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Preserving Our C2 Edge: A Near-Term Flight Plan For The Air Operations Center Weapon System

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About the Forum

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The US Air Force's Air Operations Center Weapon System (AOC-WS) is at a crossroads today: balancing growing needs for operational command and control, increasing manpower demand, the necessity to integrate effective distributed control, and the requirement to incorporate non-kinetic effects into its operations.

The likelihood of significant modernization progress in the near term, however, is less than encouraging. This paper discusses a proposed realistic near-term "flight plan" for the AOC-WS, allowing USAF to modernize this capability despite the difficult fiscal forecast. If adopted, it could help the Air Force progress towards one of its strategic goals to "increase C2 agility to permit distribution of control and execution."

This proposal urges USAF to take advantage of personnel efficiencies via the use of sensible reachback capability for some products associated with AOC-WS missions, and take steps to consolidate many of its currently operating AOCs. The service should also develop tools allowing the integration of non-kinetic effects, in areas such as cyber and electronic warfare, with kinetic effects—enhancing the toolkit of capabilities air operations can provide commanders to meet operational and strategic goals. Closer collaboration between the military services, other government agencies, and the defense industry is also needed, as well as better alignment of the USAF operations, requirements, programming, and acquisition communities with regards to the AOC-WS' future capabilities and demands.

This proposal alone will not make a next-generation AOC completely ready to meet the challenge of future operations, but is an important step towards preparing this capability to meet future needs.

Introduction

The US Air Force today has 13 air and space operations centers (AOCs) spread across the globe. The personnel manning these sophisticated command and control (C2) hubs ensure the Air Force, together with the air arms of its sister services and international partners, delivers the right effects (via airpower, satellite support, and cyber activity) at the right place and right time in the battlespace.

Some AOCs are forward-based and regionally focused, like the ones in Germany, Qatar, and South Korea. The AOC at Al Udeid AB, Qatar, for example, oversees the US military's air activities in Southwest Asia, including the US-led air campaign against Islamic State forces in Iraq and Syria. Other AOCs work at a global level, such as the one at Scott AFB, Ill. that manages the continuous aerial movement of troops and materiel from the continental United States (CONUS) to points across the Atlantic and Pacific Oceans. Like its airplanes, the Air Force considers the AOC a weapon system (known in the service as the AOC-WS), and carries the designation AN/USQ-163 Falconer.

Advocacy for increased distributed control is of considerable merit, especially given the advanced threat and anti-access/area-denial (A2/AD) environments that US military personnel face and may have to operate in.

From November 2006 to September 2007, I commanded one of these centers, the 613th AOC at JB Pearl Harbor-Hickam, Hawaii, supporting Pacific Air Forces' (PACAF) massive area of responsibility. We operated under the motto, "Ready … Right Effects … Right Time." During my tenure, the uniformed personnel manning the AOC did an outstanding job, as did the industry contractors supporting them. They were the "ace of aces" in my book, staying true to the 613th AOC's namesake, Maj Richard I. Bong, the highest scoring ace in US history. Teaming with the Air Force Forces (AFFOR) staff of PACAF's 13th Air Force, the AOC was a powerful synchronizing enabler for multiple real-world operations, and for many more joint and coalition major exercises, such as Exercise Talisman Saber, Exercise Terminal Fury, and Exercise Yama Sakura.

Today, the AOC-WS is at a crossroads. Parallel to the work of maturing it into a modular capability with open systems architecture are efforts advocating an AOC of tomorrow. The Mitchell Institute for Aerospace Studies' research project, *Command and Control for the Information Age: Beyond the AOC*, is one such activity helping to define that vision. Additionally, the Air Force's Strategic Master Plan of May 2015 established a vector for C2, as it is one of USAF's five core mission areas.[1] The document discusses many of the themes promoted by the Mitchell Institute and by the Defense Advanced Research Projects Agency (DARPA), such as distributed control in the form of distributed battle management.

This advocacy for increased distributed control is of considerable merit, especially given the advanced threat and anti-access/area-denial (A2/AD) environments that US military personnel face and may have to operate in. Unfortunately, the likelihood of significant progress in the near-term—within the next five years, or within the future years defense program (FYDP)—toward an AOC of tomorrow is less than encouraging. This is due to factors like operational demands on these centers, technological issues, and budgetary constraints.

This paper discusses a near-term "flight plan" for the AOC-WS that would allow the Air Force to modernize it despite today's difficult fiscal climate. Doing so would realize the goal articulated in the strategic master plan to "increase C2 agility to permit distribution of control and execution."[2]

AOC Today and Tomorrow

It was Gen John P. Jumper, Air Force Chief of Staff from September 2001 to September 2005, who provided the guidance in 2000 to transform operational C2 of air activities from "a pick-up game" to a weapon system and program of record, during his tenure as head of Air Combat Command (ACC).[3] Because of the phenomenal efforts of AOC Airmen, along with AFFOR and air communications squadron (ACOMS) professionals, few realized the amount of integration work happening behind the scenes back then to fuse around 45 software systems into a weapon system fueling 17 mission threads. This work was so the AOCs could inform and assist the joint force air component commander (JFACC) in planning and executing theater or regional air operations, to influence the conduct of an overall campaign, and achieve objectives.

The current AOC-WS is the senior C2 element of the Air Force's Theater Air Control System

(TACS) and provides operational-level command and control for air, space, and cyberspace activities as well as for joint and combined operations. This includes managing joint theater air and missile defense; time-sensitive targeting; and intelligence, surveillance, and reconnaissance (ISR). The current AOC 10.1 baseline (the initial baseline was AOC 10.0) is a system of systems that contains numerous third-party software applications, many of them a system of systems themselves. Major software systems in the AOC-WS include the Global Command and Control System-Joint (GCCS-J), Theater Battle Management Core Systems-Force Level (TBMCS-FL), Master Air Attack Plan Toolkit (MAAPTK), and Joint Automated Deep Operations Coordination System (JADOCS). In several AOCs with a ballistic missile defense mission, there is also the Command and Control, Battle Management, and Communications (C2BMC) system.

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It is no easy task, but the Air Force kludges these and many other disparate systems together with much systems engineering "sweat" to satisfy mission requirements. They include air operations plan (AOP) development; airspace control plan (ACP) development; area air defense plan (AADP) development; air operations directive (AOD) development; ISR strategy and planning; intelligence preparation of the operational environment; target planning; air tasking order (ATO) development; airspace control order (ACO) development; re planning/re-tasking capability; integrated air and missile defense (IAMD) and homeland security; dynamic targeting and time-sensitive targeting (TST); joint close air support (CAS); combat search and rescue (CSAR); and tactical and operational assessments.

To complicate matters, each of the seven regional AOCs, such as the 613th AOC, have unique mission or coalition requirements that usually entail the use of additional systems. Most notable of these is the Combined Enterprise Regional Information Exchange System (CENTRIXS), a collection of classified coalition networks that enables information sharing through email and web-based instant messaging or chat tools. Some AOCs may also have unique regional or functional software capabilities, many requiring their own enterprise change proposals and/or workaround techniques to the baseline software.

During my time at the 613th AOC, the joint interface control officer (JICO), with responsibility for overseeing and integrating these disparate systems, was my "most valuable player" on most days. On other days, it was the ACOMS team, which ensured systems viability and reliability.

To illustrate the challenges faced in the AOC, I offer an example from later in my career in 2009 to 2010, when I led the effort to develop and build the Afghan Air Force. I remember seeing an old metal Coke bottle top Afghan maintainers had used to cover a bullet hole in one of their Mi-17 helicopters. This type of "patchwork," while ingenious, was no replacement for the original equipment manufacturer (OEM)-certified parts the Afghans needed to meet Western standards for airworthiness. My training and advising team liked to say we were "building the airplane while we were flying it," as the mission didn't stop so we could fix everything. Instead, we needed to bring about fixes as the mission continued.

For years now, this is how the AOC has operated. This is not to say OEM "parts" were not present, but the sense of "patchwork" to achieve the system of systems certainly was. Once the AOC-WS became a program of record, and certainly after the Air Force achieved initial operational capability with it in 2005, there was an aggressive plan to exercise the AOC-WS and "fly it" (i.e., use it) in real-world operations. There certainly was much goodness in showcasing and utilizing this C2 capability. Doing so established trust with the various joint and coalition commands associated with a given exercise or real world operation. However, this also affected how quickly the weapon system could evolve. Unlike an aircraft coming off the schedule to go through depot-level maintenance or upgrades, once theater commanders experienced the C2 capability of the AOC, none of them wished to go to war without it. Hence, upgrades needed to happen concurrently with "flying" this weapon system.

Today, there is ongoing development of the AOC 10.2 system. It is supposed to be a step towards a service-oriented architecture (SOA) that allows for easier access to third-party applications and provides for modular upgrades. As was

the case with AOC 10.1, much of the challenge lies with integrating the third-party applications, transitioning to a "smartphone-like" platform with "dial-up" applications, and synchronizing budgeting priorities and timelines for all the software systems. There is the additional task of ensuring cyber security to meet ever-changing standards as the cyber threat becomes increasingly sophisticated. This is especially difficult given that the United States integrates coalition partners into many exercises and real-world operations.

These are just a few of the hurdles to clear in order to advance the AOC-WS. As such, the Air Force has yet to field AOC 10.2, despite almost a decade passing since work began on it.

Speed Brakes to Progress

There have been numerous factors acting as "speed brakes" in AOC-WS development. First and foremost has been the concurrent development and operation of the weapon system. Similarly to the concurrent development and production challenges that have plagued the F-35 Lightning II program, maturing the AOC-WS from the command and control "pick-up game" it carried out in 2000 has proved every bit as frustrating. Transforming the disparate software into a system of systems took a few years for the baseline AOC 10.0 used in the key nerve centers during Operation Enduring Freedom in Afghanistan (which started in October 2001) and Operation Iraqi Freedom (which began in March 2003).

Transitioning the AOC-WS from the "pick-up game" of C2 software and communications capability to a modular system with open architecture is a daunting task even without operating it simultaneously.

After another three years, the Air Force had the AOC 10.1 baseline available for initial operational use. Development continued for another seven to eight years before the Air Force declared it had the full operational capability for AOC 10.1 in place. However, this capability was not as robust as the service had originally envisioned. AOC 10.2 development began in 2006. While the program has received a number of lifesaving funding measures to keep it alive, the Air Force likely will not field it for another year or two.

From the initial fielding of AOC 10.0, the AOC-WS has been "flying and fighting" at an operations tempo matching many of the Air Force's most in-demand aircraft. JFACCs have not been willing to place their respective AOC into "depot-level" status to allow for easier upgrade. Also, there's been no JFACC willingness to accept an AOC that doesn't have backward compatibility to communicate with other AOCs, which use a different version of the weapon system's architecture. Lack of this compatibility would limit options for continuity of operations (COOP) during times when conditions render an AOC inoperable, a real concern given the capabilities of potential adversaries, such as an electromagnetic pulse (EMP) attack.[4]

Undoubtedly, transitioning the AOC-WS from the "pick-up game" of C2 software and communications capability to a modular system with open architecture is a daunting task even without operating it simultaneously. Exacerbating the situation has been a dynamic, evolving environment where new requirements constantly emerge based on the evolving threat and theater-specific desires. Neither the Air Force nor industry has managed these requirements particularly efficiently or effectively. In a world where new applications come from outside the Air Force, it is difficult to enforce and manage common standards, making integration more burdensome and costly.

There have also been fiscal challenges with AOC-WS advancement that I witnessed from my perch in the AOC, then as ACC's director of requirements, and later as director of programs on the Air Staff. This includes the sequestered budgets that became reality in Fiscal 2014 and Fiscal 2015 under the Budget Control Act (BCA), testing the Air Force leadership's willingness to stay the course with the AOC-WS. Requests for funding AOC-WS development faced hard questioning throughout the program objective memorandum (POM) development process (as did many other programs, especially underperforming ones). Any weapon system that requires any degree of integration programming (which is the case with most if not all Air Force weapons systems) is ripe for cost miscalculations.

AOC 10.2, and 10.1 before it, met many a "firing squad" during budget drills at the core function lead level at ACC and at Air Force headquarters. However, each time, after vigorous questioning, the AOC-WS program survived because

of a concerted effort to restructure the program and, more importantly, because of the criticality of C2. Service officials were determined not to return to the "pick-up game" of yesteryear.

Given the fiscal environment, prioritization of programs for funding is a driving imperative. During the process of assembling the Fiscal 2015 POM, the Air Force senior leadership developed the service's POM position through the use of "strategic trades" sessions, at which officials, in essence, prioritized which programs the service would fund, and identified those it would not fund.[5] Senior civilian and military leadership in the Active Duty and reserve components debated the merits of all investment programs as well as the proposed levels of funding for operations and sustainment.

The Air Force has formalized this process, creating "planning choices" sessions.[6] Command and control systems seem to consistently rank high in the category of programs for which the service would gladly spend more money if the funds were available. While this may be understandable when looking at each program in a vacuum, it is not as effective if the intent is to maintain the US military's advantage of having synchronized, synergized, and informed forces able to operate with greater autonomy and win in the dynamic, demanding scenarios expected in tomorrow's conflicts. If there ever was a force enabler, and a key to maximizing all US air, space, and cyberspace power, C2 capability is it.

A Near Term Flight Plan

A near term AOC-WS flight plan lies somewhere between the recommendations in futuristic studies and the current technological and fiscal reality. I have no doubt regarding the Air Force's vector in this regard—the "call to the future" in Air Force parlance—but all signs indicate this will be an evolutionary process rather than a revolutionary process.[7] I say that with confidence because the Air Forces continues to "fly" the AOC-WS as it works with industry to transition it to a C2 capability greater than the one operating today.

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A first step towards an AOC of tomorrow is to "lean" the centers of personnel while taking advantage of "reachback" capability (i.e., the CONUS-based computer processing and manpower that support forward-based units in near real time via satellite connectivity) and advances in networking and information technology.

During the Fiscal 2013 POM deliberations, Air Force officials developed the idea of a distributed AOC enterprise and recommended it to service senior leadership. This was specifically in response to service-wide manning challenges. The idea was to consolidate production of a number of the AOC mission threads back at an "AOC-Main." This AOC-Main would be located at one or another of the Air Force's communications centers and would push out specific and individualized products to all AOCs in the enterprise, or the "AOC-Forwards," at great capacity.

From my perspective as an AOC commander, acting JFACC for numerous coalition exercises, and deputy commander for operations of a geographic combatant command staff, having precise ATO, ACO, special instructions (SPINS), and other products to orchestrate an effective air operations plan were the keys to overall success. Where these products came from was not. What mattered most was the relationship between the JFACC and the campaign commander as well as their component peers, and between the JFACC and their strategy and assessment team. Not to discount the importance of all mission threads provided by the AOC-WS capability, but the Air Force no longer requires a large footprint of personnel assigned specifically for the C2 of airpower at each of its 13 AOCs.

There was also discussion on the consolidation of a number of the AOCs, like the Air Force did in October 2011 with the 603rd AOC and 617th AOC in US European Command (the Ramstein AB, Germany-based 603rd AOC supports both EUCOM and AFRICOM operations). Undoubtedly, many variables come into play when considering consolidation, such as command authorities, coalition partnerships and agreements, reserve component manning, and congressional sensitivities. With open dialogue and transparent engagement, the Air Force can overcome these issues. From a programmatic/budget perspective, it must resolve them, or it risks losing other combat capabilities.

Air Force senior leadership agreed in principle to the consolidation of some of the mission threads

to an AOC-Main, and the service incorporated a manpower reduction of close to several hundred personnel in the Fiscal 2013 POM. This came after service officials used initial savings to ensure AOC-WS manning was at the "norm" for weapon systems across the Air Force. However, for various reasons, this decision did not hold and the Air Force returned the manpower to the individual AOCs.

I believe the AOC-Main concept remains a viable option and one the Air Force may be wise to reconsider. Whether it is called a "distributed AOC enterprise" or a concept I have heard called a "federation of AOCs" does not matter. What does count is to take the leap of faith, embrace the reachback capability that makes operational sense, and lessen the footprint of personnel within forward-located AOCs. This may also create space within the AOCs for growth in the number of joint personnel, should the Air Force have opportunities for joint task force (JTF) command and need to use an AOC as a headquarters. This was the case for JTF-Support Forces Antarctica (JTF-SFA), with the 13th Air Force commander serving as the task force commander, overseeing the US military's support of US scientific research on the southernmost continent—also known as Operation Deep Freeze.

The nature of air operations plans has changed dramatically since the successful Operation Desert Storm air campaign in Iraq in 1991. So, too, have the environment and domains in which the Air Force operates.

The ongoing effort to ensure COOP capability for each of the AOCs should facilitate the consolidation of production of some of the key mission thread products and the continued consideration of AOC consolidation, in general. Unfortunately, "consolidation" has a negative connotation with many in the Air Force. This is about smart business, though, and allowing for a more resilient weapon system made up of a "team of teams" that takes advantage of the disparate digital and common mission control nodes evolving with the maturation of remote piloted aircraft (RPAs).[8] I believe this would be in line with the guidance for "flatter, more agile organizations" discussed in the service's strategic master plan.[9]

As previously stated, the JFACC has a key relationship with their strategy and assessment team. But there are times when circumstances dictate the JFACC's engagement and require the commander's attention in a timely manner. This includes strategic threats, such as ballistic missiles and rogue terrorists' airborne threats as well as tactical events that become strategic in nature and quickly attract worldwide media attention. Because the JFACC's primary attention is given to planning and engagement with their commander and peer component commanders on a daily basis, there needs to be a tool allowing them to assess the situation quickly and provide information and guidance. The viewing instrument for such assessment should be not only adaptable to the JFACC's needs, but also be agile and mobile, and be equipped with the cyber security tools to afford timely JFACC situational awareness and engagement. Such tools would be invaluable especially during scenarios requiring execution of a COOP plan.

Agility such as this is critical for the AOC of tomorrow. The nature of air operations plans has changed dramatically since the successful Operation Desert Storm air campaign in Iraq in 1991. So, too, have the environment and domains in which the Air Force operates. The large-force employment (LFE) packages of aircraft developed in the AOC's predecessor, the Tactical Air Control Center (TACC), have given way to complex, networked operations conducted in the air, space, and cyberspace domains for a localized and immediate effect against what is most likely a mobile threat or target. The intent of that effect is to achieve operational or strategic advantage.

RPAs, which have proliferated in combat operations since the terror attacks of September 11, 2001, are now prevalent and have become integral to air operations plans and execution. The JFACC today, while having less capacity to draw upon compared to what was available during Desert Storm, has a tremendous amount of mission flexibility with many of the platforms, including the ability to re-task them dynamically during a sortie. Strike aircraft of yesteryear have given way to attack platforms with tremendous ISR and C2 capability. RPAs, originally dedicated ISR assets, now have great strike capability. Traditional mobility aircraft are even employing munitions.

Developing non-kinetic effects, such as in the areas of cyber and electronic warfare, enhances the toolkit of capabilities air operations can offer the warfighting commander to meet operational and strategic goals. Operational planning must evolve

given this agility and the nature of the combat environment. With the continued maturation of non-kinetic effects, a requirement exists to develop software systems that integrate them with kinetic fires within mission planning, execution, and assessment. These tools must be easy for the operator to understand and use to ensure timely execution in the dynamic battlespace.

Dynamic air tasking traditionally has come through airborne C2 platforms from the combat operations floor of an AOC. In the future, the Air Force cannot assume there will be assured voice communications; other avenues of centralized common command and control that make use of the joint aerial layer network may be a key to mission success.[10] This may also allow for an increased reduction in the forward presence of AOC personnel while making use of common mission control centers that have evolved along with RPA proliferation.

A silver lining of a BCA-driven fiscal environment should be a trend towards closer collaboration between the services and other government agencies, and between the services and industry. This holds the promise of maximizing research and development dollars and capabilities. The jury is still out on whether such collaboration is happening. If not, all must work harder to make it so, and then to help improve this cooperation to the maximum extent possible within appropriate authorities and federal acquisition regulations.

The AOC-WS needs to become lean, agile, and resilient to complicate any enemy's attempt to target it.

The same is true within the services with respect to collaboration and coordination between the requirements community and programmers. Having an ongoing dialogue between them should be the norm. However, indications are this may not be the case today at all levels with respect to the AOC-WS.

While acquisition professionals are the experts on program management, it is the experienced operators providing key performance parameters of the requirements who should have visibility and a means to provide input throughout the development process. This becomes especially important with weapon systems featuring requirements largely defined by information technology. Keeping the AOC-WS on a positive flight plan requires prioritized, realistic, and viable threshold and objective requirements that the Air Force defines and consistently communicates to industry.

Next-Gen AOC

Through consolidation of production and the actual number of AOCs, the Air Force could use efficiencies in manpower in part to ensure higher levels of combat readiness with respect to the personnel in the remaining AOCs. While those moves alone will not make a next-generation AOC ready with the right effects at the right place and the right time to meet the demands of air operations in any environment, they are important initial steps.

Being right-sized and taking advantage of sensible reachback capability should provide both a reduced forward footprint and a recurring programmatic advantage. Follow-on steps should see a next-gen AOC structured in such a way to evolve as technology allows through agile development methodologies and continuous integration via modular upgrades with automated testing approaches.

This approach would be "easy done hard," to quote Michael Wynne, Air Force Secretary from November 2005 to June 2008.[11] It will take the commitment of Air Force senior leadership to accept properly sizing the manpower contingents at the forward AOCs and to trust the production capability of the next generation of "ace of aces" in the AOC-Main facilities or provided through other common mission control nodes.[12] It will also require the continued evolvement of those other centralized common C2 capabilities given that the network-centric nature of space, cyber, and RPA operations is becoming the norm in nearly all operations. This approach is in line with the "strategic agility and adaptability principles" that William LaPlante, then Air Force acquisition executive, explained to Congress in April 2015.[13] LaPlante said the service was emphasizing these principles in its acquisition practices in order to field new systems more rapidly and build resiliency in them.

The AOC-WS needs to become lean, agile, and resilient to complicate any enemy's attempt to target it. As a start, and similar to what happened with AOC 10.1, the Air Force needs to "close" on AOC 10.2 and potentially accept more capability in the weapon system, albeit less than what was originally promised. This means committing to its fielding and to execute this plan accordingly. Then

the Air Force can pursue modernization through sustainment as they have advertised a desire to do, using an open, service-oriented architecture with increased agility in the development by using modular upgrades.

In this fiscally constrained environment, and the many Air Force programs in need of modernization, it is critical to develop innovative methods and contract vehicles with a proven vendor. The Air Force should attempt to select an industry partner with the ability and experience to transform legacy systems into flexible, scalable, vendor-agnostic, and secure capabilities. This may allow for modernization of the AOC-WS through sustainment, a crucial factor since this weapon system will need to continue to "fly" during development of its next iteration. Because of this, I cannot overstate the importance of the AOC-WS "sustainment and technical refresh and modification" model under consideration given dynamically evolving threats and potential conflicts our forces could find themselves in.

Summary

The idea of C2 beyond the AOC is a great "call to the future," but the Air Force is not yet in the position to make that leap of faith. Indeed, there remain impediments to achieving a revolutionary change in how the Air Force conducts the C2 of airpower. These include assured access to funding in the current austere fiscal environment, not yet fielding the baseline for the core system of systems, despite nearly a decade of development, and not having reached the technology readiness level required to fully exploit distributed control and distributed battle management concepts.

Centralized command from an AOC-WS or like capability … has been the cornerstone of a dominant Air Force for the past quarter of a century.

The AOC-WS is at a crossroads. Centralized command from an AOC-WS or like capability, with decentralized execution by those forward-based Airmen at the tip of the spear, has been the cornerstone of a dominant Air Force for the past quarter of a century. Most, if not all, Air Force aircraft weapon systems rely on hardware and software upgrades to respond to potential threats, or are retired in favor of new ones. The same approach is required for the AOC-WS.

An upgrade to the baseline is in progress, but a concerted push is required to field it sooner than projected and then transition to a process where the Air Force can attack some modernization of the AOC-WS through sustainment. The operating environment is becoming increasingly complex and the C2 backbone must evolve to remain ahead of vulnerabilities. If it lags behind, it risks becoming irrelevant.

The drive toward centralized command, distributed control, and decentralized execution using a flatter, more agile "federation" of AOCs is a worthwhile endeavor. In fact, it is an operational imperative.

The success of the AOC-WS has been undeniable when evaluated against air operations since 1990. I believe the Air Force has achieved Jumper's vision, but not without much "patchwork" and workarounds. For the AOC-WS to remain relevant in the information age, it will take the commitment of service senior leadership to embrace a more realistic, near term flight plan. It will also require the defense industry to deliver capability in a timely manner. If these efforts are successful, it will help the Air Force realize its call to the future.

Footnotes

1 Department of the Air Force, "USAF Strategic Master Plan," May 2015, http://www.af.mil/Portals/1/documents/af%20events/2015/Strategic_Master_Plan.pdf, accessed on Jan. 12, 2016. Along with command and control, the Air Force's core mission areas are: air and space superiority; intelligence, surveillance, and reconnaissance; rapid global mobility; and global strike.

2 "USAF Strategic Master Plan," 47.

3 "Pick-up game" is a phrase I heard General Jumper use multiple times in person when discussing operational command and control of airpower.

4 Electromagnetic pulse attack is a high-intensity burst of electromagnetic energy caused by the rapid acceleration of charged particles. Scientists believe this type of energy burst would render electronic devices and the electronic power grid inoperable unless they were hardened to survive such an event. One EMP attack scenario is the detonation of a nuclear bomb in the upper echelons of the atmosphere over an adversary's territory.

5 The Air Force designed the "strategic trades" process for the Fiscal 2015 program objective memorandum deliberations. This gave senior leadership visibility into all classified and unclassified investment as well as all operations and sustainment funding across the Fiscal 2015 future years defense program.

6 "USAF Strategic Master Plan," 10.

7 See: Department of the Air Force, "America's Air Force: A Call to the Future," July 2014.

8 Gen Stanley McCrystal, USA (Ret.), Team of Teams: New Rules of Engagement for a Complex World (Portfolio: New York, 2015). McCrystal discusses the strength of combining the adaptability, agility, and cohesion of a small team with the power and resources of a giant organization.

9 "USAF Strategic Master Plan," 17.

10 George I. Seffers, "Joint Aerial Layer Network Vision Moves Toward Reality," Signal, no. 6 (2013), http://www.afcea.org/content/?q=node/11123/, accessed on Jan. 12, 2016. The JALN concept connects disparate networks to provide greater information to troops at tactical levels.

11 I heard Secretary Wynne use this phrase on multiple occasions.

12 I propose an increase in the percentage of AOC-WS manning as measured against an adjusted unit manning document (UMD). Current manning in the AOCs is well below 100 percent.

13 Assistant Secretary of the Air Force for Acquisition William A. LaPlante, testimony before the Senate Armed Services Committee's readiness and management support panel, April 22, 2015.

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The Mitchell Institute educates the general public about aerospace power's contribution to America's global interests, informs policy and budget deliberations, and cultivates the next generation of thought leaders to exploit the advantages of operating in air, space and cyberspace.

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