

Domain Expertise and Command and Control

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There was a time when brilliant men could hope to possess a depth of knowledge across the arts and sciences sufficient to act wisely in any number of realms. History celebrates these Renaissance Men as exemplars fit for any task. But these men are gone, never to return. Similarly, with respect to modern military operations, no commander today can be fully steeped in the competencies of the land, sea, air, space, and cyberspace domains.

With limited resources, commanders are more likely to be effective if they are efficient. Aircraft and spacecraft are particularly scarce, for instance. A commander must use them efficiently and not fritter them away piecemeal to subordinate commanders. Because of their knowledge, domain experts are best equipped to command and control their respective forces on behalf of a joint force commander (JFC). The key to success is *centralized* control and *decentralized* execution.

For the joint force commander, there is only one campaign. He cannot wisely allocate his forces believing that there are separate land, sea, air, and space campaigns.

A JFC needs not only the facility to command and control, but also the experts capable of exploiting a depth of knowledge in operations, tactics, techniques, and procedures to best employ the available forces. The skills of these domain experts do not come easily; they are developed over many years through detailed study, organizational development, and participation in military operations. During their decades of service, these experts are invested with both functional skill and leadership ability. However, the idea of domain experts developing organizations and enabling centralized control has not always been obvious.

Importantly, different Service perspectives on domain expertise continue to be an issue. In 1947, the creation of an independent U.S. Air Force was vehemently resisted by both the Army and Navy. Today, some still question whether the air domain is so unique

as to require discrete control and capability development with respect to organizing, training, and equipping Service forces. Indeed, as far as air, each Service continues to conduct its own operations.

But what concerns us most today is the challenge that air and space forces need not be centrally controlled—that they are better utilized if they are portioned out to subordinate commanders with whom a JFC can invest complete responsibility for mission success with regard to any particular task during a military campaign phase. This issue arose during a contested exchange at a recent combatant commander's conference in a discussion about whether to devolve command and control of joint air force elements to the land and maritime component commanders. The JFC had already made clear a predilection for parceling out air capabilities to subordinate commanders. Concluding with a pointed comment on the subject, the joint forces land component commander remarked, "You either trust the joint forces air component commander [JFACC] to control air operations, or you don't."

Soldiers on patrol in Iraq, 2007

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U.S. Air Force (Adrian Cadiz)

This essay claims a link between effective command and control and domain expertise and offers that link as the foundation for intelligent employment of military forces.

Air and space forces are relatively scarce, yet they are particularly in demand during major combat operations. In the future, they will be increasingly expensive and scarce. The concept of how these air and space forces are intended for use as well as the impetus for future development of capabilities are Service responsibilities. Domain experts provide the vision to guide development for the mid and far term. Joint force commanders should rely on that same domain expertise for command and control to best employ those forces in a military campaign.

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Domain Expertise

To respond effectively to the enemy, our forefathers needed intelligence and warning, a coherent plan of action, and centralized command and control. Happily, they had a plan to deal with the threat by rapidly marshalling response forces—Minutemen—to confront the enemy. These forces had been very effective in past engagements. Unfortunately, by the time of the Revolutionary War, these superbly trained forces lacked the centralized command and control necessary to take advantage of initial battlefield successes. Like us, they needed to adapt to changing circumstances.

Of course, our world is far more complex than theirs. Could the Minutemen ever have imagined the range, speed, flexibility, and devastating precision offered by modern aircraft, the near-instant capabilities of space-based satellites operating on the other side of the planet, or the *botnet* (a collection of software robots) swarms in cyberspace awaiting the order to attack our information systems? Clearly, circumstances have changed, but the requirement for unified command and control and the imperative for innovation have not.

Land and sea—those physical realms or vectors in which or from which operations might take place—have been joined over the years by air, space, and cyberspace. Each domain offers unique opportunities that we can exploit as well as new avenues of attack for our adversaries. In each domain, we seek security and strength through superiority. In each, we work for dominance. To be successful, we must have the ability to exercise command and control. Together, these various domains can be brought to bear in a joint warfight far more effectively than if operations occur in isolation.

allow those effects to be generated at a higher or lower level of cost and efficiency. While we could achieve victory—after great expense, effort, and delay—by marching our troops down the central boulevard of an enemy's capital city, this might not be the optimal use of our instruments of power. Ideally, to paraphrase Sun Tzu, we would look our adversary in the eye and, fearing the worst, he would quit and quail. Task for task, both effectiveness and cost can vary widely.

Certainly, movement of men and materiel on land costs least, and effects can be



Diver outside submerged USS *Woodrow Wilson*

U.S. Navy (Mark Reinhard)

It is easier to relate to the contributions made in different domains if we can readily touch or see the capabilities employed. The reality—or *physicality*—of operations in each domain varies greatly. It is far easier for the public to see video of troops in action than to be aware of ships at sea, aircraft operating high above and far from home, or satellites invisible to the naked eye.

When commanders integrate effects between domains, they too must have a sense of the capabilities at hand. They must have the knowledge to compare those capabilities as well as the expertise to wield them for greatest effect. Though similar effects can often flow from each domain, specific domain attributes

generated with the exquisite precision afforded troops in contact. Great numbers of troops can create many discrete effects in the battlespace. Compared to operations in other domains, however, they do so sequentially, relatively slowly, and at greater risk. As a whole, large land force operations are no less expensive than operations in other domains and may be far more expensive, particularly with respect to the political effects created. Still, there is no better method of compelling the actions of affected populations.

In the maritime domain, operating from the security of international waters, bulk goods can traverse great distances at a moderate cost, and we are beholden to no other nation for access, though the vastness of our oceans imposes lengthy delay. In the air, we can transport men and machines swiftly, but at a much higher cost, cube for cube, than by sea. We can

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range globally to create effects in minutes or hours, but we cannot place physical hands on our adversaries.

As for capabilities in space, although immensely expensive, they can enable or magnify the effect of operations on land, at sea, in the air, and in cyberspace like no other capabilities. Space power is:

unique due to its global perspective, responsiveness, and persistence. Through the integration of space capabilities, Airmen conduct simultaneous operations affecting multiple theaters. Because space-related effects and targeting can be global in nature, Airmen involved in the application of space power . . . [employ] an effects-based approach to space operations based on functional capabilities rather than geographic limitations.¹

While few would advocate portioning out our physical assets in space to ground commanders, prioritizing capabilities is the bread and butter of effective use in the space domain. Within a theater, “the challenge for campaign planners is to ensure space operations are integrated throughout the joint force commander’s scheme of maneuver across all levels of war—strategic, operational, and tactical.”²

Of course, airpower is also unique. In many cases, it offers the greatest economy of force to combatant commanders. The Former Republic of Yugoslavia was coerced through the use of airpower to end its war aims in Bosnia and Kosovo without the combat loss of a single allied soldier.

During the Persian Gulf War, 39 days of precision bombardment from the air so reduced Iraqi capability and will to fight that Saddam Hussein capitulated after a mere 100 hours of the ground campaign. Airpower is an inherently strategic force that can hold an enemy’s strategic centers of gravity and critical vulnerabilities directly at risk immediately and continuously. It can exploit the principles of mass and maneuver simultaneously to a far greater extent than surface forces. The inherent speed, range, and flexibility of airpower combine to make it the most versatile component of military power. Whoever controls the vertical dimension generally controls the surface.³

Today, technological advances allow those who control the air to dominate the land and sea forces of other nations. Airpower remains, dollar for dollar, our most effective investment in domain dominance. Sometime in the future, it is reasonable to assume that with advances in



Gen. Henry H.
"Hap" Arnold

U.S. Air Force

directed energy, propulsion, and power generation, control of space will allow us to dominate the air forces of others as well as their land and sea forces. Beyond that, we may posit a time when control of cyberspace will allow us to dominate space and all that operates below.

The Air Force was not created to satisfy a demand for men at arms, but instead from the urge to operate in a new domain by taking

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advantage of revolutionary technology. Refinements to the art of manned flight allowed military operations in the air, which meant much more than just operating from new high ground. Airpower soon had a critical effect in the battlespace. By 1944, Allied air supremacy and the defeat of the Luftwaffe enabled a potentially perilous Channel crossing and the invasion of Normandy, without which the defeat of the Third Reich might not have occurred.

From its beginning in 1947, the Air Force has nurtured a culture of innovation. We are experts in our domain and know that air superiority must never be taken for granted. As Airmen, we are charged with modernizing our force by identifying new technological applications and concepts of operation. With forethought, we are creating synergistic capabilities that will make “every sensor a shooter” and perhaps “every soldier a sensor.” Space operations provide integrated tactical warning and attack assessment to ground commanders charged with defending our airbases. For now, air and space superiority remains the first requirement for successful military operations; for the future, cyberspace superiority may be the sine qua non for success.

When we think of operations in cyberspace, we often imagine ethereal effects on information and data. However, operations within cyberspace not only require physical infrastructure but also can have very physical consequences. For techniques such as electronic attack and electromagnetic pulse, physical assets such as planes and missiles typically host the means to generate the effects. For supervisory control and data acquisition attacks, the Internet can provide a conduit

Landing Craft Air Cushion departs the beach at Po Hang, South Korea



U.S. Navy (Mark R. Alvarez)

for large-scale disruption of industry or infrastructure.

On the other hand, for attacks on computer servers, thousands of disparate host computers can be invaded stealthily and employed as a botnet when needed. Attacks can be scripted and automated employing resources that are distributed and exploited. These botnets can be borrowed, rented, or seized. Forces employed in cyberspace need not be expensive, scarce, or apportioned and prioritized in quite the same way as forces employed in the other domains. Our idea of dominance in cyberspace may be fleeting.

Each of the Services seeks through force development to improve capabilities to contribute to the joint battle. Sailors build ships to move faster and employ weapons systems to reach farther; Marines equip themselves with network-centric intelligence and warning to operate with greater assurance far from shore; Soldiers employ indirect long-range fires and Blue Force trackers; and Airmen use joint tactical air controllers to integrate joint fires with maneuver forces on land and leverage assets in space to enhance precision, intelligence, and communications across the domains.

As a nation, we are dominant on land, at sea, in the air, and in space, and we have declared our intentions for cyberspace. For the future, we must seek synergy between operations within these domains to create a level of effectiveness well beyond the sum of our capabilities within each domain. As important, we must be aware of new avenues of attack, especially in space and cyberspace, through which adversaries may seek to dislocate our operational coherence.

In many ways, operations within these domains are alike because the principles of war remain relevant across all domains. In other ways, they are very different. They can be defined by two dimensions or three or even the fourth—whether operations proceed sequentially or simultaneously, are focused locally or globally, occur at the speed of a foot patrol or of light, or are primarily physical and kinetic or electromagnetic. Because of essential differences in operations in each domain, we will want to tailor our command and control arrangements to best employ the attributes that distinguish each of our operating domains.

If we grant that air, space, and cyberspace are all unique, how should we order our command and control to best make use of our forces? How should we address the need for innovation in organization, equipment, concept of operations, tactics, techniques, and

past, air operations by components not controlled by air tasking order were deconflicted geographically, or by altitude, or by time. Army helicopters have operated at will flying nap-of-the-earth. Route packages carved up slices of Vietnam for operations by fighter bombers. Over time, our concept of command and control for air operations has evolved from the essential deconfliction associated with the Big Sky theory during the time of Eddie Rickenbacker in 1918 to the magnificence of synergistic exploitation and apportionment via the Joint or Combined Air Operations Center.

Now, unmanned aircraft systems have proliferated to such an extent that ground force commanders have challenged centralized control on the basis of incompatibility with their concepts of operation at the tactical level of war. But it is not just small, limited, and local operations in question. For instance, in the case

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procedures? Moreover, as we look at history, as one domain has come to dominate the operations of others the way air operations have come to dominate both land and sea, is it time to “load the dice” and heavily favor investments in space and cyberspace?

Command and Control

Not only has the old debate over centralized control of the air domain not been settled, but it has also burst to the forefront of command relationships. In the not too distant

of the Army’s MQ-1C Sky Warrior, which can drop bombs from medium altitude, the public must begin to wonder whether every Service must have its own air force and whether joint, interdependent operations mean the same thing to each Service.

There have always been minor exceptions to centralized control of the air that have historically made sense. But with respect to fixed-wing air operations, centralized control should be the *rule*. Modern combat aircraft are too precious, whether manned or unmanned. There are too few air assets and too many tasks for airpower to be employed piecemeal without synoptic control.

The joint force air component commander emphasizes efficiency, flexibility, and the paramount effects desired by the JFC. He has the greatest situational awareness of the battlespace with respect to air and space and the best ability to control those forces.⁴ If a JFC did not have a JFACC, he should be keen to invent one.

Centralized control within the Air and Space Operations Center (ASpOC) allows the JFACC to see the entire air picture across the theater of operations and provides him the facility to rapidly reapportion forces to supported commanders to account for the fog and friction of war. He has the critical ability to integrate supporting activities (for example, tanker support, space assets, and airspace

Inauguration of F-35 Joint Strike Fighter at Lockheed Martin



U.S. Navy (Eric A. Clement)

control measures) in order to meet the JFC's overarching needs when managing competing requirements for airpower.

The ASpOC is at the heart of this process. It coordinates with other component commanders to achieve the specific objectives of supported commanders as well as the JFC's overall objectives. Because of the inherent flexibility of airpower, the ASpOC is capable of dynamic retasking to deal not only with the fog and friction of warfare, but also with short notice opportunities and threats.

Within the ASpOC, liaisons from other components integrate, coordinate, and deconflict plans and operations. They ensure that other supported commanders receive necessary air and space attention in terms of prioritization and apportionment. They help the JFACC and his staff advance the JFC's overall objectives by understanding other operations in the battlespace. In other functional component headquarters, Air Component Coordination Elements ensure the JFACC is aware of each commander's priorities and plans and that other functional "commanders are aware of the JFACC's capabilities and limitations (constraints, restraints, and restrictions)."²⁵

In contrast to the alternative of providing specified air assets for control by other component commanders, JFACC centralized control allows scarce airpower assets to be leveraged across several mission sets as needed. Individual sorties can be multitasked to provide needed capabilities to different supported commanders. For example, a single flight of F-22s can provide air superiority, electronic attack, maritime interdiction, and intelligence, surveillance, and reconnaissance. The attribute of economy of

force within a theater of operations or even globally is by itself a potent argument for the joint command and control of air operations.

Robust communications capabilities do not by themselves warrant command and control; networked command and control of distributed forces is insufficient on its own. Because of the complexity of integrating the effects of modern tools of war, commanders must have more than a passing understanding of forces at their disposal. To efficiently and effectively stage operations with limited assets, air component commanders must have a thorough understanding of the tactics, techniques, and procedures typically employed in air and space operations. Deconfliction is only one of the many tasks that must be planned.

Air operations during major combat operations comprise a system of systems with the flexibility to maneuver and mass across the depth and breadth of the battlespace, creating precise effects in accordance with the JFC's scheme of operations. To best further the JFC's overall objectives, operations within the air domain rely on the timely and effective integration of many disparate activities, including logistics and maintenance ground support, timely and pertinent intelligence and analysis, air operations, and space-based position, navigating, and timing data. Together, the air, space, and cyberspace domains exploit the vertical and emphasize speed as key dimensions in which to magnify combat effects at the time and place of our choosing.

In the cyberspace domain, the command and control function in the ASpOC can be applied through a coordinating liaison similar to that provided for mobility and

space operations. Just as Air Force Space Command supports U.S. Strategic Command (USSTRATCOM) as a vital component to provide global capabilities, Air Force Cyber Command will support USSTRATCOM through its ASpOC and distributed cyber enterprise. In a parallel fashion, a director of cyberspace forces in a theater ASpOC can coordinate for reachback to Air Force Cyber Command.

However, for those effects in cyberspace generated by theater assets, including production and assessment of the electronic order of battle and attack operations in the electromagnetic spectrum, a planning, tasking, controlling, and assessment function must exist within the ASpOC. Certainly, many elements of defensive cyberspace operations associated with electronics infrastructure and digital data security must be forward in theater. On the other hand, offensive capability associated with computer network attack in theater will likely be tasked through USSTRATCOM.

To assure concentration of effort and economy of force, to exploit versatility and flexibility, the Air Force deems centralized control of airpower a "master tenet . . . the keystone of success in modern warfare."²⁶ Moreover, domain expertise allows us to magnify capabilities by integrating effects generated in air, space, and cyberspace; to generate timely effects for joint force commanders; to mass and maneuver with an economy of force across the planet; and to provide, with scarce resources, a system of systems for command and control, intelligence, combat effects, and combat assessment across a wide range of military operations. There is no substitute for domain expertise. **JFQ**



U.S. Air Force (Garrett Davies)

NOTES

¹ Air Force Doctrine Document (AFDD) 2-2, *Space Operations*, draft (2005), 2.

² Ibid.

³ See AFDD 1, *Air Force Basic Doctrine*, June 19, 2007, draft (version 3), 12-13.

⁴ Joint Publication 3-30, *Joint Command and Control for Air Operations* (Washington, DC: Department of Defense, June 5, 2003), II-10, states, "If a JFACC is not designated, unity of effort in joint air operations requires the JFC to centrally plan, direct, and coordinate joint air operations with other joint force operations."

⁵ AFDD 2, *Operations and Organization* (Washington, DC: Headquarters Department of the Air Force, April 3, 2007), 71.

⁶ AFDD 1, 30.