STRATEGY RESEARCH PROJECT

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FUTURE COMMAND AND CONTROL OF AEROSPACE OPERATIONS

BY

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ABSTRACT

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The system of controlling air operations has improved in effectiveness and efficiency with every air campaign since its inception in World War II. The Aerospace Operations Center (AOC) is the command and control element responsible for planning and executing air power. The AOC has matured into a large system capable of planning and executing a major theater air campaign as demonstrated in Operation Desert Storm. However, a challenge to this massive AOC model is a lack of resources. The keen competition for reduced military resources and the growth in information technology point to a necessary change in the AOC model.

The Air Force solution is a modest AOC-forward concentrating on reach back to a theater-based AOC and/or a CONUS-based AOC. This course of action is adequate, feasible, and acceptable to support the probable joint task force executing a contingency tasking. However, the reduced AOC-forward will not be acceptable to the Joint Forces Commander without demonstrating that the Joint Forces Air Component Commander can lead an air campaign while relying on reach back operations. The theater- and CONUS-based AOCs are therefore challenged with improving reach back through exercises, experiments, and after action air campaign reports.

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PREFACE

As a career space and missile officer, the AOC subject area has been a personal and professional focus of mine for the past 12 years. My interest in AOCs was whet by the Squadron Officer School scenario Balboa that I facilitated seven times as an instructor. I also had the opportunity to learn more about the operational level of controlling air operations while attending Air Command and Staff College. However, it was between 1998 and 2000 that I extensively honed my practical knowledge of AOCs while commanding a squadron for 26 months that operated and maintained an AOC.

This paper focuses on the strategic and operational issues affecting centralized control of aerospace operations and refrains from delving into the tactical details of the air tasking orders. The term aerospace is used fluidly to reflect the emphasis that the aerospace medium is a continuum from directly above the ground, through the earth's atmosphere, and into space. In essence, all efforts to command and control aerospace operations apply to aircraft and spacecraft. Additionally, the military has competing acronyms for centers that are charged with the responsibility of controlling aerospace operations (i.e., Joint AOC (JAOC), Combined AOC (CAOC)). For consistency, this paper uses the AOC terminology, but recognizes that each AOC has unique characteristics in order to fulfill its mission.

FUTURE COMMAND AND CONTROL OF AEROSPACE OPERATIONS

Today's aerospace operations command and control (C2) system consists of an organization that can easily require over one thousand people operating an intricate command, control, communications, computer, intelligence, surveillance, and reconnaissance (C4ISR) architecture. This C2 system is commonly housed in an Aerospace Operations Center (AOC). The evolution of AOCs depicts military operations that yielded useful aerospace control lessons. Air campaigns over the last 60 years highlight significant trends in warfare: world wars, nuclear wars, major theater wars, and now the more common small-scale contingencies (SSC). The lessons learned from each major conflict rationally leads into a review of contemporary AOCs. The AOC as a system of controlling aerospace operations has made a lot of progress since WWII. However, it's also valuable to look at the recent progress of individual AOCs. Though looking at today's AOCs is a snapshot in time, it does provide a strong basis for assessing the future AOC model. Specifically, the AOC model for 2020 is a limited AOC-forward with reach back to a theater- and/or CONUS-based AOC. To help determine if this future model is viable, a review of the estimated strategic environment, military initiatives, and growth in technology is needed. We'll begin with a historical review of air campaigns.

THE EVOLUTION OF CONTROLLING AEROSPACE POWER

This evolutionary trek begins with WWII, 25 years after Americans first flew combat missions in WWI. The brief review of selected military conflicts through Operation Allied Force identifies the key attributes that helped develop today's AOC.

WORLD WAR II, KOREA, VIETNAM

During WWII, both Axis and Allied Forces for the first time employed airplanes as weapon systems to decisively turn the tide of ground battles. As a result, WW II produced enduring principles for controlling strategic air assets. Specifically, U.S. Army Air Corps officers insisted throughout WWII that air leaders control air forces so that air power could remain consolidated to strike decisively. Ground commanders adamantly disagreed that air units should be assigned directly to them to provide undivided close air support.[1] Many successes, like that of General Doolittle's Twelfth Air Force in North Africa drove an immediate change to doctrine concerning air employment. The 1943 issue of Army Field Manual 100-20 included: "...control of available air power must be centralized and command must be exercised through the air forces commander if this inherent flexibility and ability to deliver a decisive blow are to be fully

exploited."[2] Control of aerospace assets continues today through the Joint Forces Air Component Commander (JFACC).

The European Theater also produced the beginnings of our tactical air control system. For example, Lieutenant General Vandenberg and his Ninth Air Force established an air-ground team to provide essential air support for General Bradley's 12th Army Group. General Vandenberg committed air and ground liaisons to ensure daily tactical air operations were synchronized and prioritized to maximize the overall ground effort.[3]

Inter-service rivalry for controlling air power gained momentum when the Air Force was established as a separate service as a result of the National Security Act of 1947. Between the end of WWII and the Korean war, each service matured its own air assets primarily to advance their force protection rather than develop additional strategic air forces.[4] When U.S. forces were employed to defend South Korea, General MacArthur recognized the need to centrally coordinate airborne assets. Lieutenant General Stratemeyer was named the commander of Far East Air Forces, or JFACC in today's terms, and given the coordination control over Navy and Marine air missions when they were operating over Korea.[5] Additionally, the Air Force received increasing criticism about inadequate close air support during the Korean War and therefore reestablished Tactical Air Command.[6] Through the 1950s, Tactical Air Command would refocus airmen on tactical operations to include improvements for aerospace control.

Over the ten years of U.S. involvement in Vietnam, the Seventh Air Force (7 AF) developed the tactical air control system (TACS) which grew into three Tactical Air Control Centers (TACC).[7] General Momyer's 7 AF operated a TACC and a command center out of Tan Son Nhut Air Base near Saigon. The TACC executed and assessed "today's war" while the command center planned "tomorrow's war." The third TACC was located in Thailand controlling air strikes in Laos and acting as the alternate command center.[8] This massive system made managing and leading air operations difficult, but the system was too complex to correct before the war ended. The Air Force recognized the solution and dedicated the 1970s and 1980s toward combining the three centers into one in order to streamline the organization. Additionally, the constraint of geographically separating the strike effort between the Navy and Air Force hindered interdiction results. The complex C2 of B-52s resulted in inefficient, decentralized taskings since scheduling B-52 strikes required constant coordination with Strategic Air Command, COMUSMACV, and 7 AF.[9]

To summarize, the air campaigns of WWII, Korea, and Vietnam enhanced aerospace control in several areas. First, each war reinforced the need for centralized command and

control of joint and combined air operations with a JFACC. Second, close coordination with the land, maritime, and special operations component commanders is required to ensure synchronized operations to accomplish the Joint Force Commander's (JFC) objectives. Third, elements for controlling aerospace operations (i.e., planning and execution) should be collocated with a streamlined organization rather than the duplicate centers we saw in Vietnam.

OPERATIONS JUST CAUSE, DESERT SHIELD/STORM, ALLIED FORCE

Operation Just Cause provides an example of an SSC in which the theater AOC faced difficulties in monitoring the current air picture. For operations security, personnel planning and executing air operations were limited to those forward deployed of which many were unfamiliar with AOC systems.[10] A lesson learned for future SSCs is to not underestimate the need for trained AOC personnel. In this case, Twelfth Air Force had, and continues to have today, an AOC dedicated to supporting contingencies in U.S. Southern Command's area of responsibility. Another lesson for AOCs supporting SSCs is to take required equipment in-theater so the JFACC can oversee and dynamically re-task aerospace execution. Additionally, Just Cause shows that the AOC for a JTF must be quickly activated, deployable, with a small-footprint, but not at the sacrifice of mission effectiveness.

From Operation Desert Shield/Storm, we witnessed an AOC expand into a 1500 to 2000-person system to plan and execute the air campaign.[11] Lessons were learned from the interoperability deficiencies and inability to parse the immense daily ATO into what applied to each flying unit.[12] Additionally, Navy and Marine Corps contentions with respect to control of aircraft were addressed and documented in joint doctrine following Desert Storm. Specifically, the fact that the JFACC had tactical control over the military forces made available for tasking.[13] The joint air campaign of Desert Storm demonstrated the powerful results of synchronizing service aerospace power to devastate an enemy's warfighting effort. At the same time, planning and executing a massive, prolonged air campaign required extensive manpower because integrated planning tools were not yet available.

At the conclusion of Operation Desert Storm, no-fly-zones (NFZ) were established. Iraq continues to aggressively challenge these boundaries in the north and south. Therefore, Joint Task Force Southwest Asia (JTF-SWA), a multi-service, multinational coalition, has been engaged in Operations Northern and Southern Watch for over 10 years.[14] JTF-SWA will remain until Iraq complies with cease-fire provisions and UN sanctions. These standing, in-theater AOCs supporting JTFs of extended duration will be the standard into the foreseeable future.

Operation Allied Force is the most recent air campaign supporting a JTF to draw lessons from. The NATO-operated AOC fulfilled the mission, however many lessons are reported in the year-long Air Force study entitled Air War Over Serbia (AWOS). Specifically, the AOC was inadequately staffed and many of those augmenting the AOC were not properly trained in C2 requirements.[15] The different U.S. and NATO rules of engagement also detracted from the overall effectiveness of AOC planning efforts. The AWOS report also highlights the difficulty in developing separate ATOs for U.S. and NATO forces due to releasability restraints.[16] This is an issue we continue to struggle with in today's AOC.

To summarize, this review of the 1980 - 2000 era of air campaigns also produced lessons for aerospace control. First, the AOC needs to be quickly activated and flexible enough to support a JTF. Included in this lesson, the JTF should take forward AOC-trained personnel and equipment that is capable of depicting the current air picture or common operating picture. Second, we must document common understanding of roles and responsibilities in joint doctrine and rely on the JFC to provide any further clarification. Third, the AOC must ensure the tasked air units of different services and different countries receive the task order with enough time to plan their mission. With the advent of web-based technology, these lessons have been corrected in today's AOC.

CONTROLLING AEROSPACE OPERATIONS TODAY

These lessons learned from air campaigns of past wars, major regional conflicts, and recent JTFs lead into a brief study of today's command and control processes for aerospace operations. This next section reviews the standard AOC requirements as directed by joint and Air Force doctrine. Additionally, this section looks at specific AOCs and their continuous efforts to improve operations.

STANDARD AOC REQUIREMENTS

Today's AOC comes in a variety of names, locations, sizes, and specific missions. However different each AOC is, they are all responsible for planning and executing aerospace operations for a defined AOR. Joint and Air Force doctrine help ensure the AOC retains a common operational mission, basic objectives, and a fundamental organization.

We'll start with joint doctrine since it provides the overarching guidance on how the services fly and fight. Joint doctrine steers the CINC to appoint a JFACC when the U.S. is conducting joint air operations. The AOC is charged with enabling the JFACC to plan, monitor, execute and assess the air campaign. Joint doctrine enumerates eight JFACC responsibilities,

however, three of these responsibilities are more closely related to the AOC and its processes. First, the JFACC must develop the joint air operations plan (JAOP) to support the JFC objectives.[17] The JFACC relies on the AOC's Combat Plans Division to develop the JAOP for each operation. The JFACC is also responsible for controlling the execution of joint operations and depends on the AOC's Combat Operations Division to monitor the aerospace picture and recommend dynamic re-tasking, when required.[18] Another duty assigned to the JFACC requires close coordination of joint air operations with other component commanders.[19] Component liaisons attend reoccurring Combat Plans meetings to update the Master Aerospace Attack Plan from which the daily tasking orders are derived.[20] The basic organization structure of an AOC consists of the Combat Plans Division planning the next two days' ATOs (24- to 72-hours) and the Combat Operations Division executing today's ATO. Other divisions include: the Strategy Division looking beyond 72-hours, an Air Mobility Division ensuring effective coordination with U.S. Transportation Command, and an Intelligence Surveillance and Reconnaissance (ISR) Division providing intelligence preparation of the battle space. Additionally, the Air Force is considering grouping much of A4 (Logistics and Maintenance) and A6 (Communications and Computers) under a Combat Support Division charged with maintaining the AOC architecture. Now let's see how Air Force doctrine complements joint doctrine with respect to AOCs.

Airmen are taught that centralized planning, direction, control, and coordination of aerospace operations is conducted within the AOC to support the Commander for Air Force Forces or COMAFFOR. When conducting joint air operations, there will always be a COMAFFOR and a JFACC and in many operations they will be the same commander. According to the AFFOR Concept of Operations, the desired goal for an AFFOR is to integrate a "comprehensive, global support capability, and provide essential unity of command in the full presentation of USAF forces to the JFC."[21] Based on that concept, COMAFFOR is assigned a multi-disciplined operational staff organized as a Numbered Air Force (NAF). The previous historical review of aerospace operations highlighted NAFs as the combat commands of the Air Force (i.e., 7 AF in Vietnam). The Air Force continues to organize operational-level commands as NAFs with AOCs attached. A review of selected NAFs and their associated AOC reinforces this basic responsibility.

Seventh Air Force operates the TACC in Seoul, South Korea. This TACC ensures air forces within Combined Forces Command are ready to respond to a North Korean invasion. Eighth Air Force (8 AF) at Barksdale AFB, Louisiana operates an AOC providing support for U.S. Joint Forces Command and U.S. Strategic Command. Ninth Air Force (9 AF) at Shaw AFB, South Carolina operates and maintains an AOC to prepare for USCENTCOM

contingencies. The Combined Air Operations Center (CAOC) in Riyadh, Saudi Arabia is operated by the 9th Aerospace Expeditionary Task Force (AESTF), 9 AF's forward element. This CAOC supports JTF-SWA by planning and executing flying missions to monitor the southern NFZs thereby enhancing regional security. And finally, Sixteenth Air Force (16 AF) operated the CAOC in Vicenza, Italy for Operation Allied Force with augmentation from Third Air Force (3 AF) and 32 Air Operations Group at Ramstein AB Germany.

In addition to the traditional AOCs, there are two CONUS-based centers that operate 24-hours a day, 365-days a year providing C2 for airlift and space assets. The Tanker Airlift Control Center at Scott AFB, Illinois tasks, schedules, executes, and recovers hundreds of worldwide missions daily on behalf of USTRANSCOM.[22] Fourteenth Air Force (14 AF) with headquarters at Vandenberg AFB, California operates an AOC to manage, integrate, and direct Air Force space forces to support theater forces using a daily Space Tasking Order.[23] Each AOC interacts with both of these centers through liaisons to integrate and synchronize airlift and space operations to maximize the effect of aerospace operations. Therefore, today's AOCs must continue to progress to improve aerospace operations for the COMAFFOR/JFACC.

IMPROVING AEROSPACE OPERATIONS

The Air Force is continually updating the processes of the AOC to ensure improvement from one military operation to the next. There has been a lot of progress in standardizing and employing the AOC since 1998 when the Aerospace Command and Control Intelligence Surveillance and Reconnaissance Center (AC2ISRC) was established. The most dynamic advancement has been the declaration of the AOC as a weapon system in September 2000.[24] This means the Air Force created a funding line and program element manager on the Air Staff to manage the organization, training, and equipping the AOCs. This was an important but difficult step for the budget-constrained Air Force that is more familiar with funding traditional, tangible, air-breathing weapon systems and their munitions.

At Langley AFB, Virginia the Air Force's Materiel Command and Air Combat Command teamed up to build an experimental center known as, CAOC-X. The Air Force officially inaugurated CAOC-X in October 2000. This new center integrates a team of acquisition, operations, and testing professionals to rapidly develop the future, standard AOC.[25] Today's AOCs are beginning to employ a new C4ISR architecture called Theater Battle Management Core Systems (TBMCS). Though a major step ahead, TBMCS is limited by AOR-specific databases. As a result of TBMCS limitations, one of the first goals for CAOC-X is to make sharing information easier through secure web sites. Additionally, right sizing the AOC to

support the spectrum of conflict is another emphasis. As discussed previously, past AOCs required thousands of airmen to deploy. It's estimated this could eventually be cut to fewer than 500 by automating jobs and reaching back for support.[26]

In December 2000, Pacific Air Force (PACAF) announced recent AOC-related changes that affect four Air Force bases in their theater. Most notably, PACAF created a deployable AOC and moved their Tanker and Airlift Control Element from Kadena Air Base, Japan to Yokota Air Base, Japan to be collocated with the C-130H aircraft.[27] As AOCs around the globe continue to change to stay relevant, the C2 Warrior School instructors at Hurlburt AFB, Florida strive to provide relevant training to over 1000 AOC operators and senior leaders a year.

By June 2001, information operations missions add another progressive change for aerospace control. The 1999 Unified Command Plan has given USCINCSPACE the information warfare missions of Computer Network Defense and Computer Network Attack (CND/CNA).[28] As a result, the Air Force is preparing AOCs to plan for CND/CNA missions at the operational level as they add a 24-person Information Warfare Flight to most AOCs. All of these progressive changes help move command and control of aerospace operations into the future.

PROJECTING C2 OF AEROSPACE POWER INTO THE FUTURE

The previous analysis of history and progress of aerospace control provides key characteristics for the AOC that will be viable in the year 2020. This final section estimates the strategic environment including projected threats, growth of information technology (IT), and military initiatives. Based on the predicted environment, this research concludes with an assessment of the limited AOC-forward model that relies on reach back operations.

ESTIMATE OF THE STRATEGIC ENVIRONMENT

The National Security Strategy outlines the strategic environment and explains how the military instrument of power is employed to enhance America's security, to bolster America's economic prosperity, and to promote democracy and human rights abroad.[29] Comparatively, our national military objectives of promoting peace and stability and when necessary defeating our adversaries[30] should remain consistent through 2020 even with the Quadrennial Defense Review for 2001. As we reviewed lessons learned from the 1980s, it's increasingly conspicuous that American Presidents are willing to employ aerospace force (i.e., air strikes) to accomplish strategic effects whether alone or in concert with other military forces. Therefore, it should be expected when the military instrument of power is employed that aerospace control is also necessary.

As our conflict-prone world continues into the year 2020, many expect the U.S. military will continue responding at a high operations tempo to border-state conflicts, internal conflicts, and humanitarian assistance, while always being ready for a major theater war. In response to most conflicts, military intervention will still be preferred as a coalition member under United Nations (UN) or North Atlantic Treaty Organization (NATO) legitimacy. For that reason, dealing with interoperability and releasability issues continues to be an initiative for AOCs by exercising aerospace operations with foreign allies.

Estimating the capabilities of our probable adversary in 2020 helps identify what type of aerospace forces may be employed to counter that enemy. Many futurists postulate the rise of an aggressive peer competitor is unlikely in the next 20 years.[31] Instead of one rival country threatening our national security, it's possible the adversary could be a transnational group with decentralized leadership and therefore more difficult to identify and confront. Hence, AOCs need to remain focused on current trends that influence the international security of their AOR. More specifically, AOCs should look for potential flash points as a result of natural resource disputes, political unrest, depressed economies, organized crime, and terrorism.[32]

Today, international terrorist networks are tapping into the IT explosion to advance their causes.[33] By 2020, it's plausible we would be contending with asymmetric attacks like a computer virus that disrupts communication, transportation, or even financial nodes to dissuade the U.S. from intervening in world affairs.[34] As a result, we need to protect these essential systems. Our AOC model with heavy emphasis on reach back should be flexible to respond to asymmetric attacks. When discussing essential U.S. systems we typically look to the tangible ground-based systems, but we should also look toward space. The sanctuary of space that all countries enjoy today could be challenged by an adversary's advanced satellite tracking and counterspace technologies like jamming and lasers. Additionally, space planes and space maneuver vehicles are on the horizon and will require aerospace control. The AOCs are therefore challenged with improving the effectiveness and efficiency of reach back through exercises and experiments.

Joint Vision 2020 tasks the services to prepare U.S. forces to deal with these 21st Century challenges and the AOC-forward must complement that direction.[35] The Expeditionary Air Force (EAF) proactively addresses these same challenges as it recognizes the tendency to employ aerospace power over sustained periods to support the warfighting CINCs. U.S. forces prove every day they are capable of handling these challenges. Specifically, each command participates in extensive exercises throughout the year that test readiness and hone established

procedures. Military experiments with cutting technology also improve effectiveness and efficiency by assessing, modifying, and improving our aerospace capabilities.

The Air Force has dedicated three years of experimentation reviewing aerospace operations initiatives. The results of Joint Expeditionary Force Experiment (JEFX) 1999 provided the necessary support to spirally develop systems within the AOC like space integration, interoperability with U.S. services and combined forces, web-based technology, and collaborative tools.[36] Demonstrating reach back has been an initiative of JEFX 1999 and 2000. Reach back operations allows the AOC to deploy forward with the smallest possible footprint. A small footprint ensures our expeditionary force gets lighter and leaner, but we can't sacrifice combat capability for size. Other JEFX 2000 initiatives that leveraged AOC reach back included integrating C2 of future space-based systems, fusing timely weather data for mission planners, reducing mapping and imagery delivery from days to hours, and providing chemical and biological emergency medical response data from medics to commanders thereby assisting force redeployment considerations.[37] Other initiatives focused on inter-service coordination, such as improving air mobility by re-targeting an airdrop while it was airborne, synchronizing the air campaign with the ground campaign through a Battlefield Coordination Detachment within the AOC, and dynamically re-targeting strike aircraft and artillery.[38]

Both JEFX 1999 and 2000, successfully demonstrated reach back operations from the AOC-forward at Nellis AFB, Nevada to the CONUS-based AOC located at Hurlburt Field, Florida nearly 1700 miles away. All these efforts indicate the Air Force is committed to properly equipping the AOC of the future and helping reassure the warfighting CINCs, JFCs, and JFACCs the AOC is already dealing with future challenges. After reviewing the strategic environment, growth of information technology, and Air Force initiatives, it's now appropriate to assess the AOC-forward model that relies on reach back operations to a theater- and CONUS-based AOC.

ASSESSING THE FUTURE AOC MODEL

The lessons described in the historical review and analysis of today's AOCs in this research paper provide assessment criteria for the AOC-forward model. Specifically, the AOC-forward must be quickly activated, be capable of supporting extended operations, be interoperable with joint/combined forces, sustain a small forward presence, and be flexible to meet the JFACC's needs. Additionally, the AOC-forward should be survivable through redundant communications to the theater- and CONUS-based AOCs. A further discussion of reach back operations through collaborative tools helps validate the AOC-forward model.

Reach back offers electronically linked support for the unanticipated requirements.[39] More specifically, a CONUS-based subject matter expert can readily review plans and offer solutions without deploying. The reach back architecture also provides standardization between AOC databases. Standardization improves operator proficiency as operators with AOC experience move from one AOC to another AOC throughout their military career. Moreover, this standardization effort receives praise from instructors at the C2 Warrior School because they are able to maximize student training by teaching a common AOC curriculum for all ranks.

Reach back also assures a smaller footprint of personnel and equipment in the AOR. A smaller footprint logically leads to a more deployable and survivable AOC that complements the Air Force's quick response and expeditionary force characteristics. One estimate shows the future AOC-forward's personnel strength could be 50 percent less than today's deployed AOC. Current efforts are underway to estimate and validate the AOC size based on the number of flying missions it will support. In most cases, the number of missions relates to the type of military mission. For example, the number of missions increases from non-combatant evacuation operations (NEO), to humanitarian assistance (HA), to SSCs, and reaches its maximum with MTWs. Correspondingly, it's estimated the size of the AOC-forward will increase as the mission moves across the spectrum of conflict thereby allowing the AOC to be tailored for each mission. This effort supports the AOC criterion for flexibility.

One Air Combat Command model estimates that an AOC supporting 300 missions or initial response package (IRP) would need 175 people to operate the AOC-forward, 300 people to plan a 500-mission operation or quick response package (QRP), 500 people to plan a 1000-mission operation or limited response package (LRP), and 700 people to plan an operation with 2000 missions or total response package (TRP).[40] Not every NAF concurs with these drastic manpower savings. One NAF recounts much higher AOC requirements: a QRP requires 579 people, an LRP needs 1196 people, a TRP requires 1561. Additionally, this NAF estimates another 100 liaisons if dealing with joint and coalition forces.[41] Further exercises and experiments with reach back operations will help validate or refute personnel requirements for the AOC-forward.

Another important factor of reach back operations is to reassure the JFC and JFACC that though the theater- and CONUS-based AOCs are out of sight, they are still in the fight and can respond with a sense of urgency. The supporting AOC directors at theater- and CONUS-based AOCs must therefore ensure their operations are synchronized with the JFACC's battle rhythm.

Reach back operations also help mitigate interoperability problems. Interoperable taskings to joint and combined forces have been successfully demonstrated in JEFX 2000 as

the ATO was pushed to web-based technology. Additionally, each flying unit will have parsing tools to select only their missions. Unfortunately, interoperability with respect to planning and assessing missions will remain an initiative for many years due to releasability issues with combined forces and acquisition of different service communication systems. All U.S. military services should therefore contribute to and benefit from these reach back initiatives with respect to C2 for aerospace operations. Depending on the future scenario, it's probable the USS Coronado would initially support the JFACC afloat and transition to JFACC ashore once an AOC-forward was established. It's also possible the Marine Air-Ground Task Force (MAGTF) could be the JFACC using his Marine Air C2 System (MACCS) that typically ensures C2 of air operations within assigned airspace and coordinates MAGTF air operations with other Services.[42] Simply said, we need to keep all services aware of reach back technology as the Air Force marches toward initial and final operations capability of the AOC-forward. More importantly, we need to work towards all the services becoming an integral part of reach back for aerospace operations not just aware of Air Force initiatives.

Survivability is another assessment criterion of the AOC-forward model. The AOC-forward should be configured with survivable or redundant communication.[43] Even with redundant communication links to the theater- and CONUS-based AOCs, the AOC-forward should have the minimum essential personnel in place to plan and execute aerospace operations. Survivability should also include an alternate location in case the AOC-forward is attacked or temporarily unusable.

To summarize, this future AOC-forward model does meet the assessment criteria developed throughout this research. First, the AOC-forward meets the "quickly activated" criteria. Second, the AEF tasking process enables the AOC-forward to support extended operations by providing replacement personnel. Third, web-based technology helps mitigate interoperability problems. Fourth, the AOC-forward will have a small forward presence, how small is still to be determined. Fifth, the EAF concept allows each JFACC to tailor his AOC-forward while reaching back to the theater- and CONUS-based AOCs. Finally, the forward-AOC will be survivable when redundant communications are established with the theater- and CONUS-based AOCs.

By reviewing air campaigns over the last 60 years and trends in warfare, this paper estimates that large, theater-based AOCs to support major theater wars, won't be necessary in the year 2020. Instead, our future AOC-forward will have the ability to plan and execute daily aerospace operations. This AOC-forward will be tailorable by each JFC with reach back to a theater- and/or CONUS-based AOC as the military instrument of power is employed across the

spectrum of conflict. During a time of severe competition for dollars to modernize and replace our aging weapon systems, it's critical to get the AOC model right thus ensuring the Air Force is capable of supporting the warfighting CINCs well into the 21st Century.

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