces of other nations.

If Congress and the Trump Administration really want to bolster America's capabilities in space and keep the United States on the leading edge of the coming revolution in space roles and missions, they should start work now on the transformation of the US Air Force into a new, more powerful US Aerospace Force. Organizational and doctrinal integration of air and space, not separation, is the real "out of the box" thinking US aerospace forces and our nation both need. ✪

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About the Author

Col Bill Bruner, USAF (Ret.) served 22 years as an F-111 weapon systems officer and policy analyst. Early in his career, he served on combat crews flying the Quick Reaction Alert mission in Europe. Later, he attended the USAF Fighter Weapons School and was a distinguished graduate of the School of Advanced Airpower Studies, where he wrote his thesis on the national security implications of inexpensive space access.

During Operations Desert Shield and Desert Storm, he served as chief of Scud and nuclear, biological, and chemical attack planning on the air campaign planning staff at US Central Command Air Forces. Later, in Washington, D.C., he served on the Air Force secretary's staff group, and as a fellow in the Office of the Speaker of the House of Representatives. In his final assignment prior to retirement in 2003, he was the director of the Office of Northern Gulf Affairs in the Office of the Secretary of Defense, where he won the Assistant Secretary of Defense Paul H. Nitze Award for Excellence in International Security Affairs.

From 2007 to 2009, Bruner served as the appointed assistant administrator for legislative and intergovernmental affairs at NASA, where he directed the space agency's relations with Congress, state governors, local legislators, and others.

Bruner currently serves as the CEO of New Frontier Aerospace, a technology development and consulting company in Livermore, California, which develops a range of applied technologies for the aviation, space, and energy markets. He is a graduate of the National War College, the Air Force Fighter Weapons School, and the Air Force's School of Advanced Air and Space Power Studies. He earned master's degrees with distinction in National Security Strategy and Airpower Arts and Sciences. His bachelor's degree in physical science (Astronomy) is from San Francisco State University.