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Air & Space Operations Review

SUMMER 2022 VOL. 1 NO. 2

FROM THE EDITOR

Dear Reader,

Welcome to the Summer 2022 *Air & Space Operations Review* (*ASOR*). This issue includes a senior leader perspective from US Southern Command and Air Forces Southern, articles discussing space operations, Space Force culture, and the Indo-Pacific, and contributions from European Ally and partner militaries.

The journal begins with a *Senior Leader Perspective*, reprinted from the *Journal of the Americas* 1st edition, 2022. Brigadier General Sean Choquette and Steffanie Urbano discuss China's growing influence in Latin America and argue the updated national security strategy must provide increased resources, funding, and operational capabilities to help US Southern Command and Air Forces Southern address this strategic competition in our own hemisphere.

Shifting to the celestial from the terrestrial, our *Space* forum leads with an article by Adam Wilmer and Robert Bettinger. International commercial and military activities and interstellar threats to the planet itself are increasing across the entire Earth-Moon system. Arguing that space domain awareness can no longer be confined to geosynchronous orbit, the authors propose a new taxonomy to accurately classify space domain awareness missions and better apply resources to and development of the same.

In the second article in the forum, Dan Sanders details the four historic cultural traditions to date in the US Space Force. Engineers, operators, integrators, and warfighters have all had periods of cultural ascendency in the service that predate the establishment of US Space Force. Understanding these cultures will help Space Force leaders shape an effective service culture for the future.

Our third section, *Indo-Pacific*, features a reprint from the January 2022 issue of *Journal of Indo-Pacific Affairs*. Lynn Savage presents the US Indo-Pacific Command's *Integrated Air and Missile Defense Vision 2028*. This innovative approach to integrated air and missile defense in the region will support Allies and partners as they maintain competitive advantage.

Our issue closes with the *From Our Friends* forum. The first article, cowritten by Christophe Piubeni of the French Air Force and his US counterpart, Dan Gottrich, discusses the myriad challenges the Department of Defense and the US Air Force must overcome to conduct multidomain operations effectively. Key to this is integrating Allies and partners.

The forum and our issue concludes with an article by Sokol Thana of the Albanian Air Force. The author details the significant changes the Albanian army underwent in command, control, and communication after the fall of the Soviet Union, to achieve its national objectives and to advance the major military transformation required by Western international security organizations. Albania is a compelling case study for other nations experiencing similar, radical political and societal change.

~ The Editor

Outcompeting China in Latin America

A Top National Security Priority

Brigadier General Sean M. Choquette, USAF
Senior Airman Steffanie G. Urbano, USAF

China's influence in Latin America is growing, threatening the historic hemispheric agency of the United States. In order to counter Beijing's rising tide in the USSOUTHCOM area of responsibility, the updated National Security Strategy should provide increased resources, funding, and operational capabilities to help the command address this strategic competition.

Partner nations in the US Southern Command (USSOUTHCOM) area of responsibility (AOR) share, for the most part, geography, values, and philosophical alignment with the United States; however, they also provide an active arena for competition between the United States and malign state actors like China, Russia, and Iran.[1] In Latin America, America faces what may become the largest rivalry in its history as Beijing tries to supplant Washington's historical hemispheric agency. This emerging strategic competition calls for fundamental policy and strategy changes, diverging from the past 20 years of Global War on Terror-centric thinking and operations.

The March 2021 *Interim National Security Guidance* addressed this new reality, proclaiming "Democracies across the globe, including our own, are increasingly under siege" while "the distribution of power across the world is changing, creating new threats. China, in particular, has rapidly become more assertive."[2] Reflective of this, the updated national security strategy should provide the basis for increased resources, funding, and operational capabilities to address this strategic competition where it is closest to home . . . in our hemispheric neighborhood.

Air Forces Southern (AFSOUTH), as USSOUTHCOM's air component, is dedicated to increasing Latin American security cooperation in support of the new defense strategy and establishing improved security partnerships while fortifying existing ones. US and partner military-to-military relationships are critical and have often provide steady, strong, and enduring stability across the AOR despite political turmoil. To continue this trend and outcompete our pacing threat, the People's Republic of China (PRC), AFSOUTH will promote active, responsive engagement that reflects military and interagency approaches and meets both US and partner goals for improved relations and reduced PRC influence.

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1. This article was first published in the *Journal of the Americas* 4 (1st ed., 2022).

2. Joseph R. Biden Jr., *Interim National Security Strategic Guidance* (Washington, DC: The White House, March 2021), 7–8, https://www.whitehouse.gov/.

China's Growing Global Disposition

One of the PRC's primary soft power strategies is improved economic leverage in the AOR via its Belt and Road Initiative (BRI). The BRI is a global infrastructure development strategy adopted by the Chinese government in 2013 to invest in nearly 70 countries and international organizations. Though the BRI provides benefit to Latin American nations through much-needed investments and infrastructure, its attendant agreements create significant influence and financial advantages for the PRC.

The BRI is one of the PRC's primary baits for debt-trap diplomacy.[3] Through contractual stipulations and confidentiality clauses that bar borrowers from revealing terms and conditions of the engagements—or even the debts' existence—the PRC obtains sufficient leverage to manipulate countries unable to repay their loans through equity agreements.[4] Sri Lanka provides a cautionary example for the AOR; it had to hand over a strategic port to Beijing in 2017 when it was unable to pay off its debt to Chinese companies.

Despite the PRC's ascendancy through this and other programs in the hemisphere, it faces significant domestic and international challenges. As explained by Hal Brands and Michael Beckley, the PRC will grapple with an aging and shrinking workforce in the future. It is approaching a demographic precipice: from 2020 to 2050, the PRC will lose 200 million working-age adults (a population the size of Nigeria) and gain 200 million senior citizens. The consequences will be devastating, as current projections suggest the PRC's medical and social security spending will triple from 10 percent to 30 percent of its GDP by 2050 just to prevent millions of seniors from dying of impoverishment and neglect.

China's future sustainability is further constrained by depleted supplies of energy and raw materials as the PRC runs out of resources. Already, water has become scarce, and the country is importing more energy and food than any other nation, having ravaged its own natural resources.[5]

Questions about the PRC's innovation capability, inequality and corruption, risks to social stability, and the environment prevail as the country turns away from the package of policies that promoted rapid growth. Under Chinese President Xi Jinping, Beijing slid back toward totalitarianism. Xi appointed himself "chairman of everything," dismantled collective rule, and made adherence to "Xi Jinping thought," the ideological core of an increasingly rigid regime.

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3. Jennifer Hillman and David Sacks, *China's Belt and Road: Implications for the United States*, Independent Task Force Report no. 79 (Washington, DC: Council on Foreign Relations, updated March 2021), https://www.cfr.org/.

4. Thomas Kohlmann, "Cracks Appear in China's New Silk Road," Deutsche Welle, May 4, 2021, https://www.dw.com/; and Asian News International, "China Debt-Traps Nations with Confidentiality Clauses: Report," NDTV, August 25, 2021, https://www.ndtv.com/.

5. Hal Brands and Michael Beckley, "China is a Declining Power-and That's the Problem," *Foreign Policy*, September 24, 2021, https://foreignpolicy.com/.

In Xi's anti-corruption campaign (or, more accurately, purge), which began in 2012, about 1.5 million citizens from the Chinese Communist Party, military, public companies, and others perceived to be against his narrative have been killed, imprisoned, or removed from their jobs—all without a fair legal process. He relentlessly pursues the centralization of power at the expense of economic prosperity. State zombie firms are being propped up while "private" firms like Evergrande and Fantasia are starved of capital.[6]

Objective economic analysis is being replaced by government propaganda. Innovation is becoming more difficult in a climate of stultifying ideological conformity. The world is becoming less conducive to effortless Chinese growth, and Xi's regime increasingly faces the sort of strategic encirclement that once drove imperial German and Japanese leaders to desperation.[7] In light of these pressures, the PRC could attempt to use Latin America as leverage or a staging ground in a last-ditch effort to hold onto power. Through debt entrapment, contractual ambiguity, the new Chinese National Defense Law, or other malicious means, Latin America could find itself the victim of an increasingly parasitic relationship with the PRC (fig.1).[8]

Figure 1. Examples of Chinese tactics in Latin America
Source: Authors

6. Michelle Toh, "Foreign Investors Are Losing Out in Evergrande's Battle to Survive," CNN, October 3, 2021, https://www.cnn.com/; and Matthew Loh, "Chinese Property Developer Fantasia Just Missed a $206 Million Repayment Deadline, a Sign That China's Real Estate Woes Extend beyond Evergrande," Yahoo News, October 4, 2021, https://news. yahoo.com/.

7. Brands and Beckley, "Declining Power."

8. John Feng, "New China Defense Law Could 'Justify' PLA Action against U.S.-Think Tank," *Newsweek*, January 13, 2021, https://www.newsweek.com/.

US Involvement

Whole of Government

Top military officials at USSOUTHCOM have warned for years that the PRC is rushing to fill the power vacuum in the wake of Washington's focus on the Middle East. Washington's decreased attention on the Western Hemisphere allowed Beijing to prop up antidemocratic regimes such as Venezuela, fomenting disorder and unrest across the region.[9] In countering this, the United States must set realistic and achievable standards as there is no way to entirely remove the PRC from the equation.

There are, however, opportunities to decrease Chinese influence and the likelihood of Latin American and Caribbean nations defaulting to Chinese options. The concept has been described by academics and economists alike as "competitive coexistence." As in a capitalist economy, interdependent adversaries can coexist peacefully, accepting competition as a healthy way to bolster innovation and efficiency. This could both defuse tensions and provide a more constructive international narrative.

Latin American countries would benefit economically and politically, as they would be offered market choices versus policy-driven options focused on displacing another country. It would be impractical, and likely detrimental, to entirely remove the PRC from Latin America's economic and political spheres; but an improved, more symbiotic US relationship would reduce Latin America's overall dependence on Chinese options. The United States can viably compete with the PRC by simply shining a light on dishonest practices while providing better options to satisfy Latin America's needs.

This requires the United States to preempt PRC messaging—to drive the political narrative. Today, the PRC is faster, more responsive, and winning the information war. It provides singular solutions to countries otherwise without options.[10] If the United States could manifest the same efficiency in support of our Latin American allies, it could leverage and win strategic, controlled competition with the PRC, to bolster our reputation and influence in the AOR.

The United States can provide more holistic, whole-of-government support and leadership within the international arena to assist Latin America in diminishing its reliance on the PRC. This includes one of the most important political nexuse. between the United States and Latin America–the Organization of the American States (OAS).

The OAS strategic pillars mirror US imperatives in the region and highlight the PRC's misalignment with closely held trans-American values. Unfortunately, some Latin American countries would argue, despite this, the OAS is one of the organizations most

9. Lara Seligman, "Biden Urged to Focus on Long-Neglected Latin America as Chaos Erupts," *POLITICO*, July 15, 2021, https://www.politico.com/.

10. Victoria Chonn Ching, "Joining the Game: China's Role in Latin America's Investment Diversification," working paper, Boston University Global Development Policy Center (website), July 12, 2021, https://www.bu.edu/.

neglected by the United States.[11] The United States should ensure consistent, productive involvement in the OAS. As the Community of Latin American and Caribbean States (CELAC)–an organization that excludes the United States–increases its influence, supporting the OAS becomes even more vital. If Latin American nations find the OAS to be biased or unproductive, or if upcoming Brazilian and Colombian elections put parties into power that do not support the OAS, the organization will lose relevance, and CELAC will become the primary inter-Latin American assembly.

The PRC is also involved in CELAC, using it to spread its narrative, whereas the OAS is a US investment in the community, having a long-term commitment to the region. Similarly, the United States should leverage the United States-Mexico-Canada Agreement, Pacific Alliance, Southern Common Market, the Caribbean Community, Association of Caribbean States, and other trade and commercial integration organizations to continue building significant regional free and special trade relationships. Though not a direct member of all of these, the United States, through its trade representatives, can use these regional enterprises to help foster deeper commercial bonds addressing the hemisphere's economic deficits.

In 2022, the United States will also host the tri-annual Summit of the Americas, providing an opportunity for the current administration to emphasize response to the changing global economic landscape in order to meet twenty-first-century environmental challenges, improve social inclusion, and develop a new dialogue on governance embracing the region's diversity, as recommended by P. M. McKinley.[12] Doing so would allow shared concerns to be addressed with Latin America's priorities as the main feature.

There are additional ways the United States can mitigate the issues presented by the PRC's Belt and Road Initiative, such as the *America Crece* (Growth in the Americas) program, the Better Utilization of Investment Leading to Development (BUILD) Act, and the Group of 7's (G7) Build Back Better World (B3W).[13] The B3W launch event is planned for early 2022 and will include details aimed at allocating $40 trillion for infrastructure projects over the next 14 years.[14] It provides sustained impact as an alternative to the PRC's BRI as it focuses on areas including climate, health, and digital technology.[15] These domains cover tourism, socioeconomic concerns, and citizen well-being—all areas the PRC is uninterested in developing.

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11. Andrea Barrera and Jack Kincaid, "Mexico Softens Tone on Possible OAS Shake-Up Plans," Reuters, September 17, 2021, https://www.reuters.com/.

12. P. Michael McKinley, *The Case for a Positive U.S. Agenda with Latin America* (Washington, DC: Center for Strategic and International Studies (CSIS), April 2021), https://csis-website-prod.s3.amazonaws.com/.

13. Sean M. Choquette, "US and China in Latin America: Tenets for Strategic Competition," 2021.

14. "Fact sheet: President Biden and G7 Leaders Launch Build Back Better World (B3W) Partnership," The White House, Statements and Releases (website), June 12, 2021, https://www.whitehouse.gov/.

15. Trevor Hunnicutt, "U.S. Plans Projects in Latin America Countering China's Belt and Road," Reuters, September 27, 2021, https://www.reuters.com/.

Through this project, Latin American countries will receive higher-quality products from the G7 and a sustainable solution to their needs. Additionally, to address the legal concerns associated with the BRI, the United States should offer third-party or neutral-state legal counsel to Latin American countries regarding foreign contracts. Third-party (US-endorsed or otherwise) review of these stipulations advice on contract law would force transparency into the PRC's actions. It would also insulate Latin American countries from disingenuous dealings, allowing Latin American nations to better assert their foreign policy on their own terms.

Ideally, these initiatives could improve US and Latin American teaming to supplant China as the world's preferred manufacturing base. For decades, the United States ceded much of its manufacturing base to the PRC to leverage the country's cheap labor supply. The world is now dependent on China for much of its global supply chain, posing a significant military threat as China could easily cut off critical defense resources. Rare earth materials such as steel and ferroalloys are key to the development and maintenance of warfighting hardware. They are necessary to produce nearly all technical components, such as microchips, and are almost exclusively sourced from overseas. This allows for deliberate interference with essential national security supply chains.[16]

Latin America now offers many of the same benefits China once offered via more affordable labor and flexible regulations, so there is an opportunity for US manufacturing infrastructure to develop closer to home with countries whose values are aligned. This will simultaneously undercut the PRC's monopoly and supply Latin America with greater economic power. Many Americans would rather see "Made in [Latin American Country]" than "Made in China" on the goods they buy.

Air Forces Southern

Military efforts in the region must align with a coherent whole-of-government approach. While USSOUTHCOM and AFSOUTH do not develop national policy or actions, they implement it and help provide bedrock regional stability through continued political-military engagement and rock-solid military-to-military relationships. As the PRC encroaches on the Western Hemisphere, trans-American shared concerns, history, and values based on geographic proximity are at risk. This is where USSOUTHCOM and, in particular, AFSOUTH, can provide pertinent, actionable intelligence and recommendations to reduce Latin American reliance on the PRC.

AFSOUTH can help accelerate foreign military sales, offer more affordable opportunities for partner military training, and increase information sharing and military interoperability. The March 2021 *Interim National Security Strategic Guidance* doubled down on partnership building in the region as vital to Western Hemisphere strength. The

16. Jay Town, "China Exploiting Supply Chain Vulnerabilities," *National Defense* (website), December 9, 2020, https://www.nationaldefensemagazine.org/.

positive effects are multiplied when efforts are combined multilaterally to address common challenges, share costs, and widen the circle of cooperation.

To support this line of effort, AFSOUTH will increase partner-nation operations, activities, and investments that include training, partner-nation exercise support, professional military education, and key leader engagements. Bilateral ties can be fortified by negotiating adherence to international norms, invigorating cyber and space cooperation, and establishing information-sharing agreements, particularly in the space and cyber domains.

The slow and rigid declassification and dissemination of information to partner nations is clearly a barrier to timely support. Creation of an intelligence alliance encompassing Latin American countries for easier dissemination of classified information would improve and expedite collaboration between the United States and its Latin American partners. Such communication would improve our ability to relay regional threats and the global risk of Chinese activity in a more timely and explicit manner. Through a comprehensive common operating picture, the United States and its partners could more effectively communicate, interoperate, and defend our neighborhood from malign external influence.

USSOUTHCOM and AFSOUTH continue to increase partner-nation collaboration via senior leadership engagement and cooperation, contingency operations, subject matter expert exchanges, interoperability, and combined exercises. Successfully partnered exercises like Relampago VI, Resolute Sentinel 21, Cruzex, and Panamax promote regional interoperability and strengthen national ties.[17]

As the national security strategy evolves, resources and operational capabilities will be reallocated, many to elsewhere in the world. AFSOUTH will need to focus its limited resources on key opportunities to optimize its presence throughout the AOR. It will leverage opportunities like FIDAE 2022, the largest air and trade show in Latin America held biannually in Chile, to challenge PRC and Russian influence and military offerings.[18] Increasing opportunities for Latin American partners to attend American military schools or world-class exercises at the Nellis Test and Training Range and/or national and Joint readiness training centers will encourage improved collaboration between military forces and leadership. AFSOUTH must act faster to meet opportunities, becoming more responsive to our partners' requirements. It is of critical national interest to have US equipment, training, and procedures as the desired standard in our partner nations.

AFSOUTH will also endeavor to expand and accelerate foreign military sales in Latin America. Foreign military sales is a complex State Department program executed by the Defense Security Cooperation Agency, requiring congressional approval and coordination with private industry. AFSOUTH can better lobby for recommended or requested military equipment and seek to shorten approval and delivery times. Examples include fighter aircraft and ground-based radars for improved airspace awareness. Increasingly

17. United States Southern Command (USSOUTHCOM), "Building Partner Capacity: Supporting Our Partners," USSOUTHCOM (website), n.d., accessed October 21, 2021, https://www.southcom.mil/.

18. R. Evan Ellis, *Chinese Security Engagement in Latin America* (Washington, DC: CSIS, November 2020), https://csis-website-prod.s3.amazonaws.com/.

ambitious opportunities include exporting variants of more complicated systems or upgradeable base platforms such as aircraft and surface-to-air missile systems that are modular to allow for upgrades in alignment with partner-nation budgets and needs. These can provide affordable, timely options to our Latin American allies to bolster their national defenses.

Finally, AFSOUTH can further US defense and cooperation strategies by leveraging its intelligence, cyber, and space enterprises to identify infrastructure and collaboration opportunities, highlight Chinese malign activities through key leader engagements and information operations, and cultivate more intentional multicountry sharing agreements. AFSOUTH's cyber subject matter experts can provide education on network security to protect partner-nation critical digital infrastructure against malign exploitation.

With the increasing ubiquity of space influence across the AOR, AFSOUTH should increase involvement in Latin American space infrastructure and programs to conduct operations and share with partner-nation equivalents. These programs, paired with other US-led capabilities, will foster trust through crisis prevention and response through both preemptive and reactive support (i.e., humanitarian assistance & disaster relief, COVID relief, weather support, political/social unrest, or food/water insecurity).

To better enable these efforts to compete in the gray zone, USSOUTHCOM and AFSOUTH require additional resources. Retired Admiral James Stavridis offered that USSOUTHCOM must practice medical and humanitarian diplomacy through the provision of hospital ships and airlifted clinics, timely responses to natural disasters, the humanitarian construction of schools and other infrastructure, and counternarcotics operations. These capabilities, he argued, are inexpensive and will achieve outsized effects.[19]

There is an urgent need for the current administration and the Department of Defense to dedicate more resources to the Western Hemisphere, and USSOUTHCOM in particular, in order to counter the PRC's predatory economics and illegal resource exploitation. As an example, the Pentagon could dedicate further resources or expand authorities for intelligence, surveillance, and reconnaissance detection and monitoring efforts to better assist partner nations in countering illegal, unreported, and unregulated fishing operations within their territorial waters. AFSOUTH could then actively illuminate these illicit activities in the information space to provide tangible examples that counter the PRC's unchecked narrative. Initiatives of this type are low-cost, effective ways for the combatant command to prevent continued PRC ascendance in the Western Hemisphere; however, they require some investment and prioritization by Washington.

To best defend the Western Hemisphere against malign state actor influence, Latin America must be reprioritized to defeat transnational threats and enhance regional political stability. Delays in partner support will manifest in adversary gains that could, in a not-too-distant future, develop into levels of PRC influence and presence that require greater investment and military actions.

19. Seligman, "Chaos Erupts."

AFSOUTH, as a key component in SOUTHCOM's defense of the Western Hemisphere, requires proper support and resources to this end. Inaction could put at risk unrestricted access to the Straits of Magellan and increase vulnerability of our space assets through increased PRC observation, tracking, and targeting. Chinese basing could present very near and real threats. Chinese-owned and operated infrastructure could be postured for intelligence collection on US and host nation entities.

The United States cannot afford to lose Latin American partnerships and influence through inaction. We are preventing our own future success by allowing the growth of malign influence across the Western Hemisphere. Latin America has become key terrain in outcompeting the PRC and other adversaries while protecting strategic alliances. AFSOUTH must lead this fight through increased training, operations in the information environment, key leader engagements, partner-nation exercise support, and a keen focus on sharing intelligence and interoperability.

Trans-American Ideological Core

Today, Latin American partners and the United States share a common history, culture, and vision for the future, though this was not always so. Through the American Wars of Independence in the late eighteenth and early nineteenth centuries, that were influenced by the American Revolution, independent nations formed. The hemisphere reshaped its cultural disposition after this colonial break, forming its own unique identity.

Though the United States fell into some of the same colonial behaviors as it developed into a world power, it eventually recognized and acknowledged these mistakes. Today, the United States is dedicated to the development of mutually beneficial bilateral and regional partnerships. The modern Western Hemisphere boasts trans-American standards like respect for democratic values, energy security, economic prosperity for a burgeoning middle class, infrastructure development, and improved fiscal resiliency that are based on human rights, universal liberal governance precepts, privacy, and free global commons.

Latin America's political transformation since the 1990s has been profound. It now boasts the highest proportion of democratically elected governments outside Europe and North America, tying the United States and Latin America together through democratic ideals. In the economic sphere, Latin America developed from an insular region dependent primarily on commodity exports, into an increasingly dynamic region integrated on a global scale.[20]

Self-determination and democracy remain at the forefront of Latin American political thought despite recent regional and global events that have led to a backslide in several Latin American countries.[21] In this environment, it is more important than ever for the

20. McKinley, *Positive U.S. Agenda*.

21. Daniel Zovatto, "The Rapidly Deteriorating Quality of Democracy in Latin America," Order from Chaos, Brookings Institute (blog), February 28, 2020, https://www.brookings.edu/.

United States to support our partners through high-quality, transparent initiatives that meet their needs and bolster their democratic institutions.

In sum, the United States must continue to build synergistic relationships with Latin American nations that take advantage of cultural similarities, mutual benefit, and shared values. As the United States implements a more partner-focused approach, goals should emphasize community, cultivation of new relationships, and revitalization of current ones. This will help prevent our Latin American partners from defaulting to China as a partner of necessity—and the US military has a key role. Recognizing America's greatest strategic asset as its alliances and partnerships, AFSOUTH must lead, continuing its legacy of strong regional partnerships and accelerating the development of improved operations, activities, and investments in the USSOUTHCOM AOR. ✈

Beyond the High Ground

A Taxonomy for Earth-Moon System Operations

Adam P. Wilmer
Robert A. Bettinger

Situational and space domain awareness in the space domain can no longer be confined to that which is found in geosynchronous orbit. International activities—commercial and military—and threats to the planet itself exist and are increasing across the entire Earth-Moon system. This reality requires a new taxonomy to accurately classify space domain awareness missions and better apply resources to and development of the same. This work presents such a taxonomy for the classification of space domain awareness regions.

The 2010s witnessed a renewed international interest in space operations extending outside near-Earth space. Invigorated Chinese, Russian, and US lunar mission initiatives; planned commercial lunar projects; and coalescing international efforts to reach Mars encompass the cislunar environment (the spherical volume of space extending from super-synchronous orbit to the Moon's orbit) and beyond. Based on these development initiatives, space beyond geosynchronous orbit will likely become competitive and congested in the coming decades.

Attaining space-situational and wider space domain awareness (SDA) will thus require a field of view not limited to the traditional bounds of geosynchronous orbit. This new reality demands a novel way of classifying SDA missions that encompass the entire Earth-Moon system, including the spatial expanses in the outside vicinity of Earth's gravitational sphere of influence (SOI).

This article presents new taxonomy for the classification of space domain awareness regions. The new taxonomy will enable a spatial division of the national SDA mission portfolio, with specific regions corresponding to compounding distances from Earth and multiple SDA mission subsets including space traffic management, space control, lunar and Earth-Moon Lagrange point surveillance, space weather observation, and planetary defense.

Background

The US Space Force has declared that space domain awareness "encompasses the effective identification, characterization, and understanding of any factor associated with the space domain that could affect space operations and thereby impact the security,

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safety, economy, or environment of our Nation."[1] The space domain is becoming increasingly congested, contested, and competitive as peer, near-peer, and emerging space powers expand their presence in space. Consequently, SDA will remain a critical mission for securing and advancing the space operations of the United States, its Allies, and partners in the coming decades.[2]

Until the 2010s, SDA missions were nominally restricted to the near-Earth space orbital regime bounded by geosynchronous and super-synchronous orbits due to the volume of space traffic within this region. But the late 2010s and early 2020s marked a shift in the space operations paradigm, with renewed international interest in pursuing missions extending into the cislunar environment, to the Moon, and beyond the gravitational influence of the Earth-Moon system.

Domestically, this shift is represented by reinvigorated initiatives to return to the Moon via the National Aeronautics and Space Administration's (NASA) Artemis program and planned commercial space projects. Recent international cislunar activity includes plans to develop a joint Chinese-Russian base at the lunar south pole in the 2036–45 timeframe, China's Chang'e-5 lunar sample-return mission in 2020, Israel's attempted lunar surface mission in 2019, and China's Chang'e-4 far-side lunar mission in 2018.[3] Of note, China's Queqiao communications relay satellite, which is accompanied by the Chang'e-4 mission, is the first vehicle to orbit the Earth-Moon Lagrange point located on the far side of the Moon.[4] International missions in cislunar space will likely increase throughout the 2020s, with a corresponding increase in the number of spacecraft operating in this region, as scientific exploration expands, space system technology evolves, and the lunar economy emerges and develops.

Undoubtedly, the largest DoD SDA mission will be to protect space lines of commerce. Nations and private companies alike are exponentially building space-based infrastructure to ensure communication, surveillance, and transportation. In doing so, near-Earth space is becoming congested with thousands of active spacecraft, and 23,000 debris fragments

1. US Space Force (USSF), *Spacepower: Doctrine for Space Forces*, Space Capstone Publication (Peterson Space Force Base [SFB], CO: USSF, June 2020), 38, https://www.spaceforce.mil/.

2. Robert M. Gates and James R. Clapper, *National Security Space Strategy: Unclassified Summary* (Washington DC: Department of Defense and Office of the Director of National Intelligence, January 2011), 1, https://www.hsdl.org/.

3. Eva Dou, "China and Russia to Open Moon Base, Expanding Space Cooperation," *Washington Post*, March 10, 2021, https://www.washingtonpost.com/; Adam Mann, "China's Chang'e-5 Lunar Mission: Sampling the Lunar Surface," Space.com, December 2020, https://www.space.com/; and Maria Temming, "Israel's First Moon Mission Lost Moments before Landing," ScienceNews, April 11, 2019, https://www.sciencenews.org/.

4. Leonard David, "U.S. Military Eyes Strategic Value of Earth-Moon Space," Space.com, August 29, 2019, https://www.space.com/.

larger than a softball and half a million debris fragments larger than a marble resulting from historical mishaps and breakups.[5]

This congestion, combined with the growing connection of space access to national security and economic growth, has prompted many nations to realize the benefit and prestige of extending space operations into cislunar space. Cislunar space and the outer reaches of the Earth-Moon system are becoming the new high ground for space operations. The SDA mission and focus must expand accordingly to handle this growth of congestion and competition to ensure continued US space dominance.

A key component of a broadened SDA mission is a new multiregion taxonomy that will enable a spatial division of the national SDA mission portfolio. This taxonomy includes five constituent regions, which, in total, extend from the planetary surface and low-Earth orbit to out beyond Earth's gravitational sphere of influence. The article emphasizes the spatial volume outside of geosynchronous orbit, as four of the five regions exist in cislunar and higher orbital regimes. Critically, these five regions host different SDA missions based on potential orbits.

Space Domain Awareness: Structure and Missions

In the wake of World War II, the United States acknowledged the growing importance of the air domain in national security operations by establishing the US Air Force—a service dedicated to attaining and projecting airpower. Similarly, the US Space Force has emerged as an independent service due to the need to attain and maintain national power and superiority in space—a domain now irrevocably linked to US sovereignty and economic power.

Until the 2010s, the US military was hesitant to refer to space as a war-fighting domain. But the patent realization of space as a congested, contested, and competitive domain has prompted an evolution in how space is viewed and framed from a national security perspective.[6]

For almost 50 years following the start of the first Space Age in the mid-twentieth century, space represented a supporting function to wider terrestrial conflict—either on land, at sea, or in the air. Yet as early as 1982, space was described as the "ultimate high ground."[7] Indeed, space operations enabled the introduction of game-changing technologies through persistent overhead surveillance, communication beyond the line of

5. Mark Garcia, "Space Debris and Human Spacecraft," National Aeronautics and Space Administration (NASA) (website), last updated May 27, 2021, https://www.nasa.gov/.

6. Sandra Erwin, "Air Force: SSA is No More; It's 'Space Domain Awareness,'" Spacenews, November 14, 2019, https://spacenews.com/.

7. Benjamin S. Lambeth, *Mastering the Ultimate High Ground: Next Steps in the Military Uses of Space* (Santa Monica, CA: RAND Corporation, 2003), 27, https://www.rand.org/.

sight, and precision navigation and timing that would spur a revolution in US military strategy and operational art in the later twentieth and early twenty-first centuries.[8]

Against a backdrop of expanding space access and utilization during the first half century of the Space Age, a new mission emerged in the 1960s: early warning and space object tracking and characterization. The protoform of what became known as space situational awareness (SSA) arose due to the need to differentiate between nonhostile resident space objects (i.e., operational satellites and debris) and ballistic missile nuclear payloads.[9]

The SSA mission grew to encompass four functions: search, detect, track, and characterization. Once a space object was characterized and its orbital position and velocity were known for predictive tracking, it was cataloged. At its heart, the SSA mission became one of space traffic management; ground- and space-based sensors constantly updated and refined the space object catalog to deconflict orbits and generate collision-avoidance warnings.[10]

While SSA remains a consistent term in civilian space flight, the general SSA mission has become a subset of a wider mission set for the Department of Defense—space domain awareness. In 2019, then-Major General John E. Shaw, the US Space Command deputy commander, discussed the formal shift from SSA to SDA within the Department of the Air Force. "The implication of space as a warfighting domain demands we shift our focus beyond the Space Situational Awareness mindset of a benign environment to achieve a more effective and comprehensive SDA."[11]

According to Space Force doctrine, SDA "leverages the unique subset of intelligence, surveillance, reconnaissance, environmental monitoring, and data sharing arrangements that provide operators and decision makers with a timely depiction of all factors and actors—including friendly, adversary, and third party—impacting domain operations."[12] Based on the requirements of securing full-domain awareness in near-Earth space and beyond, five distinct missions compose the broader endeavor to attain SDA: 1) space traffic management; 2) space control; 3) lunar and Earth-Moon Lagrange point surveillance; 4) space weather; and 5) planetary defense.

8. Lambeth, *Ultimate High Ground*, 27.

9. Brian Weeden, Paul Cefola, and Jaganath Sankaran, "Global Space Situational Awareness Sensors" (lecture, Advanced Maui Optical and Space Surveillance Technologies Conference, Maui, HI, 2010).

10. Mark A. Baird, "Maintaining Space Situational Awareness and Taking It to the Next Level," *Air & Space Power Journal* 27, no. 3 (September-October 2013): 60.

11. Erwin, "SSA Is No More."

12. USSF, *Spacepower*, 38.

Mission Types

Space Traffic Management

Like air traffic management and—from a localized perspective—sea traffic management, the space traffic management mission promotes safe access to and operations in the space domain. Baseline operations include the SSA function of space catalog maintenance and orbit prediction to avoid collisions between resident space objects such as active and retired satellites, rocket bodies, and space debris.

The space debris population is continuously growing due to decreased launch costs, the expansion of space mission architectures, the increasing reliance on space communication, commerce, and defense, and the emergence of new space-faring nations. The low-Earth orbital regime, due to ease of access and proximity to terrestrial space users, has become increasingly congested, making space traffic management all the more critical. This congestion will only further and dramatically increase with the expansion of mega-constellations and as new private/commercial and state-affiliated players enter the space operations arena.[13]

Space Control

The United States has a vested interest in securing space superiority to ensure unrestricted access to and the use of space to fulfill national security objectives, support terrestrial military campaigns, and, ultimately, preserve national sovereignty. Space control represents a military-centric mission intended to counter the growing competitive and contested nature of space and is "a mixture of defensive and offensive measures. . . and is particularly important during periods of increased international tensions or hostilities."[14]

One subset of the space control mission will mirror actions performed in the maritime domain: the protection of US economic interests amid the growing competitive nature of the space domain. In July 2020, the commander of the Air Force Research Laboratory Space Vehicles Directorate discussed this subset mission and stated that "our mission in the Space Force will become to protect . . . the 'celestial lines of commerce,' or the space lines of commerce."[15]

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13. Jonathan C. McDowell, "The Low Earth Orbit Satellite Population and Impacts of the SpaceX Starlink Constellation," *Astrophysical Journal Letters* 892, no. 2 (2020), https://iopscience.iop.org/; and Dan Swinhoe, "China's Moves into Mega Satellite Constellations Could Add to Space Debris Problem," Data Center Dynamics, April 20, 2021, https://www.datacenterdynamics.com/.

14. Terrence Smith, "Challenges to Future U.S. Space Control," *Army Space Journal* (Summer 2002): 1, https://apps.dtic.mil/.

15. Theresa Hitchens, "DoD Needs Plans to Protect Commercial Space Industry, Says New Study," Breaking Defense, July 28, 2020, https://breakingdefense.com/.

Lunar and Earth-Moon Lagrange Point Surveillance

A subset of space traffic management and space control, the lunar and Earth-Moon Lagrange point surveillance mission focuses on the surveillance of lunar orbit, the Earth-Moon corridor comprised of the Moon and the L1 and L2 Lagrange points, and the vicinity of the unstable L3 and stable L4 and L5 Lagrange points. These regions are of particular interest to the international space community due in part to growing international and commercial interest in cislunar and lunar exploration.

In particular, the Lagrange points proffer lucrative positions within the Earth-Moon system for a variety of missions including scientific monitoring of space weather and celestial bodies and intrasystem SSA. Consequently, surveillance satellites operating at the Lagrange points could bolster orbit deconfliction and collision avoidance as a space traffic management function and could track potentially hostile space vehicles under the space control mission.

Space Weather

Space represents a challenging operating domain for both manned and unmanned space vehicles due largely to the natural environmental conditions. The dynamic space weather is primarily a function of solar activity via the generation of thermal radiation, ionizing particles, and plasma. With events such as solar flares and coronal mass ejections, the Sun imperils satellites and their constituent electronic equipment and sensitive payloads with radiation and high-energy particles that may cause temporary or even permanent damage based on the intensity of the event.[16] Tracking space weather contributes to the general SDA mission and enables operators to forecast potentially harmful or destructive natural environmental events, enhancing the safety posture of space vehicles operating within the Earth-Moon system.

Planetary Defense

Apart from tracking manmade objects, debris, and space weather, another SDA mission involves tracking objects outside of the Earth-Moon system for planetary defense. Asteroids, meteors, and comets orbiting the Sun are classified as near-Earth objects (NEOs) when their orbits bring them within 30 million miles of Earth's orbit. NEOs pose an impact risk to both the Earth and the Moon; searching for and tracking these objects enables the overall planetary defense mission.

Currently, NASA manages this mission by providing early detection, tracking, and characterization of NEOs. Additionally, NASA develops strategies and technologies for

16. K. L. Bedingfield, R. D. Leach, and M. B. Alexander, eds., NASA *Spacecraft System Failures and Anomalies Attributed to the Natural Space Environment,* NASA Reference Publication 1390 (Cape Canaveral, FL: NASA, August 1996), http://www.dept.aoe.vt.edu/; and NASA, *Spacecraft Charging*, NASA Reference Publication 1375 (Cape Canaveral, FL: NASA, 1995).

mitigating potentially hazardous objects and plays a lead role in coordinating US government planning in response to an actual impact threat.[17]

Constraints and Limitations

As peer and near-peer competitor nations edge toward pursuing space superiority, the sensors and ground stations that formed the cornerstone of US space domain awareness in previous decades are becoming restrictive in their range and resolution. Previous conceptions of space operations nominally limited to geosynchronous orbit and below are being superseded by a growing necessity to attain situational awareness of resident space objects deep within the cislunar environment.

Current US space sensing assets must be upgraded or replaced to ensure US global superiority. The International Academy of Astronautics assesses "the capacity and accuracy of current space monitoring systems is not sufficient to cover small objects or to provide for orbital avoidance service for all space assets."[18] Ground-based radar and optical systems are the primary methods for characterizing objects in space; however, weather, solar blind spots, and the equipment's terrestrial moorings all cause limitations.[19]

Furthermore, many ground-based systems have significant optical capability gaps. The Ground-Based Electro-Optical Deep Space Surveillance (GEODSS) system is only capable of tracking basketball-sized objects at a distance of 32,187 km (20,000 miles), a distance far below that of cislunar space, which is measured in the hundreds of thousands of kilometers.[20]

One primary challenge regarding tracking and orbit determination via optical sensors is the solar exclusion angle—the cone region within which an optical sensor cannot view a given object. In other words, the Sun is too close to the sensor's line of sight for the object to be resolved and distinguished against the celestial background. Cislunar-based sensors offer a solution to these issues in the Earth-Moon system by hosting a wider range of angles from which to view objects compared to ground-based or near-Earth orbital optical sensors.

Of note, Air Force Research Laboratory's Space Vehicles Directorate is beginning to push the bounds of SDA into cislunar space. Once developed and fielded, the Cislunar Highway Patrol System (CHPS) intends to search, detect, track, and characterize missions within cislunar space and the lunar exclusion zone, or a spatial region imperceptible to Earth-based sensors due to lunar albedo.[21]

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17. "Planetary Defense Coordination Office," NASA (website), last updated March 14, 2019, https://www.nasa.gov/.

18. Corinne Contant-Jorgenson, Petr Lála, and Kai-Uwe Schrogl, eds., *Cosmic Study on Space Traffic Management* (Paris: International Academy of Astronautics, 2006), 11, https://www.black-holes.eu/.

19. Baird, "Space Situational Awareness," 60.

20. Baird, 58.

21. Joseph J. Roth and Eric J. Felt, "Overcoming Technical Challenges from Low Earth Orbit to Cislunar" (lecture, Advanced Maui Optical and Space Surveillance Technologies Conference, Maui, HI, 2020).

Proposed Taxonomy

Currently, the US Space Force uses an SDA taxonomy comprising five altitude-delimited regions: very low-Earth orbit (VLEO), low-Earth orbit (LEO), medium Earth orbit (MEO), geosynchronous-Earth orbit (GEO), and XGEO.[22] While LEO, MEO, and GEO are all universally standard orbital regions, VLEO is a special LEO case corresponding to the higher-drag environment of the 250-350 km altitude range.[23]

First employed by the Air Force Research Laboratory in 2020, the term XGEO describes distances beyond the GEO belt, with XGEO denoting some multiple "X" of the GEO radial distance.[24] Although the inclusion of XGEO into the current SDA taxonomy highlights the necessary pivot to cislunar space awareness, the existing region-based model is limited and fails to capture the scope of the Earth-Moon system adequately.

The increasing spatial scope of space operations necessitates an SDA taxonomy that considers the entire Earth-Moon system rather than the near-Earth space region confined by GEO and geostationary Earth orbits (GSO). The following proposed SDA taxonomy comprises five distinct, spatially delimited regions radiating outward from Earth (fig. 1).

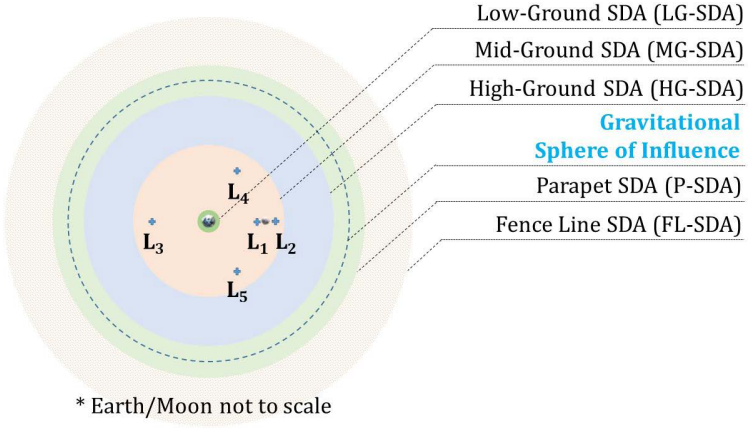

Figure 1. Proposed Earth-Moon system SDA taxonomy (not to scale)

These regions relate to different dynamical zones of operation within the Earth-Moon system. Each contains different potential SDA missions and space system requirements for access to and operations in these regions. Some regions present more challenges than

22. Roth and Felt, "Low Earth Orbit."

23. Eric Kuhu, "Satellite Constellations—2021 Industry Survey and Trends" (lecture, 35th Annual Small Satellite Conference, Logan, UT, 2021).

24. David Buehler et al., "Posturing Space Forces for Operations Beyond GEO," Space Force Journal, January 31, 2021, https://spaceforcejournal.org/.

others to maintain a specified trajectory due to the chaotic nature of the Earth-Moon system, such as near the Earth SOI, the region around the planet within which the Earth's gravitational influence exceeds the gravitational pull of other celestial bodies. Each proposed region is described below with a corresponding identification of the associated spatial distance as measured radially from the center of the Earth in terms of kilometers and the previously mentioned XGEO canonical unit. For comparison purposes, other key locations within the Earth-Moon system, such as the Moon and Lagrange points, are also given.[25]

Low-Ground Space Domain Awareness

The first three SDA regions contain a similar naming convention exploiting the notion that space is the "ultimate high ground."[26] The first region, low-ground SDA (LG-SDA), encompasses near-Earth space and includes the common orbital regimes of LEO, MEO, and GSO/GEO. Specifically, LG-SDA extends from the Von Karman Line (~100 km from the surface of the Earth), a nominal delimitation for the start of space, out to a super-synchronous orbit beyond GEO (42,464 km from the center of the Earth), an orbital regime approximately 300 km above GEO typically used for spacecraft disposal at mission end-of-life.[27]

The LG-SDA region contains most current space operations and represents the highest density of resident space objects and debris to search, detect, track, characterize, and catalog for the general ground- and space-based SDA missions. In terms of the XGEO canonical unit, the LG-SDA region extends from the planetary surface to about 1XGEO.

Mid-Ground Space Domain Awareness

Next, mid-ground SDA (MG-SDA) denotes SDA operations occurring in the region of space commonly referred to as cislunar. The MG-SDA region also contains all five Lagrange points and extends 15,000 km beyond the collinear L2 Lagrange point (~465,000 km). Therefore, MG-SDA encompasses space operations occurring from ~42,500 km to 480,000 km as measured from the Earth's center (between 1–11.4XGEO). Plans for and the development of space-based infrastructure in cislunar space are rapidly growing, thus making MG-SDA an attractive region for performing SDA in the near future.[28]

25. All values are based on the Earth-Moon nondimensional mass parameter, μ=0.01215058655.

26. Lambeth, *Ultimate High Ground*, 27.

27. Nicholas L. Johnson, "A New Look at the GEO and Near-GEO Regimes: Operations, Disposals, and Debris," *Acta Astronautica* 80 (2012): 82–88, https://ntrs.nasa.gov/.

28. James A. Vedda, "Cislunar Development: What to Build—And Why," (Arlington, VA: Aerospace Corporation, Center for Space Policy and Strategy, April 17, 2018), https://csps.aerospace.org/.

High-Ground Space Domain Awareness

High-ground SDA (HG-SDA) is associated with the translunar orbital regime of the Earth-Moon system. The HG-SDA spherical region begins at the outer boundary of the MG-SDA region (480,000 km) and extends to within 25,000 km of the outer bounds of the Earth's SOI, a demarcation occurring at approximately 925,000 km from the Earth (21.9XGEO). At the outermost bounds of the Earth SOI, the effects of solar gravity begin to supersede that of Earth's gravity. Overall, HG-SDA represents SDA operations occurring between 480,000–900,000 km (11.4–21.3XGEO).

Parapet Space Domain Awareness

Beyond the HG-SDA layer is the parapet SDA (P-SDA) region, a spherical volume containing the demarcation of the Earth-Moon gravitational sphere of influence, and extending 25,000 km on either side of said boundary. The gravitational SOI is loosely analogous to the dynamical wall or fence of the Earth-Moon system and, as a result, the P-SDA region derives its name from a parapet—the protected walkway and/or battlement located on top of a castle wall.[29]

In terms of spatial distance, P-SDA defines operations occurring between 900,000–950,000 km (21.3–22.5XGEO). Orbital trajectories residing exclusively within the P-SDA region are challenging to define and maintain due to the chaotic instabilities of the Earth-Moon gravitational system at these distances. Consequently, space systems seeking to perform a P-SDA mission will likely require orbits that traverse other regions within the Earth-Moon system to deliver the necessary transit times in and around the SOI.

Fence-Line Space Domain Awareness

The final region within the proposed taxonomy is referred to as fence-line SDA (FL-SDA). Continuing the analogy of the gravitational SOI resembling a pseudo-barrier, FL-SDA embodies the concept of performing surveillance and security operations outside a barrier that may surround a forward operating base in theater or a secure installation. Space system orbits within the FL-SDA region are still influenced by the gravity of the Earth-Moon system; however, the gravitational influences of the Sun have a greater effect on trajectories.

Tertiary bodies to the Earth-Moon system also become increasingly relevant at this distance. A given SDA mission could extend well beyond the Earth SOI, based on the needs of the mission and the corresponding design of the orbital trajectory. Therefore, an outer boundary for the FL-SDA is only estimated herein. For the purposes of this article,

29. E. Viollet-Le-Duc and Martin MacDermott, *Military Architecture* (London: James Parker and Co., 1907), 66, 85.

the FL-SDA region starts at 950,000 km from Earth and extends to approximately 2.3 million km (22.5–55XGEO).

Mission Mechanics

Mission Mapping

The efficacy of a new SDA taxonomy depends upon missions allocated to each region and the types of trajectories that can be generated to perform these missions. Nominally, the space traffic management mission will reside in the regions closest to Earth and the Moon, specifically LG-SDA and MG-SDA, due to issues related to orbital congestion and collision avoidance between spacecraft and resident space objects (e.g., debris).

The space control mission will reside in regions where space traffic management is a priority due a similar need to monitor spacecraft trajectories. But we suggest including HG-SDA as a potential region for space control due to the vantage point that translunar space proffers for inward surveillance of the Earth, the Moon, and orbital regimes of interest in the LG-SDA and MG-SDA regions.

Overall, the space weather mission can be performed in any orbital regime within the Earth-Moon system based on specific program needs such as scientific observation or warning. The outer regions of HG-SDA, P-SDA, and FL-SDA are identified as potential areas for space weather missions due to their distance from both the Earth and the Moon, thereby proffering an outward surveillance perspective for pseudo-early warning of space weather events. While the first tier of space weather early warning and monitoring occurs at the Sun-Earth Lagrange points, such as the National Oceanic and Atmospheric Administration's Deep Space Climate Observatory (DSCOVR) at L1, the placement of monitoring spacecraft in trajectories traversing HG-SDA or other outer regions would provide a second tier for warning and solar event intensity.[30]

As previously stated, surveillance of the Moon and Earth-Moon Lagrange points is of interest due to the planned infrastructure development at or near these locations in the coming years. Specifically, the collinear L1 and L2 Lagrange points around the Moon have become a focus for mission planners because of their proximity to the Moon. For instance, the Gateway, a critical component of NASA's Artemis program that will provide "vital support for a long-term human return to the lunar surface [and] a staging point for deep space exploration," is planned to orbit near L2.[31] Therefore, the lunar and Lagrange point surveillance mission will occur in either the MG-SDA or HG-SDA region.

30. "Points of Lagrange: A Satellite a Million Miles from Home," National Environmental Satellite, Data, and Information Service, National Oceanic and Atmospheric Administration, October 26, 2015, https://www.nesdis.noaa.gov/.

31. David E. Lee, "Gateway Destination Orbit Model: A Continuous 15 Year NRHO Reference Trajectory," white paper (Houston, TX: NASA Johnson Space Center, August 20, 2019), https://ntrs.nasa.gov/.

The final mission set, planetary defense, is appropriate for the P- and FL-SDA regions. These regions give the ultimate vantage point for the outward surveillance of NEOs and other transient asteroids and meteoroids that may pass near or traverse the Earth SOI. Early warning is critical to averting and/or preparing for catastrophe arising from an NEO or similar piece of cosmic debris, and the stand-off distance of approximately 21–55 XGEO established by the P- and FL-SDA regions contribute to an early warning posture for planetary defense. In addition to surveillance, the vast spatial volumes of the P- and FL-SDA regions also enable the international space community to field defensive systems that can deflect or destroy potential threats arising from outside the Earth-Moon system.

Mission Orbits

Multibody gravitational systems are inherently chaotic: small changes to the initial position and velocity of a spacecraft can generate large changes in its overall trajectory. Despite the chaotic challenges posed by gravitational fields such as the Earth-Moon system, periodic orbits are indeed possible that permit the formation of repeating trajectories beneficial for a variety of missions sets, especially SDA. Different dynamical models can be employed to explore and generate periodic orbits, and all models can seek to simplify the gravitational field by examining the complex dynamical interactions of a limited number of bodies.

Example periodic orbits were generated using the dynamics assumed by the circular restricted three-body problem (CR3BP) that corresponds to each region comprising the proposed SDA taxonomy (fig. 2). The CR3BP is a useful trajectory model that considers only the gravitational influences of the Earth and Moon on the spacecraft and permits a preliminary mapping of orbit geometry.

Figure 2 depicts only a small subset of the many periodic orbits that may be found in the various SDA taxonomy regions; many more periodic orbits, specifically in the cislunar region, may be seen in Wilmer.[32] In fig. 2a, the dotted/dashed line identifies geosynchronous orbit in relation to the example LG-SDA orbit; in figs. 2b–2f, the dotted/dashed line identifies the Earth SOI.

The unique design of each example periodic orbit is the result of trajectory generation performed with respect to the synodic reference frame, a rotating reference frame with the Earth and Moon held on the x-axis. While the exact shape of a given orbit will change based on the perspective of the viewer (e.g., from the Earth or the Sun), the spatial volume within which a given orbit traverses remains the same. As a result, periodic orbits can be built that provide surveillance coverage to key locations within the Earth-Moon system including the Moon, Lagrange points, the Earth SOI, and outside the Earth SOI.

32. Adam P. Wilmer, "Space Domain Awareness Assessment of Cislunar Periodic Orbits for Lagrange Point Surveillance" (master's thesis, Air Force Institute of Technology, December 2021), https://scholar.afit.edu/.

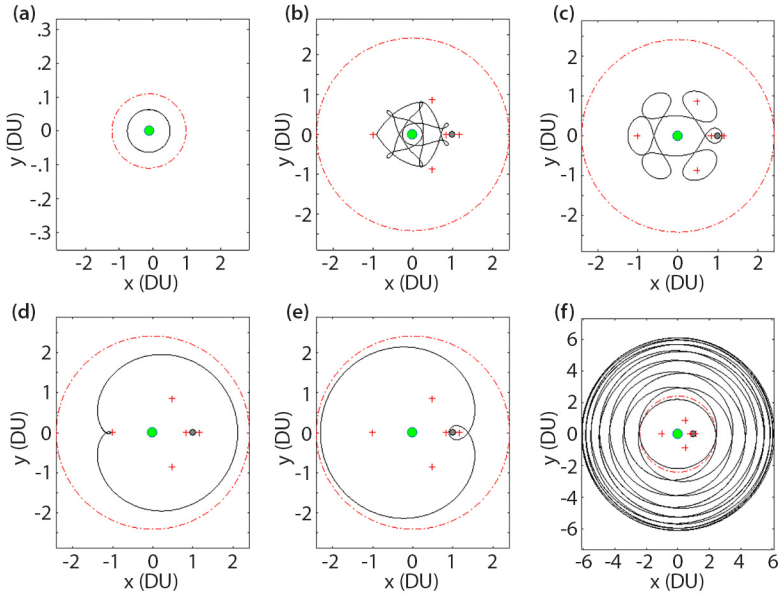

Figure 2. Example SDA orbits: (a) low-ground SDA; (b) mid-ground SDA; (c) mid-ground SDA; (d) high-ground SDA; (e) parapet SDA; and (f) fence-line SDA

Orbit Design Considerations

Within the Earth-Moon system, spacecraft can be injected into periodic orbits such as those portrayed in fig. 2 via direct launch from either the Earth or the Moon. Only a launch from the Earth is currently feasible, but the construction of lunar infrastructure could enable the launch of spacecraft into periodic orbits that pass near the Moon (e.g., figs. 2c and 2e) at relatively low propellant cost— lunar launches will require less propellant than conventional Earth-based launches due to a weaker gravitational field and the absence of virtually any atmosphere.

Regarding orbit maintenance—the expenditure of propellant to maintain a desired orbital geometry, periodic orbits in the Earth-Moon system may remain stable for weeks depending on the selected geometry, particularly depending on how closely a trajectory passes by the Earth, Moon, or the various Lagrange points. We assess that orbit maintenance will require a low amount of propellant. This low-order amount of required propellant for orbit maintenance will enhance any SDA mission's lifetime and desirability for implementation.

When designing SDA missions in any of these proposed regions, the duration of a single period will influence the number of spacecraft to perform the mission. Multiple spacecraft will likely be needed to provide a desired level of sensor coverage and revisit time in a particular region, either with a phased operation in the same periodic orbit or with the spacecraft spread over different yet similar periodic orbits. For example, the need for a constellation of SDA spacecraft will likely be important for the planetary defense

mission in the FL-SDA region. Due to a single period being on the order of approximately 1–1.5 years, numerous spacecraft—potentially on the megaconstellation scale—may be needed to provide timely and persistent monitoring and defense posture for threats external to the Earth-Moon system.

Conclusion

In the early years of spaceflight, space operations primarily consisted of near-Earth missions with few spacecraft ever venturing to the Moon. As time progressed, more missions began extending beyond geosynchronous orbit. This pattern continues today, with the contemporary space domain facing increasing concerted efforts by commercial and nation-based entities worldwide to reach and operate within the cislunar environment.

This trend will likely continue, with humankind reaching outward to the new high ground. Missions will become increasingly frequent near the Moon, in the high-ground SDA region, and beyond. As such, it is important to develop policy and terminology to address the evolving SDA mission, establishing a paradigm that will come to embrace the entirety of the Earth-Moon system and its celestial environs. At the same time, with the development and growth of the US Space Force, new policies and doctrine intended to secure US space dominance will continue to emerge. As such, the space domain awareness taxonomy presented here is vital to conceptualizing space as a war-fighting domain, better describing missions such as space domain awareness that ensure the continuous protection of US space assets. ✈

Space Force Culture

A Dialogue of Competing Traditions

William D. Sanders

In military organizations, service culture shapes organizational strategy. In the US Space Force today, four historical traditions rooted in different beliefs, values, and assumptions exist, namely, engineers, operators, integrators, and warfighters. Over four periods in Air Force space operations history, a given tradition dominated, while the others competed for currency. This history has implications for contemporary service culture. Changes in the strategic context can reduce a given tradition's effectiveness, though a waning tradition still influences the organization's behavior through its adherents. Understanding these four traditions will help Space Force leaders as they shape service culture today.

Before the US Space Force's first birthday, former Air Force Chief of Staff General David Goldfein asked, "How do we allow the Space Force to develop its own service culture?"[1] As if in response, the Space Force's first doctrine document, signed by the Chief of Space Operations General John Raymond a few months later, mentions culture 15 times across fewer than 60 pages.[2] The service's emphasis on culture is well founded. Organizational culture creates identity and expectations; it frames how members respond to stimuli. In the context of a military organization, service culture enables, shapes, and constrains strategy.

As the Space Force develops a culture in support of its distinctive mission, it must first understand its existing culture with a heritage in Air Force space operations, which provided the preponderance of the new service's personnel, organizations, and missions. Tracing that heritage reveals there is not a unitary space operations culture, but rather several competing traditions: engineers, operators, integrators, and warfighters.

From 1954 to the present, these traditions have competed for influence and currency; this dialogue helps explain the development of American spacepower and has implications for service culture. Changes in the strategic context can reduce a given tradition's effectiveness to the point that another tradition rises to the top. Yet, while a tradition may recede from prominence, it still influences the organization's behavior through its adherents. Therefore, Space Force leaders wanting to shape service culture should understand the traditions at work today.

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1. Charles Pope, "Goldfein Offers Optimistic Update on Air Force's Evolution and Future," Secretary of the Air Force Public Affairs, January 27, 2020, https://www.af.mil/.

2. John W. Raymond, *Spacepower: Doctrine for Space Forces*, Space Capstone Publication (Washington, DC: Headquarters US Space Force, June 2020), https://www.spaceforce.mil/.

This article introduces the four traditions and compares their core assumptions, values, and beliefs.[3] Differences in the traditions create tension in the Space Force today, which the dialogue seeks to resolve. The article concludes with the implications of that ongoing dialogue.

Engineers: Technically Minded Problem Solvers

From 1954, when Brigadier General Bernard Schriever, USAF, stood up the Western Development Division to develop the intercontinental ballistic missile (ICBM), to the activation of Air Force Space Command in 1982, engineers ran most US Air Force space programs.[4] Schriever designed a program management system comprising not just military members but also their colleagues in industry and academia. The system relied on contractors to design, engineer, manage, and build space systems.[5] The engineers assumed this approach to be the most effective at building space systems as it allowed the Air Force to build capacity rapidly, while rather junior officers were appointed to manage large programs.[6] Given the specialized work those officers oversaw, engineers came to value certain traits within their organizations.

Technical competence was and is the coin of the realm for the engineers. Early space systems were not complex, complicated, or robust by today's standards. Because procedures were less developed than they would be in later years, the first engineers required in-depth system expertise and the ability to creatively solve problems on the fly. Early Air Force space organizations like the Western Development Division self-selected for those traits.

Building highly competent technical teams was not only a matter of preference but also an adaptation to the external environment, because high technical risk came with the territory. When running the Division, Schriever oversaw the nation's most expensive weapon acquisition to date, surpassing even the Manhattan Project.[7] His challenge was to deliver a working ICBM anywhere on the globe in minutes, and, importantly, to beat the Soviets to the task.[8]

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3. Edgar H. Schein with Peter Schein, *Organizational Culture and Leadership*, 5th ed. (Hoboken, NJ: John Wiley & Sons, 2017).

4. Jack Ferguson, interview by author, January 25, 2021; and J. Kevin McLaughlin and Chris D. Crawford, "Forward to the Future: A Roadmap for Air Force Space (Part I)," *High Frontier: The Journal for Space and Cyberspace Professionals* 3, no. 4 (August 2007).

5. Howard E. McCurdy, *Inside NASA: High Technology and Organizational Change in the U.S. Space Program* (Baltimore: Johns Hopkins University Press, 1994), 38–39.

6. McCurdy, *Inside NASA*, 39.

7. Walter J. Boyne, "The Man Who Built the Missiles," *Air Force Magazine*, October 1, 2000, https://www.airforcemag.com/; and Stuart M. Powell, "The Day of the Atlas," *Air Force Magazine*, October 1, 2009, https://www.airforcemag.com/.

8. Jacob Neufeld, *Bernard A. Schriever: Challenging the Unknown* (Washington, DC: Office of Air Force History, 2005), 9.

It was a blow to American pride when the Soviets launched Sputnik on October 4, 1957, effectively demonstrating an ICBM capability for the world to see.[9] The event was doubly worrisome since Schriever watched sixteen of his first twenty-five Atlas missiles fail over a two-year period.[10] But he knew the only way to gather enough data to build a working missile was to test them, and, as a result, to fail fast and often. "When at the leading edge of technology and plowing new ground . . . if you do not have a failure every now and then, you are not taking enough risks."[11] Ultimately, Schriever led the Division to create the Thor, Atlas, and Titan ballistic missiles that not only won the missile race, but doubled as the boosters for national security launches such as the Corona spy satellite and civil missions including Mercury and Gemini.[12]

Throughout the Cold War, the engineers tackled risky challenges by managing talented teams of Air Force officers and defense contractors. Some of these engineers' contributions to a peaceful outcome in the Cuban Missile Crisis demonstrates the tradition at work.

In fall 1962, leading up to the crisis, the Director of the National Reconnaissance Office Joseph Charyk, asked Lieutenant Colonel Thomas O. Haig to establish a defense meteorological satellite program (DMSP) downlink capability in Florida, preferably within 24 hours. Although the first operational DMSP had been on orbit for only two months, Charyk wanted to transmit the latest weather imagery to the the RF-101 Voodoo crews conducting photo-reconnaissance flights over Cuba. It was a risky mission, and if the target was cloud covered, as Cuba often was in October, it was futile.[13]

Haig accepted the challenge and led a small team of Air Force and Radio Corporation of America (RCA) engineers to Florida to help with the Cuba situation. It took a logistics miracle to get to Florida, and in rushing to pack the equipment, the team omitted some essential pieces. First, they lacked a transmitter, which they found in the form of an old air traffic control radio. Second, they discovered they were missing an antenna. They scavenged a 3-axis antenna from the base, but it was missing a suitable feed. The RCA engineers' solution was to buy two Yagi antennas from Radio Shack, cross them, and weld the new feed to the dish. They were in business, downlinking DMSP's weather data with no time to spare.[14]

When the first photos came back, the island was socked in, but a small break in the clouds was approaching. It took another DMSP pass to determine the relative motion of

9. Neufield, *Schriever*, 17.

10. E.D. Harris and J.R. Blom, "Apollo Launch-Vehicle Man-Rating: Some Considerations and an Alternative Contingency Plan (U)," Memorandum RM-4489-NASA (Santa Monica, CA: RAND Corporation, May 1965), fig. 1, https://web.archive.org.

11. Thomas P. Hughes, *Rescuing Prometheus: Four Monumental Projects That Changed the Modern World* (New York: Vintage, 2000), 137.

12. Neufeld, *Schriever*, 21–22.

13. *The Satellite Men*, directed by Tom Sylvester (Cary, NC: Pool Room Studios, June 6, 2014), DVD.

14. Sylvester, *Satellite Men*.

the cloud formation and give the meteorologists the confidence to predict the RF-101 launch window. The space weather data proved decisive in the success of the photo-reconnaissance missions that US President John F. Kennedy relied on to hold Soviet Premier Nikita Khrushchev to account. Haig and his engineers played a small but significant role in resolving one of the defining crises of the twentieth century.[15]

As the DMSP story illustrates, the engineers ran early space operations like the research and development projects they were, relying on technical competence, risk acceptance, and a willingness to solve any problem.

Despite the high risks associated with early spaceflight, by the late-1960s, many Air Force space systems had transitioned from experiments to dependable and important military assets. For instance, weather and communications satellites proved to be crucial innovations to American generals in the Vietnam War.[16] In that war, the adversary excelled at irregular tactics, did not mass in large formations, and concealed itself well. As a result, the conflict demanded low-level fighters, higher loiter times for troops in contact, and gunships. In these missions "conventional weather sources proved inadequate to the challenge. Satellite imagery, relayed through the region, provided the answer."[17]

Moreover, some of the first military communications satellites revolutionized information flow into the theater. For example, the Initial Defense Communications Satellite program provided long-haul communications between Saigon, Vietnam and Washington, DC. For the first time, intelligence analysts in the United States could look at imagery and provide reports in near-real-time to Saigon to share with field commanders.

In the 1970s, Air Force senior leaders recognized two important facts. First, space operations were being run piecemeal with no organizing principle, save that they were strategic systems focused on terrestrial needs.[18] As a result, the Air Force was failing to capitalize on the fact that it controlled 80 percent of the space budget but had little bureaucratic clout to show for it.[19] (By the late-1970s, the Air Force had substantial space equities with programs spread across Systems Command, Air Defense Command, and Strategic Air Command.)

Second, leaders realized space operations never emerged from the research and development (or engineering) construct. Senior Air Force officers, nearly all pilots, believed systems should transfer out of program offices, away from engineers and into the hands of operators. To address both issues, they advocated for a single major command for space.

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15. Sylvester, *Satellite Men*.

16. David N. Spires et al., eds., *Beyond Horizons: A Half Century of Air Force Space Leadership* (Maxwell Air Force Base AL: Air University Press, 2011), 169–70.

17. Spires et al., *Beyond Horizons,* 170; and Benjamin S. Lambeth, *Mastering the Ultimate High Ground: Next Steps in the Military Uses of Space* (Santa Monica, CA: RAND Corporation, 2003), 24–25.

18. Spires et al., *Beyond Horizons,* 174–75.

19. Spires et al., 174.

Operators: Procedurally Focused Perfectionists

The operator tradition began with the quintessential operator, the great Cold Warrior, US Air Force General Curtis E. LeMay. Through force of will, LeMay established rigid professionalism within Strategic Air Command, and that model overtook the Cold War Air Force. LeMay forged the command into "a complex of forces, culture, plans, bases, and doctrine that would dominate the Air Force and strategic thinking for almost two decades, worldwide. LeMay's SAC would own the Air Force; SAC was the Air Force."[20] LeMay may be the most dominant personality in Air Force history—although he retired in 1965, his legacy shaped Air Force space operations as they became fully established.

In 1971, the Air Force created Air Force specialty code (AFSC) 20XX for space operations.[21] The initial, few positions only existed in Strategic Air Command and Aerospace Defense Command. The new Air Force Space Command was carved from those organizations precisely where LeMay's customary demand for exact standards and repeatable performance were strongest. Moreover, Air Force Space Command codified a LeMay-like approach by adopting Strategic Air Command and Aerospace Defense Command personnel policies.[22]

In September 1982, two weeks after Air Force Space Command's activation, its first commander, General James V. Hartinger, laid out the organization's purpose. "Space is a place—like land, and sea and air—a theater of operations. . . . We will now have an operational command to manage, control and protect operational space assets."[23] The operators' driving assumption was implicit: space operations should be run like flying operations. Indeed, ten of the first eleven commanders of Air Force Space Command were flying officers.

One of Hartinger's goals for Air Force Space Command was to promote "a much closer relationship between the research and development community and the operational world."[24] Ironically, putting the operators in charge meant relegating the engineers and developmental contractors to facilities and program offices often a thousand miles from where operators controlled their systems.

By the early 1990s, Air Force Space Command had assumed operational responsibility of most systems from the acquirers at Space Systems Division, and most missions had moved to the Consolidated Space Operations Center at Falcon Air Force Base (now

20. Carl Builder, *The Icarus Syndrome: The Role of Air Power Theory in the Evolution and Fate of the U.S. Air Force*, 4th ed. (New Brunswick, NJ; London: Transaction Publishers, 1998), 146, emphasis in original.

21. J. Kevin McLaughlin, "Military Space Culture" (paper prepared for the Commission to Assess US National Security Space Management and Organization, Washington, DC, 2001), 11, https://spp.fas.org/.

22. McLaughlin, "Military Space Culture," 12.

23. James V. Hartinger, "Space: Military Challenges and Opportunities" (speech at the Air Force Association Symposium, Washington D.C., September 16, 1982), in *Orbital Futures: Selected Documents in Air Force Space History,* vol. 2 (Peterson AFB, CO: US Air Force Space Command, n.d.), 680.

24. Hartinger, "Challenges and Opportunities," 684.

Schriever Space Force Base).[25] As a result of transitioning operations from Air Force Space Systems Command to Air Force Space Command, an increasing number of Air Force personnel, instead of contractors, were performing space operations.

The operators came to depend on robust procedures because they did not have the technical expertise of their engineer counterparts.[26] As one example, in 1992, a squadron commander lamented to his boss that his greatest challenge was trying to change "the engineer-oriented contractor approach to launch (relying on extensive personal expertise) to the operator oriented approach used by [Air Force Space Command] (relying on checklists, predeveloped and validated contingency pass plans, and training and certification process)."[27]

By the late 1990s, procedural excellence was the overriding value of the operators. Air Force Space Command leaders considered officers for increased responsibility (and therefore promotion) based on flawless operational evaluations, valuing rote memory and steadfast checklist adherence.[28] The operators were trained to a minimum standard to safely run satellite missions and to call an engineer if they ran into trouble.[29] The engineers, on the other hand, could masterfully manage and build the weapons systems, but often lacked insight into ongoing challenges or Joint warfighting needs.

Moreover, space personnel operated from contiguous US bases in windowless rooms. They had little exposure to the larger Air Force, rarely seeing aircraft or pilots on a regular basis—few space installations even had runways. It is unsurprising that pilots appreciated how space systems contributed to success in Operation Desert Storm but still could not find common ground with space personnel.[30]

In 1991, Air Force Chief of Staff General Merrill A. McPeak proudly proclaimed Operation Desert Storm was "the first space war."[31] Indeed it was the operators' magnum opus, the first full-scale conflict where all the nation's military spacepower was on display.[32] When combat operations began, an unprecedented space infrastructure was in the

25. "Unit History: Consolidated Space Operations Center Turnover," September 27, 1993, in *Space and Missiles Systems Center*, K-WG-SPACE-50-HI V.4 (Maxwell AFB, AL: Air Force Historical Research Agency, January 30, 1992–December 31, 1994).

26. McLaughlin and Crawford, "Forward to the Future," 28.

27. Letter from 3 SOPS/CC to 50 OG/CC, "Ultrahigh Frequency Follow-on Launch Readiness," October 28, 1992, in *History of the 50th Space Wing*, K-WG-SPACE-50-HI V.1 (Maxwell AFB, AL: Air Force Historical Research Agency, January 30, 1992–December 31, 1994), 22.

28. Chad Riden, former space operator, interview by author; and Lieutenant Colonel Daniel Sebeck, USSF, current space operator, interview by author, February 2, 2021.

29. John E. Hyten, "Space Mission Force: Developing Space Warfighters for Tomorrow" (white paper, Air Force Space Command, Colorado Springs CO, June 29, 2016), https://www.afspc.af.mil/.

30. See Benjamin S. Lambeth, *The Transformation of American Air Power* (Ithaca, NY: Cornell University Press, 2000), 233.

31. Craig Covault, "Desert Storm Reinforces Military Space Directions," *Aviation Week and Space Technology* (April 8, 1991), 42.

32. Spires et al., *Beyond Horizons,* 244–45.

theater. Yet the conflict also demonstrated shortfalls in the Air Force space culture, which eventually contributed to the decline of the operators' historical period.

Satellites made coalition operations more lethal and efficient. Space-based intelligence, surveillance, and reconnaissance assets helped coalition forces find, fix, target, and destroy Iraqi maneuver units taking cover under massive dust storms. The defense meteorological satellite program provided essential meteorological data that supplied weather data so pilots could employ their laser-guided munitions, the only precision air weapons of the conflict.[33] Missile warning satellites provided vital alerts to coalition forces and had some success cueing Patriot missile batteries to defend against ballistic missile threats.[34] The featureless Arabian Desert provided the perfect case study for space navigation.

Throughout the war, space systems outperformed expectations and contributed to tactical operations on the largest scale in human history. Yet neither the processes nor the personnel were optimally integrated into combat operations. The *Gulf War Air Power Survey* concluded that achieving "concrete warfighting results" required space to operate outside of traditional functional and organizational boundaries.[35] There were interpersonal challenges, too.

> Until the 1991 Gulf War, Air Force aviators and space officers lived and worked almost literally in separate worlds. . . . Rated airmen, for their part, were quintessential "operators," associated as they were with combat flying and its concerns. In contrast, the Air Force's space professionals evolved not out of the flying community, but rather from the secret worlds of overhead reconnaissance and advanced-systems acquisition. . . . As a result, they brought a pronounced technical approach to their work, which made for an almost preordained divide between the air and space components of the Air Force.[36]

Benjamin Lambeth went on to describe how the "real men" who flew jets referred derogatorily to space professionals as "techies," "pocket rockets," "space cadets," or "space geeks."[37] The space experience in the Gulf War shows while Air Force Space Command leaders succeeded in operationalizing many Cold War-era systems, they fell short in their goal to integrate space operators into Joint warfighting. Bridging the gap between the Cold Warriors and their systems and the new American way of war was the guiding challenge of the integrators.

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33. Thomas S. Moorman Jr., "Space: A New Strategic Frontier," in *The Future of Air Power in the Aftermath of the Gulf War*, ed. Robert L. Pfaltzgraff Jr. and Richard H Shultz Jr. (Maxwell AFB, AL: Air University Press, July 1992), 243.

34. Spires et al., *Beyond Horizons,* 255.

35. Eliot A Cohen, *Gulf War Air Power Survey*, vol. 6, pt. 2 (Washington, DC: US Government Printing Office, 1993), v–vi.

36. Lambeth, *American Air Power*, 233.

37. Lambeth, *234.*

Integrators: Externally Focused Practitioners

Space was central to America's emerging reconnaissance-strike complex, and with the proliferation of GPS-aided and GPS-guided munitions, space capabilities would only become more critical. To be relevant in the post–Gulf War era, then, was to be tactically relevant. Thus, the integrators assumed Air Force Space Command's worth came from what it provided to geographic combatant commanders.

The fall of the Soviet Union led to one of the few genuinely unipolar moments in history, with the United States sitting atop the world order. Absent the threat of a peer adversary in space, the nation had little imperative to pursue space superiority and every rationale to integrate space into military operations. This sentiment reinforced the notion that space operations were an adjunct to warfighting, and Air Force Space Command, a service provider.[38] The integrators' driving assumption was that space operations existed for the benefit of warfighters on the ground, in part, because there was no prospect of conflict in space.

The integrators' focus on tactical integration meant they derived value through external validation. Like operators, integrators valued test scores and evaluation performance as the baseline for measuring competence. Unlike the operators, though, the integrators began emphasizing deployments, major exercise participation, and Weapons School—experiences that could only be gained outside of Air Force Space Command.[39] Here again was a dialogue of cultural traditions at work.

Following the Gulf War, McPeak declared space coequal to air.[40] In the fall of 1992, wanting to capitalize on the postwar momentum for space and address the integration challenges, McPeak established a blue ribbon panel led by US Air Force Lieutenant General Thomas S. Moorman Jr.[41] Acting on one of the panel's recommendations in December 1993, Air Force Space Command expanded its operational focus and integration by creating the Space Warfare Center to develop specific space education and tactics development.[42]

The Space Warfare Center established the Space Tactics School in Colorado Springs, a forerunner to the Space Division of the Air Force Weapons School at Nellis Air Force Base.[43] The Space Division taught space operators how to contribute to the combat air

38. Kenneth Grosselin, "A Culture of Military Spacepower," *Air and Space Power Journal* 34, no. 1 (Spring 2020): 75.

39. Summary of author's findings from dozens of 2021 interviews with former and current space operators.

40. Merrill A. McPeak, "Does the Air Force Have a Mission?" (address at Maxwell Air Force Base, AL, June 19, 1992), in *Orbital Futures: Selected Documents in Air Force Space History*, vol. 1, ed. David N. Spires (Peterson AFB, CO: Air Force Space Command, 2004): 96–99.

41. Spires, *Orbital Futures,* 160–61.

42. George W. Bradley III, "A Brief History of the Air Force in Space," *High Frontier: The Journal for Space and Missile Professionals* 1, no. 2 (Fall 2004): 7.

43. Joseph W. Ashy, "Putting Space in the USAF Weapons School," *USAF Weapons Review* 44, no. 2 (Summer 1996): 2–4.

forces and taught flying officers where space fit with their capabilities. Moreover, the Weapons School signaled credibility to Air Force leaders, most of whom were pilots and often graduates themselves.

But the dialogue with the operators continued, because shortly after the blue ribbon panel issued its findings, US Air Force General Charles A. Horner, commander of North American Aerospace Defense Command, US Space Command, and Air Force Space Command brought ICBM operators—missileers—to the command in 1994. In missileers, Horner saw space-smart officers who he thought would bring a warfighting perspective to Air Force Space Command. In fact, the missileers' biggest influence was in reinforcing the Strategic Air Command dogma still alive in the operator tradition.

There was friction at the outset. As missileers joined space units, career space operators were skeptical of missileers' penchant for detail, precision, rote memorization, and inflexibility.[44] Intercontinental ballistic missile operations demanded procedural mastery and, unlike space operators, missileers were not required to have technical degrees. When space and missiles merged into the new 13SX AFSC, the Air Force reverted to the least common denominator and abolished the technical degree requirement for space operators.[45] These factors contributed to growing critiques of the paucity of technical expertise among space operators.[46]

Despite growing cultural tension within the command, Air Force Space Command harnessed some of the Gulf War's lessons in 1995's Operation Deliberate Force, the NATO air campaign to restore peace to the Balkans. Military satellite communications, space-based intelligence, surveillance, and reconnaissance, and GPS all contributed in a similar fashion to Operation Desert Storm, but Operation Deliberate Force heralded at least two novel uses of spacepower.

First, it was the first combat employment of the satellite-communications-dependent MQ-1 Predator remotely-piloted aircraft.[47] Second, Operation Deliberate Force was the first time a GPS-aided munition, the AGM-84E standoff land-attack missile, was used in combat.[48] The broader category of precision-guided munitions made up nearly 70 percent of the 1,026 bombs and missiles used in Operation Deliberate Force, so the operation proved a critical stepping stone on the path to the emerging way of war focused on detailed and timely intelligence and precision-guided munitions.[49] The developments only accelerated calls to better integrate space in the combat air forces.

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44. McLaughlin and Crawford, "Forward to the Future," 28.
45. Mclaughlin, "Military Space Culture," 18.
46. Mclaughlin, 21–22.
47. Richard L. Sargent, "Aircraft Used in Deliberate Force," in *Deliberate Force - A Case Study in Effective Air Campaigning: Final Report of the Air University Balkans Air Campaign Study*, ed. Robert C. Owen (Maxwell AFB, AL: Air University Press, 2000), 199.
48. Sargent, "Deliberate Force," 261.
49. Robert C. Owen, "Operation Deliberate Force, 1995" in *A History of Air Warfare*, ed. John Andreas Olsen (Washington, DC: Potomac Books, 2010), 202.

Sending space operators to the Air Force Weapons School in 1996 was one of the most important steps Space Command took toward integration. In one example, when US Air Forces Europe sought help from the Weapons School in planning the 1999 Operation Allied Force in Kosovo, the school sent a resident GPS expert to advise the strategy cell on joint direct attack munitions (JDAM) employment considerations. The officer, a graduate from the first class of space weapons officers, encountered resistance right away. Not yet a decade removed from the Gulf War, pilots were reluctant to employ GPS-aided munitions and skeptical of space capabilities in general. This officer's role expanded from space advisor to spacepower advocate.

The officer believed his Weapons School time helped him understand flyers' concerns and how to better argue for employing the JDAM. His arguments helped win over the air commander, Lieutenant General Michael Short.[50] Short later called Operation Allied Force a "precision guidance war." "We would not drop dumb bombs. We would drop bombs guided by laser, or GPS, to be as precise and accurate as we could possibly be."[51] Indeed, given the Kosovo clouds that stymied laser-guided weapons, GPS-aided munitions were the most reliable precision weapons at Short's disposal, and the advocacy by an early space weapons officer-graduate was important to their employment.

Though engineering expertise declined under the integrators, they made tremendous strides in tactical space employment. In the early 2000s, the integrators made substantial contributions to Operations Enduring Freedom and Iraqi Freedom, expertly planning and employing their capabilities in support of the Joint fight. They had every reason to celebrate their ability to support the warfighter. Yet, the tradition that adapted to the challenges of integrating space capabilities into the tactical fight on earth had nothing to say about fighting in space.

Warfighters: Adversary-Focused Theorists

By the mid-2000s, the United States had invested heavily in space assets and space-enabled capabilities across the Joint force. Joint forces depended on myriad integrated space capabilities, including GPS-guided smart bombs, blue-force tracking, numerous intelligence and communications functions that relied on wideband and protected satellite communications, space-based intelligence, surveillance, and reconnaissance, and timely weather information. Unfortunately, America's adversaries and rivals took note. As a revanchist Russia and rising China sought to offset America's advantages, they developed extensive antisatellite weapons (ASAT). One ASAT test event brought this into sharp relief.

50. M.V. Smith, interview with author, May 24, 2021.

51. PBS Frontline, "Oral History: General Michael C. Short," n.d., accessed May 24, 2021, https://www.pbs.org/wgbh/pages/frontline/shows/kosovo/interviews/short.html.

On January 11, 2007, China destroyed its Feng Yun 1C weather satellite with its SC-19 missile and put an end to the 20-year taboo against kinetic ASAT tests.[52] Since Sputnik, no single event has done more to shape Air Force space culture than China's ASAT test. Air Force space operations had to look inward to answer the question, how do we protect and defend the space domain, a question not considered since the Cold War. The test was significant not so much for its military utility as for what it said about the US capacity to deal with a contested space domain.[53] Thus, 2007 signaled the beginning of a shift toward a tradition whose overriding assumption is that space is contested.

The warfighters believe their raison d'être is space superiority. The Space Force's first doctrine document states it plainly, "Military space forces are the warfighters who protect, defend, and project spacepower."[54] The warfighters recognize mere compliance and rigid procedures are not sufficient to compete with a thinking adversary in a dynamic environment.

In the immediate aftermath of the Chinese ASAT test, many space professionals recognized a need to adapt to the changing environment.[55] But at the most senior levels of Air Force Space Command, it took nearly a decade to make a decisive pivot to a warfighting mentality as leaders awaited recognition from civilian leaders.[56] The commander of Air Force Space Command, General John E. Hyten got the unambiguous signal he needed in April 2015 when Deputy Secretary of Defense Robert O. Work asserted Air Force Space Command was not prepared for a conflict in space.[57]

In 2016, Hyten published the Space Mission Force white paper, his plan to shift the command's culture to meet the challenges of the contested domain.[58] His concept challenged space crews to take on more accountability for their own training; to train to failure, and learn through that failure with a culture of self-improvement; to explore root causes and mistakes; and to exercise operational authorities at the lowest level.[59]

Later that year, General John W. Raymond succeeded Hyten as commander and accelerated the efforts to build a warfighting culture. In 2017, Raymond introduced the Space Warfighting Construct, an umbrella concept for six lines of effort, including Hy-

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52. Roger G. Harrison, "Foreword," in *The US Response to China's ASAT: An International Security Space Alliance for the Future*, Drew Paper no. 8, by Anthony J Mastalir (Maxwell AFB, AL: Air University Press, 2009), vii, https://media.defense.gov/.

53. Mastalir, *China's ASAT*, 98.

54. Raymond, *Spacepower*, vi.

55. McLaughlin and Crawford, "Forward to the Future"; Chad Riden, interview; and John E. Shaw, "Guarding the High Ocean: Towards a New National-Security Space Strategy through an Analysis of US Maritime Strategy," *Air and Space Power Journal* 23, no. I (Spring 2009), 56–58.

56. John E. Hyten, interview by George W. Bradley and Rick W. Sturdevant, Air Force Space Command Directorate of History, Oral History Program, April 19, 2016.

57. Hyten, interview.

58. John E. Hyten, "Space Mission Force," 2.

59. Hyten, "Space Mission Force," 4–5.

ten's space mission force, aimed at addressing the contested, degraded, and operationally limited space domain.[60]

Despite those efforts, US Representatives Mike Rogers (R-AL) and Jim Cooper (D-TN), long dissatisfied with the Air Force's stewardship of space, resurfaced the idea for an independent space service. Air Force Space Command responded to the pressure, in part by developing a 2018 talent management framework for space forces.

As with the earlier Space Warfighting Construct, the command was unable to enact the full framework due to time and resource constraints.[61] Nevertheless, it generated more detailed, adversary-centric undergraduate space and follow-on training courses, and invigorated exercises like Space Flag.

Space Flag, modeled after the Air Force's Red Flag, is a tactically focused exercise set in the space domain. It aims to replicate space warfighting with as much fidelity as the military-industrial complex can muster in a virtual environment. Teams of Guardians gather to simulate orbital engagement maneuvers (i.e., dogfighting with satellites). At the exercise, dozens of exercise participants from the US Space Force and the National Reconnaissance Office practice fighting in a contested domain and defeating a highly skilled red team.[62] Though similar in construct to major Air Force exercises, Space Flag has some notable limitations.

As Clausewitz says, friction is what distinguishes "real war from war on paper."[63] There is simply no substitute for live training and exercising. During Space Flag, guardians do not actually move any satellites, they input moves to purpose-built software that replicates how spacecraft should respond. For numerous reasons including safety of flight concerns, fuel limitations, and lack of an orbital maneuver training range, exercising orbital maneuvers has thus far been impractical. Still, in the history of US military space operations, Space Flag is the highest-fidelity orbital exercise that has ever been available to space professionals.

The Space Force has more realistic options in the electromagnetic spectrum where the Space Test and Training Range provides a realistic signal environment where space control operators can wage war with great accuracy against an operator playing the part of an adversary. The service also continues to make investments in more realistic on-orbit training. But nothing can replace combat experience. In fact, the biggest challenge facing the warfighters is their tradition remains aspirational so long as a space war never happens.

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60. Christopher Merian, "AFSPC Commander Unveils Three Major Space Initiatives at 33rd Space Symposium," Air Force Space Command, April 7, 2017, https://www.afspc.af.mil/.

61. Sebeck, interview.

62. Tyler Whiting, "Space Flag, the Premier Exercise for Training Space Forces, Successfully Concludes for the First Time under STAR Delta Provisional," Space Force News, August 21, 2020, https://www.spaceforce.mil/.

63. Carl von Clausewitz, *On War*, ed. and transl. Michael Eliot Howard and Peter Paret (Princeton, NJ: Princeton University Press, 1989), 119.

Notwithstanding substantial efforts like Space Flag, the Air Force could not avoid creating the Space Force, and in 2019, the United States reestablished US Space Command and established the Space Force as a new military branch.

Implications and Recommendations

The article thus far has described cultural traditions contributing to US Space Force culture today. Over each period in Air Force space operations history, one tradition dominated, but other traditions competed for currency, which begs the questions, "What is the Space Force culture today?" and "Why does it matter?"

The warfighter tradition is most prominent today. It follows naturally from the service's mission, that is, to provide freedom of action in, from, and to space. If one substitutes "space" in the preceding sentence with any other domain, it would sound just like the other services' missions, and no one questions whether Soldiers, Sailors, Marines, or Airmen are warfighters. Yet space warfighters are preparing for prospective war with little combat history. Meanwhile, engineers, operators, and integrators still have constituencies in the service. Therefore, the Space Force will be most effective when it understands the various traditions contributing to its culture today.

First, engineers may gain more prominence in the coming years. As the Space Force, already heavily dependent on technology, seeks to become the first digital service and accelerate innovation, engineers may exert more influence over service culture.[64] While one need not have a particular AFSC or degree to be an engineer, trained engineers are more likely to evince the tradition, and acquisition managers and developmental engineers constitute about half of the Space Force officer corps. Moreover, organizations like the National Reconnaissance Office, where many Guardians are assigned, may still be dominated by the engineers today.

Furthermore, space warfighting requires not-yet-fielded technologies. To best harness the engineers' strengths, the Space Force needs to provide well-defined, time-bound, challenging problems that serve its mission, to ensure the means of the space weapon do not become the ends of the engineers' strategy.

Moreover, the Space Force will have to overcome decades of ambivalent policy toward fielding counterspace technologies in light of worrisome advancements by China and Russia.[65] In the mid-1990s, Carl Builder argued that the Air Force mistook the means of

64. John W. Raymond, *Chief of Space Operations' Planning Guidance: 1st Chief of Space Operations* (Washington, DC: USSF, November 9, 2020), https://media.defense.gov/.

65. See Paul B. Stares, *The Militarization of Space: US Policy, 1945–1984* (Ithaca, NY: Cornell University Press, 1985); and United States Defense Intelligence Agency (DIA), *2022: Challenges to Security in Space: Space Reliance in an Era of Competition and Expansion* (Washington, DC: DIA, March 2022), https://purl.fdlp.gov/.

the air weapon for the ends of strategy.[66] If anything, the Space Force is more susceptible to that mistake than was the Air Force.

Second, the operator tradition is still deeply embedded in the Space Force. Though the operators' influence waned after the Gulf War, the tradition lay just beneath the veneer of the integrators' tradition for decades. The operators' rigor and a penchant for standards are not, in themselves, bad things, but the Space Force must balance checklist discipline with creativity and innovation. For the Space Force to build an innovative organization, its leaders will have to measure and reward the right behaviors, which may prove challenging. It is easy to reward performance on objective instruments such as evaluations and written exams; it is far harder to reward Guardians for cultivating a lean and agile organization. It is harder still in the defense bureaucracy whose function is to protect the status quo.

Third, the Space Force should build on the work of the integrators. If the Space Force exists to protect freedom of action in, from, and through the domain, it is because the nation derives power from activities there. For now, military space operations provide value by supporting missions close to the earth's surface. To be Joint warfighters, the Space Force must integrate smoothly with the other services and combatant commands, particularly US Space Command.

What happens, for instance, when space forces supporting the terrestrial combatant commands are organized under a commander of space forces and perhaps not collocated with the Air Operations Center as they have been for decades? With a long record of integrating space into the Joint fight, weapons officers should continue to provide connective tissue between the Space Force, other services, and combatant commands.

Fourth, the warfighters' tradition is well suited to the current and foreseeable international context. Space is contested. China and Russia constitute real threats to American interests in space. Both countries have a range of kinetic and nonkinetic weapons threatening every orbital regime. The Space Force's mission is to preserve freedom of access in space, and it must perform that mission with adversaries in mind.

For now, space warfighting also meets the challenges of domestic and internal contexts. While policymakers and lawmakers of both parties supported creating the Space Force, political support can be whimsical, which calls for a note of caution. On April 18, 2022, Vice President Kamala Harris announced the United States would commit to not conduct destructive, direct-ascent ASAT missile testing.[67] While avoiding irresponsible destructive ASAT testing is sound policy, the declaration may also indicate a shift away from the idea of space warfighting.

It should not be objectionable for a military service charged with defending a specific domain to think in warfighting terms. But there may come a time when service leaders

66. Builder, *Icarus Syndrome*, 29, 35, 179.

67. "FACT SHEET: Vice President Harris Advances National Security Norms in Space," The White House, April 19, 2022, https://www.whitehouse.gov/.

find it less politically appealing to talk about space warfighting. The Space Force would do well to repeatedly communicate the service's value proposition: the nation is best postured to preserve freedom of action in and reap the benefits of the space domain if it has a Space Force. Guardians may prove to be an inspired moniker precisely because it reinforces values of protection and defense.

Setting aside communications' strategies, the warfighter tradition is the most aspirational of the four, and its true test is undoubtedly still ahead, as Raymond said, "The ultimate measure of our readiness is the ability to prevail should war initiate in, or extend to space."[68] The same is true of the warfighting culture the service seeks to build.

Conclusion

The Space Force does not get to create its culture ex nihilo; it has deep roots in the traditions of Air Force space operations. Anyone wishing to understand or shape Space Force culture would do well to understand those traditions and how they interact.

While the Space Force has progressed toward building a culture to meet the demands of today's contested space environment, organizational cultures adapt to changing stimuli. It remains to be seen whether or for how long the warfighters can prevail in the dialogue of competing traditions. More importantly, the open question is: Can the service incorporate the useful elements and shed the restrictive elements of its various traditions? In a future conflict beginning in or extending to space, the answer may prove decisive.✈

68. Raymond, *Planning Guidance*, 1.

USINDOPACOM's IAMD Vision 2028

Integrated Deterrence toward a Free and Open Indo-Pacific

Lynn Savage

The US Indo-Pacific Command's Integrated Air and Missile Defense Vision 2028 represents an innovative leap forward in integrated air and missile defense, supporting the United States and its Allies and partners as they maintain competitive advantage in the Indo-Pacific region.

Once China has acquired the capability to deny U.S. forces access to the first island chain moreover, Chinese military planners will likely shift their focus of attention to the second island chain.

—Roger Cliff

Over the first decade and a half of the twenty-first century, China carried out its strategy to counter US power presence within "island chains" in a synchronized, methodical manner by extending its own basing in the South China Sea with manmade islands and inhabiting sovereign territory of neighboring countries.[1] China also increased its presence in the Indian Ocean with the establishment of its first overseas military base in Doraleh, Djibouti.[2] This "fourth island chain" drove the USINDOPACOM combatant command name change but was only the opening clutch of China's rise to power in the region.

Along with increases in basing and offshore island building, China was also rapidly developing its ballistic missile arsenal, further improving its reach and sphere of influence. The combination of these effects extended China's anti-access/area-denial (A2/AD) range and its ability to affect the area, challenging the United States and US allies' and partners' previously uncontested freedom of maneuver in the region.

To counter China's A2/AD concept, one line of effort USINDOPACOM has focused on is the Integrated Air and Missile Defense (IAMD) enterprise, with a once-in-a-generation, revolutionary vision. In 2018, INDOPACOM published the *IAMD Vision 2028*, which is an innovative jump forward in IAMD development for the United States and its allies/partners to maintain a competitive advantage in the region and the topic for this article.

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1. This article first appeared in the *Journal of Indo-Pacific Affairs,* January 28, 2022, https://www.airuniversity.af.edu/JIPA/.

2. Wilson Vorndick, "China's Reach Has Grown; So Should the Island Chains," *Asia Maritime Transparency Initiative*, Center for Strategic and International Studies, October 22, 2018, https://amti.csis.org/.

Leading up to this ground-breaking IAMD concept, in 2015, *Air & Space Power Journal* published an article entitled "Back to the Future: Integrated Air and Missile Defense in the Pacific."[3] The authors defined IAMD from the US perspective, how we got to where we were at the time, and what "right" looked like in the Pacific. Significantly, the article highlighted the importance of Allies and partners in successfully conducting the IAMD mission. Security cooperation, seen as "Runways and Relationships" and "Places not Bases," were the catchphrases capturing Pacific Air Forces' strategic narrative and relationship line of operation with Allies and partners, ultimately morphing into the Agile Combat Employment (ACE) concept of today.

The article emphasized the importance of regional access, praised bilateral IAMD architecture such as we have with Japan, touched briefly on the benefit of a common operating picture and information and data sharing, and advocated the benefits of training and education with regional Allies and partners as provided by the Pacific IAMD Center. All these concepts were valid then and still resonate today, but the INDOPACOM *IAMD Vision 2028* took a revolutionary leap on these tenets.

Instead of a common operating picture that "PACAF can constantly monitor," *IAMD Vision 2028* suggests a network architecture that all Allies and partners can share and "any sensor, any shooter" in the region can leverage to thwart an incoming threat.[4] Instead of bilateral area air defense plans, *IAMD Vision 2028* advocates for area of responsibility (AOR)-wide integrated, netted, and layered sensor coverage. Beyond a robust US–only command and control for its own forces, *IAMD Vision 2028* proposes a regional integrated and interoperable fire-control architecture and an advanced joint and combined IAMD battle management and engagement coordination system. The revolutionary changes *IAMD Vision 2028* envisions are credible, fixed, mobile, and expeditionary operations that untether interceptors from sensors and tailor multilateral information-sharing agreements throughout the region, enabling Allies and partners a holistic freedom of maneuver and power-projection presence to maintain a free and open Indo-Pacific.

The *IAMD Vision 2028* opens with a clear statement of what needs to be defended: critical fixed sites dispersed over a vast AOR and mobile and expeditionary forces. Given China's growing ballistic missile, cruise missile, unmanned aerial systems (UAS), and hypersonic weapons arsenal and capability, the vision suggests fixed sites, regardless of location, throughout the Indo-Pacific, are vulnerable to missile attack. Guam, Hawaii, the United States mainland, and Allies' and partners' critical sites are vulnerable to a potentially overwhelming Chinese threat.

Additionally, Beijing's open desire to become the world's dominant power and extend its sphere of control in the region, as expressed in the "China Dream," demonstrate China's resolve to close off a free and open Indo-Pacific and impose its will to the second

3. Kenneth R. Dorner, William B. Hartman, and Jason M. Teague, "Back to the Future: Integrated Air and Missile Defense in the Pacific," *Air & Space Power Journal* 29, no. 1 (January–February 2015), https://www.airuniversity.af.edu/.

4. Dorner, Hartman, and Teague, "Back to the Future."

island chain and beyond. This desire, along with the emergent capability and capacity, foreshadows a time in the near future where the United States and its Allies cannot continue to mass forces from fixed, main operating bases as has been the operational strategy for decades.

Additionally, US IAMD resources alone are overmatched and unable to defend the high-value assets across the entire Indo-Pacific. The USAF, realizing its main operating bases are now targets not havens, is doing its part by moving toward a revolutionary ACE methodology of airpower generation to preserve the service's ability to generate combat airpower and counter China's strategy. Even with forces repositioning throughout the theater, once detected by China, and because air defense (AD) forces would not be able to move with equal agility, the forces would once again become targetable and vulnerable to missile attacks. INDOPACOM *IAMD Vision 2028* realized this conundrum and envisioned the need to defend mobile forces throughout the entire theater, including future ACE basing locations.

Previous air and missile defense planning doctrine called for developing a defended asset list of fixed locations within adversary interceptor range. Updated military operational strategy of rapidly maneuvering and dispersing forces for combat involves deployment to locations where US IAMD forces are not adequately postured to defend and unable to relocate in a timely manner.[5] *IAMD Vision 2028* resolves this dilemma, not by attempting the nonviable option of increasing US IAMD capability alone but instead by synergizing sensors and interceptors with our regional Allies and partners, further extending INDOPACOM's IAMD capability and ultimately the survivability of combat forces.

With INDOPACOM's vast AOR, Allies and partners are absolutely critical, and the vision to seamlessly integrate with regional partners is the revolutionary aspect of the new vision. It is nothing new for the United States to work side by side in "coordination" with Allies and partners, both politically and militarily. However, to seamlessly integrate and interoperate forces is a new initiative. The landing on the D-Day beaches, with each Ally having their own beach, was an example of side-by-side integration. Operation Iraq Freedom and Operation Enduring Freedom ground forces' laydown are other examples of side-by-side integration, as coalition forces were divided across the different countries' land mass. There are numerous other examples of side-by-side integration, but what has always been missing is a truly seamless amalgamation.

Side-by-side integration, as recent coalition operations in Southwest Asia and Afghanistan showcase, is analogous to one nation running the offense while another runs the defense. Seamless integration as described in *IAMD Vision 2028* directs partner nations to integrate offensive and defensive skills. Every player, every coach, has the same playbook, knows each other's moves and rules, and coherently and effectively practice and execute the game plan together. Players and coaches mix and match, practice together,

5. Hailey Haux, "PACAF Commander Talks ACE at AFA's Air, Space, Cyber Conference," Pacific Air Forces Public Affairs, September 21, 2021, https://www.pacaf.af.mil/.

and are seen by opponents as one well prepared team. *Vision 2028* recognizes the shortfall of side-by-side integration with and among Allies and partners in defending against a Chinese A2/AD threat, and the first requirement to counter is seamless amalgamation: AOR-wide integrated, netted, and layered sensor coverage. This concept of connecting all sensor data across the Indo-Pacific is an identical concept to the Department of Defense's Joint All-Domain Command and Control (JADC2) concept but goes one step further by being combined and including all regional Allies and partners.

This envisioned combined, integrated, netted, and layered sensor coverage enables birth-to-death tracking of all threats within air and space domains utilizing space, terrestrial, mobile and partner sensors. At times, the United States may be better postured for threats to the east, with systems such as the Next-Generation Overhead Persistent Infrared (Next-Gen OPIR) and GhostEye identifying intercontinental and tactical ballistic missile launches against the US mainland.6 At other times allies and partners in the Indo-Pacific region may be better postured with sensor coverage for launches to the southern and western half of the Indo-Pacific AOR.

Including Ally and partner sensor coverage into an integrated network architecture ensures constant tracking of threats across the entire region. Additionally, partner-nation sensors help increase regional situational awareness on other hazards, including air-breathing threats, unmanned aerial systems, and cruise missiles. Finally, these sensors add redundancy by creating a kill web of sensor coverage versus a single kill chain of sensor data and enabling dispersion of systems, complicating the enemy's targeting ability. However, before the data becomes useful, before it becomes an integrated, netted, and layered sensor coverage, it must be combined. Combined operations are achievable with the vision's second requirement of a regional integrated fire-control architecture.

This envisioned fire-control architecture is a joint standard, modular, and inclusively open system. Selective multilateralism, or tailorable releasability as labeled by INDOPACOM, enables different Ally and partner sensors across the AOR to fuse together to provide a truly seamless, integrated, netted, and layered sensor coverage for everyone. This architecture will be the sensor-fusion hardware for the AOR that correlates data and presents it as a single image of the threat environment, releasing it to partners tied into the architecture. This standardized, modular, open, tailorable architecture does not exist today, but *IAMD Vision 2028* implores innovation. Currently three potential systems are in development, which will be discussed shortly. Once the system is established, the third requirement to bring the vision to fruition will be creating an interoperable software to run the architecture.

With sensors across the AOR fused together in a single image shared by all, the final requirement envisioned by the vision is software that will be defined by doctrine and tactics, techniques, and procedures (TTP). The first TTP requirement is a defense design

6. Sandra Erwin, "Missile Defense Space Sensor Made by Northrop Grumman and Ball Aerospace Clears Design Review," *SpaceNews*, August 5, 2021, https://spacenews.com/.

plan and analysis tool. This tool needs to have all the capabilities for sensors and shooters cataloged; it must be able to show where coverages exist, where they overlap, where there are seams, where there is shooter coverage, and where there are gaps. It needs to be AI-enabled to rapidly provide engagement solutions against incoming threats and display the targeting in real time.

Finally, the system would need to integrate the offensive and defensive sides of IAMD operations to enable all four IAMD operational elements. Examples include multiple engage-on-remote options, launch-on-remote options, as well as sending back point-of-origin data to afford targeting of threat location. Additionally, the system would need to be able to use AI to predict enemy future operations based on past volleys. The synergy of architecture and the software to support it would ensure the theater's IAMD success in the vision of defending high-value targets and mobile and expeditionary forces from the full range of advanced air and missile threats. Prior to the vision becoming a reality, strategic hurdles and policy-level obstacles must be overcome.

The INDOPACOM *IAMD 2028 Vision* is grandiose by any measurement. It is the first of its kind, and there will be many challenges and constraints to conquer for it to be successful. The first obstacle to moving the vision forward is the strategic level buy-in from the United States and its Allies and partners to realize the value of a shared, seamless system, including the information-sharing agreements that will be required to make it a reality.

However, as with any political interaction with Allies and partners, adjustments in national security policies necessary to accomplish *IAMD Vision 2028* is a complicated and diversified endeavor.7 The battle will be against the status quo of not sharing data, historical baggage of past conflicts and disagreements, China's intervention to prevent unity of Allies and partners, cultural differences of how to establish agreements, ethical variances of who can support who, and ultimately the perceived cost to sovereignty of sharing national security capabilities with other nations.

Each nation, including the United States, will need to adjust their national disclosure of classified information-sharing policies before an AOR-wide IAMD vision can become a reality. Participating countries will need to share sensor and fire-control data with all other countries to optimize the vision. Shooting nations will need to share interceptor locations and capability. For a real-time system, nations will need to share when systems are down for maintenance, making those nations feel vulnerable to attack as well as sharing where authorization of responsibilities lie with each nation, further highlighting vulnerabilities.

These challenges are real and longstanding, but the political buy-in necessary to move forward needs to be addressed to make the vision a reality. The ultimate authority to get the nations to initially secede a piece of their sovereignty for a greater overall defense

7. Nabin Kumar Khara, "Determinants of Foreign Policy: A Global Perspective," *International Journal of Research and Analytical Reviews* 5, no. 3 (September 2018).

network (we will see later that ultimately it increases each nation's ability to preserve sovereignty) will need to be a whole-of-government approach. However, once nations do agree to come together against a common enemy, as previously highlighted, a standardized, modular, open, and tailorable architecture to enable all the different systems to communicate timely and effectively will need to be developed.

Within the Indo-Pacific AOR, there are US-built sensors and interceptors, Russian-built sensor and interceptors, Israeli-built sensors, and a plethora of indigenous systems. While the capability to fuse disparate system feeds in one location exists, the architecture to get the 1s and 0s to align and talk is equivalent to getting all the nations to speak the same language: it is an impossible task. To get the systems to work together, they will all need to be decoded to some common 1s and 0s protocol.

While not new, Radiant Mercury, one of multiple cross-domain software applications, is a proven integrator and routinely takes a nation's incoming RADAR data and displays it on a bilateral common operating picture. *IAMD Vision 2028* architecture will need to be able to send fire-control quality data to multiple nation's interceptors, not a common practice with disparate systems; however, progress is being made to make this vision a reality.

The first of three systems going after the "really hard" problem set of an architecture that fuses data across all domains, including interoperability with Allies and partners, as well as the software necessary to run the system, is the IAMD Battle Command System by the US Army. This system is the Army's architecture and software solution to JADC2, but as with *IAMD Vision 2028*, it also recognizes and accommodates the need to include integration with Allies and partners.

The system can integrate any sensor and shooter across all domains and fuse the data securely to user-friendly displays where command and control can be executed seamlessly. As recently as 2019, the system demonstrated the capability to intercept two cruise missiles with the US Marine Corps TPS-59 radar and F-35 sensors as well as Patriot, Sentinel, and PAC-3 interceptors, which is unprecedented.[8] The IAMD Battle Command System is anticipating initial operating capability as soon as 2022. The next system going after JADC2 is the Air Force's Advanced Battle Management System.

The Advanced Battle Management System, intended to replace legacy stove-piped command and control, has, as stated by the Air Force Chief of Staff General Charles Q. Brown Jr., "demonstrated the ability to collect vast amounts of data from air, land, sea, space and cyber domains, process that information, and share it in a way that allows for faster and better decisions."[9] As of May 2021, the program has moved from developmental to purchasing and installing the hardware and software on aircraft, with the initial step including the KC-46, F-22, and F-35 aircraft. While not explicitly an advertised area-denial platform by design, the ability to tie in sensors and shooters will make it a valued

8. "IBCS Functions and Features," Northrop Grumman (website), 2020, https://www.northropgrumman.com/.

9. Charles Pope, "With Its Promise and Performance Confirmed, ABMS Moves to a New Phase," Secretary of the Air Force Public Affairs, May 21, 2021, https://www.af.mil/.

program to the IAMD mission. The final program that is still in the concept development phase and being championed by an ally in the region is AIR6500.

AIR6500 is a Royal Australian Air Force program designed to develop a joint air battle management system that maximizes the capabilities offered by fifth-generation systems.[10] The system will be the architecture at the core of the Australian Defence Force to provide high situational awareness and defense against air and missile threats.[11] It is expected to be interoperable with existing US systems and able to maintain high interoperability with coalition partners.[12]

The system desires to link disparate systems across every domain of warfare, including future submarines, over-the-horizon radar, unmanned aerial systems, and much more.[13] This "system-of-systems" will synchronize air and missile defense operations and, because of its mobility and plug-and-play capability, will have the ability to expand to include others Allies and partners in the Indo-Pacific.

The US Army and US Air Force battle command/management systems to a degree, and AIR6500 have the potential to be the architecture *IAMD Vision 2028* is calling a regional integrated fire-control network. With an architecture and software application available in the near future and a growing list of Allies and partners likely to have the political support and willingness to work through foreign disclosure agreements, *IAMD Vision 2028* shows clear signs of moving forward.

Japan and the United States have been working together in missile defense since 2004,[14] with Australia joining the two nations to form a multilateral engagement venue in 2015. The Trilateral Missile Defense Forum, conducted annually, is steadfast in its charter to increase combined missile defense capability in the region. Additionally, as recently as late 2021, Philippine Air Defense officers observed Japanese forces firing Patriot missiles as an opportunity to socialize the capability and inform the Philippine Air Force Flight Plan 2028. The PAF is eager to build up a formidable integrated air defense system in the Philippine archipelago.

The United States and South Korea have worked together in missile defense against North Korea for decades, presenting a golden opportunity to integrate sensors and shooters in the defense of the peninsula and, if required, the region. These examples are just a few that demonstrate the movement in and around the region of like-minded nations coming together against a common competitor. A recent addition, India, is highlighted as part of the Quad Conference pledge to promote an Indo-Pacific region "undaunted by coercion" and committed to a free, open, inclusive Indo-Pacific.

10. Lockheed Martin, "AIR6500 The Future of Australian Air and Missile Defence," 2020, https://www.lockheedmartin.com/.

11. Airforce Technology, "Australia downselects Lockheed Martin and Northrop for AIR6500 Project," Airforce Technology, August 6, 2021, https://www.airforce-technology.com/.

12. Airforce Technology, "AIR6500."

13. Lockheed Martin, "AIR6500."

14. Ministry of Defense, Japan, "Missile Defense," 2020, https://www.mod.go.jp/.

While never mentioning China, it is clear the Quad's united rhetoric is pointed toward China's coercive tactics and rising influence in the region.[15] In late 2021, all four nations came together in Hawaii to socialize IAMD constructs to further develop each nations capability and demonstrate resolve to counter China. The expansion of China's A2/AD and the critical importance of a free and open Indo-Pacific compel us forward under the INDOPACOM *IAMD Vision 2028*.

In line with Admiral John C. Aquilino's guidance, INDOPACOM *IAMD Vision 2028* is thinking, acting, and operating differently. It is taking an as-is, segregated, disparate, stove-piped IAMD infrastructure and transforming it into a to-be that fuses all the sensor data into an integrated, seamless operations and intelligence warfighting network, combined multinational command and control, and a joint- and coalition-driven interceptor architecture that is the first of its kind. *Vision 2028* will tie all the Allies and partners together, strengthen their strategic integrated deterrence in the region, reinforce their resolve to remain united against an ever-aggressive Chinese strategy, and if deterrence fails, bolster their ability to defend themselves individually and win as an alliance.

As the pivot that began in 2011 endures and China's increasing A2/AD military capability and the China Dream mentality threaten freedom of maneuver in the region, the recognized importance of a shared alliance and the understood value of a shared architecture, together, will help overcome political challenges and information-sharing hurdles.

US Strategic Command's 15-year biannual Nimble Titan exercise underscores the desire of Allies and partners to synchronize global missile defense posture and make a shared architecture a reality. When *IAMD Vision 2028* is closer to realization than conception, each nation will more clearly realize they are not giving up a piece of sovereignty but rather strengthening their autonomy by being a part of something greater than they could have accomplished on their own. Nations will recognize they are not giving up proprietary information and state secrets; they are tying into a system that takes them leaps and bounds above where they were before.

When *Vision 2028* becomes every Ally's and partner's vision, both on the political and military fronts, it will no longer bring the nations side by side against a common enemy but rather transform the Allies and partners into a seamless amalgamation. This new front will be greater than the sum of its parts, presenting a much greater deterrence to China, due to not only the integrated, netted, and layered sensor coverage but ultimately due to the integrated, netted, and layered alliance of like-minded allies and partners.

As General Kenneth Wilsbach, commander of Pacific Air Forces highlighted at the Air Force Association's Air, Space, Cyber Conference in 2021, China's ever-expanding landscape and imposing will that is counter to the international rules-based order and a free and open Indo-Pacific needs to be challenged every single day.[16] The United States

15. Saheli Roy Choudhury, "The Quad Countries Pledge to Promote an Indo-Pacific Region That Is 'Undaunted by Coercion'," *CNBC*, September 27, 2021, https://www.cnbc.com/.

16. Haux, "PACAF Commander."

cannot go it alone, nor does it desire to do so. Allies and partners realize the deteriorating effects of China on the Indo-Pacific remaining free and open and the detriment this brings to their sovereignty and ways of life.

Because of this, Allies and partners are working toward a solution, political discussions are occurring, and an IAMD architecture necessary to see the vision through is coming closer to a reality than a concept. While *IAMD Vision 2028* is ambitious, it is also achievable—and necessary. With a seamless amalgamation of nations politically cemented and the military IAMD capability a reality, China will ultimately be deterred from freely imposing its will in the region and threatening a free and open Indo-Pacific. ✈

Decision Superiority

ABMS and the US Air Force Digital C2 Revolution

Christophe Piubeni
Dan Gottrich

Current US military platforms, many of which date back decades, are insufficient to combat developing adversary artificial intelligence and machine-learning technological innovations. The US Air Force's Air Battle Management System answers the challenge, delivering multidomain data capabilities to digitally connect the Joint Force across all domains.

Today's adversaries are developing the capability to use artificial intelligence and machine learning as force multipliers, rendering ineffective long-standing US military capabilities.[1] Achieving air superiority rests first upon achieving decision superiority. A fully-realized Advanced Battle Management System (ABMS), the US Air Force's component of the Joint all-domain command and control (JADC2) concept, will deliver multidomain secure processing and data management, connectivity, and applications to synchronize sensors, shooters, and networks for a digitally connected Joint Force in every domain.

Introduction

It may be surprising to learn that in the twenty-first century, the country with the most expensive and most prolific military on the planet still relies on PowerPoint slides and telephone calls to conduct real-time analyses of potential threats to the homeland. But the United States finds itself in this situation. If a potential threat from a Russian bomber appears on early-warning radar scopes, it could take more than 12 minutes for personnel from various desks at North American Aerospace Defense Command (NORAD) to coordinate information, build a slide presentation with only the most pertinent data, and present it to the officer in charge to determine if a threat truly exists.[2]

Lacking the tools to collaborate in a common environment, personnel cannot fuse the necessary data to recommend a response to the national command authority until it is finally presented to the colonel in charge of the operations floor.[3]

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1. A version of this article first appeared in *Defense & Sécurité Internationale*, HS-82 (Février-Mars 2022).
2. Amy Hudson, "Revamping Homeland Defense," *Air Force Magazine*, December 2, 2021, https://www.airforcemag.com/.
3. Brian W. Everstine, "Moving from Situational Awareness to C2," *Air Force Magazine*, October 1, 2020, https://www.airforcemag.com/.

Achieving air superiority has been the cornerstone of US military tactics since the end of the Cold War. But in today's world where adversaries are developing the capability to use artificial intelligence and machine learning as force multipliers, it no longer matters if the US military has the strongest force or the most accurate and powerful weapons. The ability to out-think (or in cyber terms, out-process) the adversary becomes the new goal; a nation's military cannot achieve air superiority without first achieving decision superiority.

Advanced Battle Management System

The US Air Force has been working for several years on ABMS, a program that will fix these issues and allow commanders to receive data fused from multiple sources rapidly. The Pentagon charged the Air Force to develop the capabilities the Joint Force needs to operate outside traditionally stove-piped domains in an effort to gain and maintain decision advantage across the competition continuum.[4] In March 2020, Major General Michael Fantini, the commander of the Air Force's Warfighting Integration Capability that was established to focus the service's innovation efforts, described decision advantage as "the collection, interpretation, and use of the information required to deter or win in tomorrow's conflicts." He stressed that success would "default to the side that is most connected across all domains: air, land, sea, space, and cyberspace."[5]

The ABMS is not just one thing or one platform to design. It has alternately been described as a network of networks and a system of systems; it is a new "internet of military things" that the Department of the Air Force's first-ever chief architect calls "an architecture to rule them all."[6]

The goal of ABMS is to replace the single paths of information coming to a central hub, such as in the NORAD example, with an environment where each system and operator works off the same shared data. A fully-realized ABMS will allow the delivery of multidomain secure processing and data management, connectivity, and applications to synchronize sensors, shooters, and networks, "connecting the right sensor to the right shooter" for a Joint Force that will be digitally connected in every domain for instantaneous awareness.[7] The concept was born from a recurring problem in the service—replacing decades-old aircraft.

4. Chairman of the Joint Chiefs of Staff (CJCS), *Competition Continuum*, Joint Doctrine Note 1-19 (Washington, DC: CJCS, June 3, 2019).

5. Mike Fantini and Jake Sotiriadis, "The New Imperative: Connecting the Joint Force with a Digital Advantage," Defense News, March 23, 2020, https://www.defensenews.com/.

6. Fantini and Sotiriadis, "The New Imperative."

7. John Tirpak, "Brown: USAF Has Been 'Asleep at the Wheel' Too Long When It Comes to EMS," *Air Force Magazine*, January 27, 2021, https://www.airforcemag.com/.

The New JSTARS

The E-8C joint surveillance and target attack radar system (JSTARS) aircraft was designed during the 1980s and first fielded in 1991, just as the Cold War it was originally designed to support was coming to an end. The platform provides airborne ground surveillance, battle management, and command and control capabilities, and the US Air Force is still flying 16 of the aircraft 30 years later. Hence, at Robins Air Force Base, Georgia, the units deployed continuously to the Middle East for 18 years, the second-longest deployment in US Air Force history.

In 2014, the Pentagon funded the research for a JSTARS replacement, and the defense industry had begun designing and testing new platforms as of 2015. But Air Force leadership realized that monolithic air and space operations centers, fed by aging JSTARS and E-3 airborne warning and control system (AWACS) platforms, were collectively not optimized for the speed, complexity, and lethality of future conflict. These "decades-old platforms" could not reliably leverage twenty-first-century technology, and "the supporting structures to enable future C2 either [did] not exist or require[d] maturation" to be fully effective.[8]

Further, the low-density/high-demand E-8C JSTARS and E-3 AWACS aircraft were known single points of failure. They were prime targets unable to operate for long in a peer competitor's battlespace, as sophisticated anti-access/area-denial capabilities, such as electronic warfare, cyber weapons, long-range missiles, and advanced air defense systems, were being developed.[9]

At the same time, the US military began to rethink its approach to Joint warfare. In 2016, the secretary of defense directed a new combat concept called "Air-Land Battle 2.0," an update to Cold War doctrine that would focus more on air, land, sea, space, and cyberspace operations.[10] This approach soon became known as multidomain battle in the US Army and multidomain C2 in the Air Force.

Senior US Air Force generals began to think about equipping both legacy and new aircraft, manned and unmanned, with emerging technology, communications equipment, and sensors to conduct the ground surveillance mission previously assigned to the single JSTARS platform.[11] For this system to be effective, it needed to process a huge amount of data, including information from US Allies and partners. Thus in 2018, funding for a replacement JSTARS was diverted entirely to the Air Force's new multidomain C2 program that would support a DoD-wide effort known as JADC2.

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8. John R. Hoehn, *Joint All-Domain Command and Control (JADC2),* In Focus (Washington, DC: Congressional Research Service (CRS), updated January 21, 2022), https://sgp.fas.org/.

9. Nishawn S. Smagh and John R. Hoehn, *Defense Capabilities: Joint All-Domain Command and Control*, In Focus (Washington, DC: CRS, April 6, 2020), https://crsreports.congress.gov/.

10. Sydney J. Freedburg Jr., "DepSecDef Offers Dough for Army Multi-Domain Battle," Breaking Defense, October 4, 2016, https://breakingdefense.com/.

11. Nathan Strout, "Congress Dealt ABMS a Blow but Experts See Progress That Could Help at Budget Time," C4ISRNET, June 15, 2021, https://www.c4isrnet.com/.

The Advent of JADC2

In September 2020, the assistant secretary of the Air Force (Acquisitions, Technology, and Logistics) noted, "It is a shame that people come into our service connected to almost everything in their personal lives, and they come work in a military where they're connected to almost nothing,"[12] This observation highlights how the military has lagged behind the civil sector when incorporating digital enhancements. Huge DoD contracts produced equipment designed to be sustained for decades with little regard to upgrades or interconnectivity with systems in the other services or even within their own. For example, the Air Force's prized fifth-generation aircraft platforms, the F-22 and F-35, were built with different communication networks that are incompatible and thus require a third platform (e.g., the ABMS Airborne Edge Node) to share data between the two.[13]

Department leadership realized technology is changing so rapidly that success in future combat will come to organizations with integrated, networked forces that can share the most information. Accordingly, in 2021 the Department of Defense crafted a strategy that allows commanders to rapidly understand the battlespace, direct forces faster than the enemy, and deliver effects to and through any domain necessary.[14] This concept was given the moniker Joint All Domain Command and Control.

The concept of JADC2 is as a DoD umbrella: The Joint Staff sets the policies, doctrine, requirements, and common standards for the data. At the same time, the services develop the applicable technology, which the Department of the Air Force is doing through ABMS. The Army and the Navy have JADC2 programs called Project Convergence and Project Overmatch, respectively, and the services are in the early stages of coordinating their efforts. In 2021, the Joint Chiefs of Staff chief information officer observed that the new JADC2 approach would "bring order to our efforts in the command and control arena to sense, make sense and act all at the speed of relevance."[15]

Despite the challenges, Secretary of Defense Lloyd Austin declared his intent to make JADC2 one of his top priorities while at the same time recognizing that bringing Allies and partners into this new realm was paramount to deter competitors.[16] Hence, data interoperability and data replication and distribution are crucial attributes of JADC2. Further, integrity and security of this data will be necessary to build trust among the services, Allies, and partners.

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12. William Roper, quoted in Yasmin Tadjdeh, "Advanced Battle Management System Faces Headwinds," *National Defense* (September 2020): 42, http://digital.nationaldefensemagazine.org/.

13. Brian W. Everstine, "Air Force's New Plan for ABMS: Smaller Budget, Clearer Schedule," *Air Force Magazine*, June 25, 2021, https://www.airforcemag.com/.

14. Jackson Barnett, "Secretary of Defense Austin Approves JADC2 Strategy," FEDSCOOP, June 4, 2021, https://www.fedscoop.com/secretary-of-defense-austin-approves-jadc2-strategy/.

15. Carol Collins, "DoD's JADC2 Strategy Leverages AI Technology, Common Data Fabric to Develop Digital Infrastructure," GOVCONWIRE, August 20, 2021, https://www.govconwire.com/.

16. Greg Hadley, "Pentagon Announces JADC2 Implementation Plan, Unclassified Strategy," *Air Force Magazine*, March 21, 2022, https://www.airforcemag.com/.

JADC2 Challenges

Joint all-domain command and control may be a hard concept to grasp as the terminology is not entirely grounded in hardware or software solutions but rather in " 'ethereal terms' " like "redundancy, resilient architecture, and information at the 'speed of relevance.'"[17] Establishing JADC2 is about looking at the realm of the possible, building for now while keeping an eye on emerging technologies and their easy integration into the capabilities of tomorrow.[18] But first, it must overcome three major hurdles.

First, the centralized C2 architecture is currently not resilient enough in the case of a high-intensity conflict wherein C2 nodes would be the first targets. Simply trading the JSTARS and AWACS aircraft with these nodes makes them the most attractive and vulnerable chinks in the US armor. Distributed network operations will thus be a key center of gravity for JADC2.

Second, for the system to process fast enough to "sense, make sense and act" with data from every domain, the US military must heavily rely on the unproven and not-yet-fully trusted concepts of artificial intelligence and machine learning. It is easier to build the user interface and inputs of a system; the industrial base has been doing this for decades. But now the military needs a system that automatically collects that data and feeds artificial intelligence to make the best decision.[19] Moreover, the commanders must trust the recommended data and decisions (a rather large paradigm shift for those born before the digital revolution).

Third, the individual services' size and range of inventory are so extensive (e.g., the Army, renowned for its ground forces, also has boats, airborne electronic warfare, and intelligence, surveillance, and reconnaissance assets) that each has become accustomed to operating virtually independently in the other domains. Retrofitting equipment on all these platforms to communicate with the other services may be cost prohibitive. Contrast this with smaller Allied armies that have no alternative but to work jointly. The French military, for example, has created technical solutions, such as Scorpion and Connect@ero, to communicate natively between services.[20]

While the Joint Staff established the overall concept of JADC2, Air Force Futures wrote the service supporting concept. The Department of the Air Force's ABMS cross-functional team leads a capability development campaign through which war fighters can discover the latest ABMS tools and concepts. Moreover, test flag exercises (including Orange, Emerald, and Black Flags) are executed every trimester to test the survivability

17. Ryan Dean and Nancy Temple, *CDA Institute: NORAD Modernization Forum, Third Report, JADC2/JADO* (Ottawa, ON: Conference of Defence Associations, September 9, 2020), 4, https://cdainstitute.ca/.

18. Dean and Temple, *NORAD Modernization*.

19. "Western Air Defense Sector Helps Shape ABMS," North American Aerospace Defense Command, September 21, 2020, https://www.norad.mil/.

20. Philippe Gros, "The Tactical Cloud: A Key Element of Future Combat Air System," Note, no. 19 (Paris: Fondation pour la Recherche Stratégique, October 2, 2019), https://www.frstrategie.org/en/.

and lethality of new capability releases. These exercises underscore the relevance of new weapons and tactics in a multidomain environment.

The end state of an operational ABMS is a command-and-control construct composed of processes and systems that compress decision-making cycles to converge effects across domains and enable integrated operations across the planet. Speed is the key. But even as units across the Air Force are dedicating efforts to bring ABMS to fruition, some challenges remain.

China produces vast amounts of data; this is, in fact, one of their instruments of power. To compete, ABMS will have to be agile, fast, and unpredictable by relying on a network-centric rather than platform-centric architecture. How will existing, legacy systems such as JSTARS process these terabytes of information? As technology improves, sensors, equipment, and operators can become oversaturated with data, causing latency issues. 80 percent of US Air Force aircraft are fourth generation or older; retrofitting them with modern command and control systems may cost too much. The challenge lies in enabling old platforms to communicate with fifth- and sixth-generation aircraft. One cannot play iTunes music files on a record player or try to link a Commodore 64 to the internet.

Enabling Allies and Partners

When the United States goes to war in the future, it will rely on its Allies and partners. The ability to count on these nations' militaries is a force multiplier and a decisive advantage the United States has over its competitors, but over-classification and other restrictive policies are tremendous obstacles to sharing data. The US military is determined, however, to leverage technology to increase accessibility and data sharing among Allies and partners, fusing that network of networks in the form of universal workstations in coalition operations centers.[21] The goal is to let software or artificial intelligence, using set rules, appropriately share information with the coalition partners who need it.

In order to transform strategic intent into reality, Ally and partner industries must work side-by-side to allow components (such as black boxes) to speak to each other or allow aircraft systems to decrypt and use data generated by other aircraft. A bigger challenge is ensuring that ABMS will be fully compatible with the federated mission networking being developed by NATO to streamline and standardize communications among the 30 member nations.[22]

France and the United States have always been "day-one" players; our air forces are like-minded and can do things that only a few can. The ability to connect our sensors for

21. James N. Mattis, *Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge* (Washington, DC: Department of Defense, January 2018), https://dod.defense.gov/.

22. "Federated Mission Networking," North Atlantic Treaty Organization, Allied Command Transformation (website), n.d., accessed May 12, 2022, https://www.act.nato.int/

the next fight needs to happen today so that our next-generation fighters and systems can operate smoothly in a new digital architecture.

Recent exercises, such as the May 2021 tri-nation Atlantic Trident in Mont-de-Marsan, have shown that even though the Rafale and F-35 can work together, they still cannot fully collaborate due to technological and classification issues. The ongoing collaboration between our air forces associated with the Rafale block F4 suggests better integration and a close future between the French assets and the F-35, envisioned as the quarterback of a future ABMS: the player who can enhance their teammates with the best view of what is going on in the field.

Additional Obstacles

Despite these and other encouraging signs, many external challenges remain with this program. Moreover, the Department of the Air Force also must overcome numerous internal hurdles to deliver ABMS on time. Beyond the difficulty of sharing information with foreign partners, the US Air Force has not solved the problem of communicating with the other services, each with its own indigenous communications systems. The Air Force is torn between making existing equipment and policies work or starting from zero and building a system from the ground up, delaying implementation by decades. The resulting dilemma can only be resolved by achieving a balance between the two options.

Implementation will come with a price. How will the US military convince its civilian leadership controlling military funding that this new ABMS program is important (on top of all the other "important" things)? Congress did not tell the Department of Defense to pursue JADC2 and kept the purse strings closed tight. The House Report on the FY2021 Defense Appropriations Act critiqued the Air Force's ABMS request, citing weaknesses in the program that included "the absence of firm requirements, acquisition strategy, or cost estimate, as well as the unclear definition of responsibilities of the Chief Architect of the Air Force and other offices involved in executing the ABMS program."[23]

In 2021, the USAF transitioned ABMS leadership to a new, Pentagon-based cross-functional team and shifted program responsibilities to the Department of the Air Force's Rapid Capabilities office. Messaging Department structural changes and priority shifts to Congress is critical to keeping the program funded.

Internal to the service itself, how can the Air Force balance ABMS with all the other must-do requirements such as paying for the next strategic nuclear bomber (B-21), additional F-35s, the Sentinel intercontinental ballistic missile, and a sixth-generation aircraft? Thus far, ABMS has the highest level of support. Despite all the programs competing for the same funding (including hypersonic and drone swarming), nuclear modernization

23. HR 166-453, *Department of Defense Appropriations Bill, 2021, Report of the Committee on Appropriations together with Minority Views [to accompany H.R. 7617*, 116th Cong. (July 16, 2020), 294, https://www.congress.gov/.

and ABMS are two of the chief of staff's top priorities.[24] Furthermore, Secretary of the Air Force Frank Kendall named ABMS one of his top seven programs needing renewed oversight to "improve the Air Force's ability to function as an institution."[25]

When General Charles Q. Brown Jr. became the 21st chief of staff of the US Air Force, his marching orders were to "Accelerate Change or Lose."[26] While the service battles with Congress over retiring old systems it no longer needs, it is simultaneously working to further Joint collaboration on ABMS. "To win the contested, high-end fight . . . we need to accelerate how we field critical technologies today. We cannot afford to slow our momentum on ABMS. Our warfighters and commanders must fight at internet speeds to win."[27]

Conclusion

This digital revolution will be a game changer for the United States and its Allies and partners. As early tests have demonstrated, ABMS will provide the decision superiority necessary to win tomorrow's high-speed engagements by giving our commanders a clear, robust, and instantaneous common operating picture. "What we showed . . . was the first time that combatant commands were in the same data cloud architectures and made decisions about posturing forces . . . results were seen in seconds instead of days."[28] The Department of the Air Force may finally be able to discard those PowerPoint slides at NORAD after all. ✈

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24. *Department of the Air Force Posture Statement Fiscal Year 2022, Presentation to the Committees and Subcommittees of the United States Senate and the House of Representatives*, 117th Cong. (June 17, 2021) (Statement of Acting Secretary of the Air Force John P. Roth, Chief of Staff of the Air Force General Charles Q. Brown, and Chief of Space Operations, General John W. Raymond), 2–3.

25. "Kendall's Top Seven Priorities to Cope with Peer Adversaries Include Two New Aircraft," *Air Force Magazine*, December 9, 2021, https://www.airforcemag.com/.

26. Charles Q. Brown Jr., *Accelerate Change or Lose* (Washington DC: US Air Force, August 2020).

27. Stephen Kuper, "US Air Force Demonstrates ABMA Joint Force Capability," Defense Connect, September 7, 2020, https://www.defenceconnect.com.au/.

28. Everstine, "Situational Awareness."

Albanian Army C3 in the Postcommunist Era

Sokol Thana

The Albanian army experienced a radical change in command, control, and communication after the fall of Communism as it sought to achieve its national objectives and advance significant and continuous change required by various Western organizations. Albania is a case study that can highlight lessons and competitive advantages for countries experiencing similar changes.

The Albanian army experienced significant changes in command, control, and communication (C3) to achieve political and military objectives as it adapted to the rapid and radical transformation required by various Western international organizations and nations. Albania provides a case study of lessons learned for countries experiencing similar massive shifts in society and governance.

Introduction

In the late 1980s, border walls and mental barriers were beginning to crumble throughout Eastern Europe, resulting in an era of divided territories, people, mindsets, ideologies, and much more. In Albania, the people overthrew the dictatorial regime that had ruled all aspects of the country—human, political-economic, military, and sociocultural—for 45 years. The historic 1989 unification of the two Germanys; the creation of new states from those established under the Soviet Union; the fall of Communism in Hungary; and the extraordinary student movement that took place in 1990 in the capital of Albania, Tirana, heralded the beginning of a new historical epoch.

This new chapter in European history had significant implications for every aspect of society. Albania and other eastern European countries were vigorously undertaking a new journey to develop and transform themselves under the umbrella of democracy. As for Albania, despite the strength of the character of the students and the revolt of the Albanian people against the dictatorial regime of Enver Hoxha, the nation was not prepared for what would be expected of it in the coming years. While it is true Albanians were prepared for revolt and revolution, they were not prepared for continuous development and progress. Albanian leadership at that time had no viable plan to establish the foundations of democracy; consequently, democratic governance was left to evolve on its own.

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As a result, many Albanians felt disappointed and neglected. Many emigrated to neighboring countries such as Italy or Greece to find a better life.[1] The brain drain, the state of transition for which Albania found itself unprepared, a weak leadership, a poor economy, a corrupt judiciary, and the persistent hatred that people nurtured for the totalitarian system were all factors that made the Albanian army take strong but not necessarily transformative actions to contend with the multifaceted development dimensions of the postcommunist era.

At that time, the negligent leadership failed to establish strong democratic pillars in the new state, resulting in chaos, injustice, ignorance, and a lack of focus on achieving objectives and inspiring change. The transformation of the mentality of the people that was necessary to keep pace with modernity did not occur.

This article examines the institutional integration of doctrinal, technological, human, political, internal, and external elements, all of which play a vital role in understanding the historical developments of this country. This article also analyzes the challenges facing military leaders who seek to improve current military architecture in its entirety. Military leaders of all levels—tactical, operational, and strategic—have the primary responsibility for the efficient and effective integration of doctrine, education and training, technology, information flow, and management. Achieving this integration will help the organization better achieve objectives, add values, improve management and cooperation, and create a new military reality.

Finally, the article presents next steps. Improvement is a continuous process; for the Albanian army, this improvement will eventually lead to the institution keeping pace with the most developed nations of the North Atlantic Treaty Organization (NATO) alliance.

Albanian Army–Early 1990s

The Albanian army in the early 1990s found itself at a major crossroads without a proper direction due to communist-era institutional legacies. It was almost inevitable that every Eastern European country, not just Albania, would retain some of these communist structures in a postcommunist world. The elements Albania inherited inhibited the nation's struggle to find its new identity, but at the same time, these structures influenced and served the progress it made from 1999 to the present.

The legacy the Albanian army had established by the early 1990s can be classified into four main pillars: 1) an outdated military mentality; 2) Soviet-era doctrine, education and training, and organizational structure; 3) depreciated armaments; and 4) a lack of interinstitutional connections.

1. Nga Klareta Çumani, "30 vjet nga eksodi i madh i shqiptarëve (30 Years from the Great Exodus of Albanians)," *Albanian Post*, February 21, 2021, https://albanianpost.com/.

Outdated Military Mentality

The first obstacle that the Albanian army encountered immediately after the end of the dictatorial regime was the transition from an Eastern military mentality to an advanced Western one. The army was alone and had no direction as it faced radical changes in processes and procedures. The leadership at that time did not pay due attention to structural, doctrinal, technological, educational, training, legal, and financial changes and did not attempt to change the outdated mentality toward the military that prevailed in the wider population.

In that period, the country's leadership also did not try to manage the transition; it let change happen as it occurred, and consequently the Albanian army faced resistance. This is the initial reaction of people to transformative periods. Due to a lack of Western leadership models, the military and political leadership did not take into account the human capacity and fluid management of change.

In the first years of the fragile democracy in Albania, the government adhered to the principle of total defense, which held that practically all people were considered soldiers in defense of the homeland. The dictatorial state party ruled the country and stood above everything, and national defense issues relied entirely on "our efforts and forces."[2] Moreover, the structure of the Albanian army retained its strong Soviet-style foundations even after the 1990s, despite the fact that Albania left the Warsaw Pact in 1968. The concepts of defense, weapons technology, doctrine, organizational structure, and leadership were dependent on the Russian military style even after the fall of communism.[3]

It is worth noting that pre-1990s C3 was entirely centralized and enforced only by a few people. Its conjunctural structures served the totalitarian regime rather than an ideal based on continuous self-improvement. Policies and personnel could neither move, act, nor think outside the directives and policies of the state party.

Further, even after the 1990s, legacy perceptions about the military persisted. The population continued to believe that a total lack of communication between the military and the public was an organizational norm, and they also believed the civilian government used the military to achieve its political goals. The idea that the army would not be used by the new government to achieve its goals was not easily accepted at that time. "Nothing was ever reported to the public, not even those issues that normally did not require confidentiality. Marxism-Communism meant planning; planning meant control; control meant orders for the people to do what the party requested."[4]

As an example of the depth and reach of this Soviet-era military planning and how it was embedded in the daily life of the general population, hundreds of thousands of concrete

2. Pëllumb Qazimi, *Albania, the Military and the Foreign Influence* (1912–1991) (Vukovina, Croatia: Tipomat, 2012).

3. Qazimi, *Albania*.

4. John Hughes-Wilson, *A Brief History of the Cold War: The Hidden Truth about How Close We Came to a Nuclear Conflict* (Philadelphia: Running Press, 2006), 18.

bunkers were built across the country with the expressed purpose of protecting Albania from its enemies. "600,000 bunkers spread throughout the land - from the mountains to the sea, based on paranoia, which lacked any military logic . . . becoming the center piece of an exotic scenario."[5] For Albanians in the early 1990s, while the bunkers remained, years of historical ideologies were destroyed in a few short hours of revolt and change.[6]

All this brought radical contradictions in the democratic period the Albanian army was entering in the early 1990s. Total detachment from the past, a lack of democratic mentality that continued to prevail in the military institutions, outdated defense principles, a lack of leadership and modern C3, lack of proper plans to manage change and military spending, a lack of civil-military cooperation, and other elements, combined with 45 years of no freedom for the general population, made a precarious pillar upon which the Albanian army had to rely to lay democratic foundations, particularly in an environment where no one wanted to stay.

Doctrine, Education and Training, and Organizational Structure

The Albanian army inherited another heavy stone to bear—an outdated, flawed, and backward doctrine based entirely on Soviet Union defense principles.

Doctrine

Although it seceded from the Warsaw Pact in 1968, Albania never learned how to manage society and its military differently. Instead of recovering the time lost during the cooperation with the Soviet Union, the country immediately decided to cooperate with communist China. The ideology, political principles, and the concept of defense were so strong that no institution could escape them without infecting themselves. The Albanian army continued to suffer the consequences of this outdated and backward doctrine even after the 1990s. The organization failed to establish strong and unwavering leadership based on modern Western military doctrine and instead continued to maintain and encourage a leadership with old doctrinal principles, yielding negative outcomes for the army after the 1990s.

Soviet-era doctrine was not easy to implement and follow, as everything was based on the state party. Yet, future military generations continued to refuse to take responsibility for changing this doctrine and failed to adopt strong and new democratic defense concepts such as centralized control and decentralized implementation.

Doctrine should be the first milestone as a military endeavors to use human and technological resources in the most efficient and effective way and execute operations strategically

5. Stephanie Schwandner-Sievers and Bernd Jürgen Fischer, *Albanian Identities: Myth and History* (Indianapolis: Indiana University Press, 2002), 205.

6. "The Albanian Bunkers Built in the Midst of the Cold War," BBC News, February 11, 2019, https://www.bbc.com/.

in all domains. Planning, activities, actions, and strategy should all be rooted in doctrine. Additionally, to achieve the objectives of national interest at all levels, doctrine must be timely and simple to use. As US Air Force General Curtis E. LeMay once said, "Doctrine is of the mind, a network of faith and knowledge reinforced by experience which lays the pattern for the utilization of [Airmen], equipment, and tactics. It is the building material for strategy. It is fundamental to sound judgment."[7]

Training/Education

Albania inherited an army that was unprepared, untrained, and uneducated for the period in which it found itself. Albania was immersed in Soviet defense principles; the education system of the Albanian soldiers was internal to the army and based on outdated Soviet doctrine. Moreover, for 45 years the Albanian army had not had any military training or exercises in any of the countries with which it had political-military relations. Albania never deployed its troops to train outside Albanian territory, even when it was part of the Warsaw Pact.[8]

Organizational Structure

In relation to the population size, geographic territory, and resources, the Albanian army inherited a significantly exaggerated organizational structure that required considerable expenses to maintain. For example, after Ukraine gained its independence from the Soviet Union in 1991, it had "a total of 180,000 men . . . divided into thirteen divisional and five corps headquarters, whereas the US Army [same year], with its five hundred thousand members (three times bigger than the Ukrainian Army), [was] divided into only ten divisional and four corps headquarters."[9] In 1991, Albania had 21 infantry divisions and over 700,000 personnel. "The trend was to have large, heavy, non-efficient structures that were impossible to afford and extremely difficult to manage."[10] These structures were large and scattered—inefficient and ineffective in the modern world.

Depreciated Armaments

Centralized control in the hands of a few people resulted in an overload of Soviet and Chinese armaments. These weapons and equipment were outdated and could not be used for military training in country and with post–Soviet-era partners due to significant

7. Curtis E. LeMay Center for Doctrine Development and Education (LeMay Center), *The Air Force*, Air Force Doctrine Publication 1, (Maxwell AFB, AL: LeMay Center, March 10, 2021), 16, https://www.doctrine.af.mil/

8. Qazimi, *Albania*.

9. Anatoliy Grytsenko, "Ukraine's Military Reform Efforts: Lessons Learned," in *Post–Cold War Defense Reform: Lessons Learned in Europe and the United States,* ed. István Gyarmati and Theodor Winkler (Lincoln: University of Nebraska Press, 2002), 96.

10. Qazimi, *Albania*, 211.

depreciation and overall poor condition. Further, this old technology was never adopted for Eastern military training, as Western technological standards were too advanced for these old and depreciated weapons. Indeed, between the late 1970s and early 1990s, Albania did not upgrade its weapons and technology or military infrastructure.

Lack of Inter-Institutional Connections

As if all of the above were not enough, Albania and the Albanian army in particular found itself facing a total lack of communication with the armies of Western countries—it was an army in search of a new national and international identity.

As mentioned, the only international connections the Albanian army had were at the doctrinal level (Soviet and Chinese according to historical periods). The army rarely engaged with other militaries in training, education, and exercises. Suffice it to say, Albania never moved its troops outside its geographical territory. This inherited situation caused an unprecedented decrease in morale in the ranks of the army, including uncertainty about the future, instability in the present, uncertainty regarding military life in the country, unfair financial practices, and changes to the rank structure.

Transformation of Albanian C3

Albania's postcommunist military legacy guaranteed a challenging and defining journey toward democratic institutionalization and membership in various international military organizations. The steps it took after 1992 were decisive for the future. The first considerable challenges to be properly addressed in terms of the concepts of defense and C3 included a new democratic system; the new defense reality that included Western doctrine, new relationships with other Balkan states, and transitioning away from Soviet legacy armaments; establishing inter-institutional links within and outside the country; the dynamic situation in the Western Balkans region; nationalist divisions; political, economic, and social problems; terrorism; and many other issues.

The first step toward the C3 transformation in the Albanian army was the adoption of a command and control concept based on the principle of centralized control and decentralized implementation and the implementation of Western standards of military communication. In order to realize the functionality of these new concepts, Albania's membership in various international organizations helped, which, in turn, initially helped the Albanian army raise the military institution to Western norms of C3.

Albania was one of the first countries to join the North Atlantic Cooperation Council in 1992 and the Partnership for Peace (PfP) program in 1994.[11] These initial steps helped the Albanian army gain a new existential map from which it was able to distinguish its

11. Republic of Albania Ministry of Defence, "History of NATO-Albania Relations," n.d., accessed May 10, 2022, https://www.mod.gov.al/.

path toward integration in the NATO alliance and subsequent military cooperation with Alliance partner countries.

For the first time in 45 years, the Albanian army saw a path toward military reform. The inclusion of the Albanian army in these programs and international organizations and councils dispelled the savage mentality that existed immediately following the end of the Cold War and gave the organization an opportunity to carry out the first military reforms.

The army considerably reduced its bloated structure and began to implement a more Western doctrine in keeping with the international organizations with which the country cooperated. Military infrastructure improved, thus giving the Albanian army the opportunity to achieve important priorities and objectives.

The transformation of C3 in the Albanian army must be seen in terms of postcommunist national interests. The Albanian army was navigating in a new political, social, military, regional, and European environment. In these conditions, Albania's national interests had to be refocused to enable the country to find its place in a new reality full of dynamics seen from a different perspective.

The vision of the political and military leadership of the time, the values to which they aspired to adhere, and the new purpose and objectives led the Albanian army to form a new military identity under the support and supervision of NATO and the United States, as Albania itself was redefining its national interests and objectives. "Vital security interests are no longer national interests, and national security interests are no longer vital."[12]

The Albanian army had to resize, and it had to establish itself on the domestic military scene and on the international scene. Western notions of separation of powers and civil-military cooperation improved command and control, thereby strengthening institutional relations. Forces were focused on a further institutional empowerment and beyond. This drastic change lifted a large burden from the shoulders of the Albanian army.

Involvement in Alliance Institutions

Undoubtedly, the activities that the Albanian army participated in during the 1990s in the framework of PfP or NATO assistance contributed the most to the transformation of Albanian army C3. These activities focused on the development of key democratic concepts, organizational reconstruction, and resolution of technical issues, changes in force structure, and changes in education and training.

The focus, importance, and commitment that NATO structures had were critical to the Albanian army's preparation for full-fledged membership in the preeminent political and military organization in the world. Albania was rightly seen as a case study for nations facing similar challenges.[13] The transformation of Albanian army C3 took place under

12. Marco Carnovale, *Vital and National Security Interests after the End of the Cold War in European Security and International Institutions* (New York: Saint Martin's Press, 1991), 1.

13. G. Katsirdakis, "Albania: A Case Study in the Practical Implementation of Partnership for Peace," *NATO Review* 46, no. 2 (1998): 22–26.

the management and care of NATO. This assistance and oversight increased the effective operation of army forces so that they were capable and prepared to participate in joint exercises as equals, ready to work and meet the legal and moral expectations and responsibilities required by the Alliance.

Key Democratic Concepts

The implementation of Western doctrinal frameworks for C3 introduced the concept of centralized control and decentralized implementation. As detailed by US Air Force leaders, "Centralized command and control of airpower by an airman promotes effectiveness and preserves flexibility at the strategic and operational levels of war, while decentralized execution of air operations promotes effectiveness and preserves flexibility at the tactical level."[14]

Organizational Reconstruction and Technical Issues

The reorganization of the Albanian army increased operational capability, effectiveness, efficiency, speed of action, interactions, and interoperability, further enhancing C3 and information systems. The army also resolved key technical issues related to the safety and inventory of armaments.

Force Structure

The army implemented force structure changes that included restructuring, reducing, and reallocating forces. The reduction of forces at this time was significant: 31,000 troops were reduced to 16,500 troops. The army reallocated and restructured forces by forming the rapid reaction brigade, with a battalion considered a task force, and by creating a commando regiment and other military structures that instituted new concepts, doctrine, and decision making.

Moreover, the army created entirely new elements to perform advanced military activities. The air force was equipped with a multipurpose squadron of helicopters covering not only the air force's military activities but also providing practical assistance to the missions of the land and naval forces. Also, the newly created air defense brigade together with its own units was an organizational innovation in line with NATO principles and standards. As for the navy, it was organized on two naval bases and included a naval observation battalion.[15]

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14. Clint Hinote, *Centralized Control and Decentralized Execution: A Catchphrase in Crises*? Air Force Research Institute (AFRI) Papers 2009-1 (Maxwell AFB, AL: AFRI, March 2009), 19, https://media.defense.gov/.

15. Igli Totozani, "Civilian and Military in Defense Planning: From National Security Concept to a Force Development Plan," in *Defense and Security Sector Governance* (Geneva: Geneva Center for the Democratic Control of Armed Forces, 2004), 58–71.

Education and Training

The Albanian army's involvement in the training and education of its personnel and military infrastructure was essential to increasing the capacity of its human resources. The army made new, pro-Western methods of education, training, and exercising available to military members. As a member of the PfP program, the army participated in naval exercises in cooperation with NATO missions such as Operation Sharp Guardian, operations Safe Heaven and Deny Flight in Bosnia, Operation Seven Stars, Operation Dynamic Response, and the recent Operation Defender Europe.[21]

The Albanian military also engaged under the umbrella of the NATO International Security Assistance Force as part of the Turkish mission in Afghanistan. Later, the Albanian Armed Forces participated in missions in Mosul, Iraq under the operational care of the US Army 101st Division as part of the international coalition in the fight against terrorism. Today, the army continues missions in Kosovo, Lithuania, and many other countries where there is a need to be included as part of the Alliance with full rights and responsibilities.[16]

These beneficial experiences and extraordinary collaborations facilitated the Albanian army's transition from the four pillars of postcommunist operations and structures toward full participation in international interoperable cooperation. These irreplaceable experiences also increased the army's effectiveness, making it a key part of international coalitions and commitments.

The opening of the military university "Skënderbej," based on the US West Point Military Academy program, served as a critical milestone in the education and training of the next generations of officers and noncommissioned officers of the Albanian army. The cadets are involved in intensive parallel programs—one civil and the other military—and are required to graduate within four and a half years.

Importantly, the army also redefined the NCO academy, adopting western teaching methods and linking its staff to educational collaborations in partner countries. In order to prioritize the continuous education and training of the staff, members of the Albanian army participate in international programs including the US military's International Military Education and Training program. This commitment of the United States further bolsters the human resources of the Albanian army by increasing its military capacity and by contributing to the army's achievement of NATO standards.

NATO Membership

Another milestone in the transformation of Albanian army C3 took place on April 9, 2009, the date Albania was fully admitted to NATO. From this moment on, the four pillars mentioned above began to truly transform and greatly strengthened the support of

16. North Atlantic Treaty Organization (NATO), "The Prague Summit and NATO's Transformation: A Reader's Guide," (Brussels: NATO, 2003), https://www.nato.int/.

the army among the broader Albanian population. Moreover, Albania's entry into NATO increased the Albanian army's morale, energy, positivity, and motivation.

Doctrine improved considerably in quantity and quality where it was redefined according to Alliance standards. New armaments began to arrive from the United States, various NATO countries, and other partner countries, significantly improving military infrastructure.

The army added new objectives related to national and Alliance security, including operationalizing the first Albanian control and reporting center (CRC), which improved the effectiveness of national training operations and those in cooperation with other countries. The achievement of these new defense objectives was instrumental in increasing communication capacities, intelligence and reconnaissance, information flow, and institutional interoperability.

The advent of new technologies such as a new radar system significantly advanced the national objective concerned with the conservation and management of the Albanian airspace. This technology made the flow of information faster, enabling intelligence and reconnaissance to act quickly and effectively resolve challenges.

Certainly the transformation of an army will never end, as technology, human resources, and capacity will always be in the process of transformation. What matters is accepting the challenges and turning those challenges into success. A modern and democratic army does this by implementing the principle of centralized control and decentralized implementation through command, control, and communication.

As such, C3 has been critical in the transformation of the Albanian army, as modern military operations require flexibility at the tactical and operational levels and control at the strategic level. "Successful mission command demands that subordinate leaders at all echelons exercise disciplined initiative, acting aggressively and independently to accomplish the mission within the commanders' intent."[17]

The Challenge–Leadership

Throughout history, leadership has been the primary challenge for humanity in general and even more so in a military setting. Leadership creates and improves the work environment and brings competitive advantages to produce winning operational strategies. Military leadership inspires others to represent the military institution through personal example, reflecting military values in any environment, and is key to improving the four postcommunist pillars discussed above.

Leadership, then, is the next challenge for the Albanian army. In leading by example, a leader must always be coherent, objective, and developmental, and in doing so, he or she will improve doctrine, the people, information technology, management, processes, and inter-institutional and internal relations. Such leadership will integrate a new winning

17. US Army, *Operations*, US Army Field Manual 3-0 (Washington, DC: Headquarters, Department of the Army, February 2008), 3-6.

and motivating spirit to achieve any objective or goal, regardless of unexpected and critical situations. Moreover, this integration requires strong and intelligent leadership.

But leadership is challenging for a number of reasons. First, leaders have an institutionalized relationship with followers; in order for that relationship to be sustainable and strong, it must change with time. This change improves leadership and with it, improves doctrine, technology, and decision making, leading to increased situational awareness. Greater leeway in decision making, necessitated by the speed of information flow, increases the effectiveness and success of any mission or situation.

But change does not mean lowered expectations. Indeed, today's leaders must change the culture while *not* lowering expectations. The *Oxford English Dictionary* defines culture as the customs, beliefs, art, lifestyle, and social organization of a particular group or country.[18] As organizations change, it is therefore necessary to review leadership culture to encourage behavior that prioritizes requirements that need to be standardized.

Second and related to the first, leadership must always look ahead and not risk returning to problematic situations in the past. This posed a challenge for the Albanian army leadership and for the Albanian government. Leonard Wong and Stephan J. Gerras argue that in order to move forward, we must first identify any individual or organizational problems that could lead an organization to repeat past mistakes; in the case of the Albanian army, these problems occurred in the 1990s.[19]

Third, leadership must focus on followers and human resources, which have tremendous effects on achieving objectives in a timely and effective manner. Strengthening morale and prioritizing human resources is a task and challenge for leadership. As former US Army General George S. Patton wrote in 1933, "Wars may be fought with weapons, but they are won by men."[20] A key leadership challenge for the Albanian army has been changing followers' mindsets to enable the success of C3. The improvement of C3 in the Albanian army has aligned military mentality with Western doctrine, which is constantly changing and thus improves the army's C3 performance, followers, objectives, and mission.

Ultimately, leadership is power. Therefore, the challenge of leadership lies precisely in the display of power, respecting two themes—rule of law and freedom. Henry Kissinger has drawn three conclusions from Cardinal Richelieu's career that are applicable in a military setting: 1) a long-term strategy is necessary for a successful foreign policy; 2) leadership must have a coherent vision as it relates to the declared time frame—leadership needs to know where it is taking the vision and why; and 3) leadership must build bridges,

18. *Oxford English Dictionary*, s.v. "culture," accessed February 2, 2022, www.oed.com/.

19. Leonard Wong and J. Stephen Gerras, *Lying to Ourselves: Dishonesty in the Army Profession* (Carlisle, PA: Strategic Studies Institute, US Army War College Press, February 2015), https://press.armywarcollege.edu/.

20. George S. Patton Jr., "Mechanized Forces," repr. from *Cavalry Journal* (September-October 1933) in *Military Essays and Articles by George S. Patton Jr., General, U.S. Army 02605, 1885–1945*, ed. Charles M. Province (San Diego, CA: George S. Patton Jr. Historical Society, 2002), 128, http://www.pattonhq.com.

connecting experience and aspirations.[21] As Martin Luther King Jr., said, "Power is the ability to achieve purpose; power is the ability to effect change, and we need power."[22]

Looking Ahead

The future of the Albanian army will depend on the decisions made today. In order for the army to achieve its objectives and goals, it must leverage personality, inspire enthusiasm, and remain vigilant.

The army must leverage personality through all its entities. Personalities that demonstrate a sense of timing, efficiency, and a devotion to successfully achieving the mission simultaneously improve leaders and followers. The army must also inspire enthusiasm. An army that equips its human resources with optimistic enthusiasm and calm will promote professional and individual productivity toward achieving its objectives. An environment characterized by followers with high levels of enthusiasm for the mission correlates directly and positively with national security.

Finally, the army must remain vigilant. It must be focused on and vigilant regarding all technological innovation—doctrinal, human, political, and social—by implementing any change in its organizational and doctrinal structure in a timely fashion, all the while maintaining high levels of productivity to respond to all the challenges that await. And in the case of the Albanian army, those challenges are multidomain operations and close air support.

Multidomain operations and close air support will increase effectiveness of the Albanian army's C3, further assisting the transition from the four pillars but also aligning the country's internal reality to global operational situations. Seen from this point of view and in the wider political-military environment in which military operations occur everywhere in the world, the Albanian army must be entirely resized.

Such a resizing begins with adopting a common C3 doctrine to respond to the global need for a military structure that allows all forces to respond simultaneously. This change would make the best use of the capacity, infrastructure, technology, facilities, and people in peacetime as well as in wartime.

> The essence of multidomain operations is to think about military problem solving in a nonlinear way and to conduct operations focused on achieving objectives rather than on maintaining, distinct component lanes. . . . The complexity of current and future operations require breaking this pattern of thought in order to more seamlessly integrate the unique capabilities of each component to create the effects required to meet tactical, operational, and strategic objectives.[23]

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21. Henry Kissinger, *World Order* (New York: Penguin Press, 2014), 11.

22. Clayborne Carson, ed., *The Autobiography of Martin Luther King, Jr.* (New York: Warner Books, 2001), chap. 31, 372.

23. Clay Bartels, Tim Tormey, and Jon Hendrickson, "Multidomain Operations and Close Air Support: A Fresh Perspective," *Military Review* (March–April 2017), 72, https://www.armyupress.army.mil/.

The world we live in today is changing drastically and with dizzying speed. Militaries are embracing more and more engineering and cyber programming as part of a new intelligent force, which must be implemented as soon as possible in Albanian army doctrine and technology. By investing in this direction, the Albanian army will be able to implement multidomain operations, the newest environment where war is oriented today. Perhaps Carl von Clausewitz understood this when he said, "Every age has its war roots, its limiting conditions, its prejudices. . . . Every age should have its own theory of war, even if it were to be decided at all times to be concretized, according to perfectly reasonable criteria."[24]

Conclusion

Albania presents an opportunity to study and to delve deeper into the analysis to discover lessons worth using in the future. Albania and the Albanian army represent an atypical case in terms of military history and events, situations, political cooperation, the concept of defense, and methods of communication. The agreements made in different periods are seemingly appropriate and influenced by time.

But what is most impressive is the rapid pace at which Albania decided to change its concept of the state, coping with quite difficult situations for a postcommunist nation. Practically overnight, it found itself in a democratic transition that ended up lasting longer than it did for any other postcommunist state. Albania was forced to do things without a proper plan, but it developed itself with the support of Western states. Indeed, without them it would have been quite difficult for the Albanian army to have found its identity.

Moreover, the Albanian army understood the importance of training, educating, and exercising. As a result, the military leaders at all levels today are much better integrated into the defense construct, and they ensure that their followers have a clear, articulated picture of their mission. Including the latest technology is a challenge in itself—this must remain a key objective. Finally, implementing and solidifying the use of all base defense assets under a joint command umbrella could be a new challenging and fascinating objective for the Albanian army.

This article underlines the importance of seeing the Albanian army in 360 degrees with its pros and cons as a motive to improve and learn at the same time. The army, with the leadership and oversight of the United States, the EU, and NATO, is finding the brilliance it had long lacked, and it will never give up on the future. ✈

24. Carl von Clausewitz, *On War*, vol. 3, bk. 8, chap. 3, pt. B (Tirana, Albania: Shtëpia Botuese e Ushtrisë [Army Publishing House], 1996), 532.