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COMMAND AND CONTROL IN THE ANTI-ACCESS/AREA  
DENIAL ENVIRONMENT

by

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## **Biography**

Lt Col Max C. Weems is assigned to the Air War College, Air University, Maxwell AFB, AL. The majority of his operational flying experience is operating the E-8C Joint Surveillance Target Attack Radar System (JSTARS). He commanded the 12th Airborne Command and Control Squadron, and most recently was the Inspector General for the 461st Air Control Wing at Robins AFB, Georgia. Other aircraft he has flown include the EC-135 “Looking Glass” and RC-135S “Cobra Ball”. Lt Col Weems graduated from the U.S. Air Force Academy in 1995 with a Bachelor of Science in Military History. He has a Master’s degree in Aeronautical Science – Safety, Embry-Riddle Aeronautical University, FL and a Master’s degree in Operational Art from Air University. He is a Distinguished Graduate from Air Command and Staff College and has completed a tour as a Political-Military Affairs Strategist. His staff assignments include the National Guard Bureau and Headquarters, U.S. Pacific Command. He is a Command Pilot with over 2,600 flying hours.

## **Abstract**

The A2/AD battlespace will be a technologically complex, high-tempo, environment fraught with fog, friction, and chance, especially the “fog” purposely created by the enemy. In this environment, more decentralized control will be critical to success. This paper argues that forward C2 capabilities provide the best solution and proposes a concept called C2 Forward for the US Air Force, which is based on two imperatives: 1) Pushing authority and decision-making out of the AOC and other theater-level C2 agencies and moving it closer to the battle space; and 2) Utilizing multiple C2 nodes with shared situational awareness to enhance survivability, utilize all domains, and quickly gain and maintain the initiative. The paper explores the capabilities C2 Forward will need, and then recommends changes to doctrine, training, and personnel development as well as requirements for future acquisitions. The paper also points out that changes can and should be made now using existing capabilities.

“The greater the mobility of the attack, the farther forward is the proper place of senior commanders...”

- German training directive, 1 Jan 1918<sup>1</sup>

## **Introduction**

In the last few years, United States military planners have looked with concern at the state of high-end conventional warfare. For over a decade US military and civilians fought two major conflicts in the Middle East, dedicating a great deal of thought and resources to solving the problems posed by irregular warfare. Meanwhile, states with uncertain intentions and considerable conventional strength continued to improve their ability to coerce regional neighbors and deny US access in the event of open conflict. Senior US defense and civilian leaders believe our inability to gain access to the global commons could encourage regional instability and have subsequently promoted a rebalancing for US forces worldwide.<sup>2</sup>

These areas are referred to as anti-access/area denial (A2/AD) or contested/degraded environments. This battlespace is expected to be a technologically complex, high-tempo environment fraught with Clausewitzian fog, friction, and chance, especially the “fog” purposely created by the enemy. An examination of history shows more decentralized command and control (C2) schemes are the most effective in this environment. Therefore, the Air Force should seek to develop empowered forward C2 elements through a “C2 Forward” concept of capabilities to enable shared situational awareness and enhance survivability, utilize all domains, as well as quickly gain and maintain the initiative. This suggests recommendations for doctrine, acquisition, and training for staffs and decision-makers as they face policy and resource decisions regarding future C2 capabilities.

## **Thesis**

The US Air Force best meet the A2/AD challenge through more decentralized C2 schemes. To do this, the Air Force should develop empowered forward C2 elements.

### **The A2/AD Challenge**

Essentially, A2/AD is meant to make access to a given conflict prohibitively costly. Adversaries could use kinetic and non-kinetic attacks and would fight asymmetrically when possible. We would see both high- and low-tech capabilities being utilized in high-tempo operations. Land, sea, air, and space forces would all be presented with threats requiring joint action to overcome. Long-range missiles could keep US naval and air forces at a distance and could be used against bases within striking distance, forcing us to use capabilities at longer range.<sup>3</sup> We would have to choose between staying power and punching power, exposing vulnerabilities by extending our lines of communication.<sup>4</sup> Those lines would be vulnerable to cyber attack, rendering our forces unable to maintain situational awareness and share information.<sup>5</sup> The image of a deadly fog is a useful analogy.

Many see this environment as a new eventuality, but it has historical precedent. Ground forces have been operating in A2/AD environments since organized warfare began, especially since the rise of national warfare and improvements to communications, maneuverability, and firepower. World War II was probably the first to see airborne A2/AD environments – for the Allies over Europe and for the Germans over England. Anti-aircraft defenses utilized various methods to deny access to opposing air forces and limit their ability to maneuver. North Vietnam in 1966 was also contested, requiring days of route and threat study.<sup>6</sup> Modern technology has been no chimera, either, as the Israelis learned in 1973 (and re-learned in 1982),

dependence on technology in an A2/AD environment can create vulnerabilities a smart enemy will exploit.<sup>7</sup> However, in 1991, US air forces fought an Iraqi defense system far below their weight class, followed by over two decades of uncontested air superiority. For strategists and planners, contemporary A2/AD environments present formidable challenges we did not seriously contemplate for over two decades.

### **Meeting the Challenge – The Importance of Good C2**

Military planners have thoughtfully addressed A2/AD environments only in the last few years, and C2 has recently been part of the public discourse. One of the DoD's first concepts to confront A2/AD challenges, Air-Sea Battle, focuses on tighter coordination between air and maritime forces. However, the deep strikes required in this concept prompted some to view it as a thinly veiled plan for a total war with China.<sup>8</sup> Conversely, veteran and author T.X. Hammes proposed a less confrontational "Offshore Control" concept to reconcile strategic ends with the realities of geography by utilizing a less provocative stand-off approach.<sup>9</sup> In these debates, the majority of discussion focused on weapon systems. However, very recently there has been an uptick in discussion of operational considerations, particularly C2, as senior leaders have begun to re-think how to accomplish strategic ends at an acceptable cost. The latest product from the DoD, the Joint Operational Access Concept (JOAC), seeks to utilize temporary advantage in one domain to create opportunities in other domains, and dives deeply into C2 capabilities. This late revelation is not surprising, as operational and tactical C2 are often taken for granted and because it is simply not in our cultural DNA like tactical weapon systems.<sup>10</sup> It is also just plain *hard* to figure out, but it is vital.



Historic and recent experience tells us C2 is critically important in warfare. Lt Col Paul Maykish, expressed it well in a recent issue of *Air and Space Power Journal (ASPJ)*, “America’s greatest advantage in warfighting lies not in the quality of its people, ideas, weapons, or planes but in the systematic integration of those elements via C2.”<sup>11</sup> The quality of a C2 system is measured in a force’s ability to make high-quality decisions in the face of uncertainty and execute them properly. Designing a system well-suited to the situation is high art. In *Command in War*, historian Martin Van Creveld puts the commander’s dilemma thus:

Confronted with a task, and having less information available than is needed to perform that task, an organization may react in either of two ways. One is to increase the information-processing capacity, the other to design the organization, and indeed the task itself, in such a way as to enable it to operate on the basis of less information. These approaches are exhaustive; no others are conceivable.<sup>12</sup>

The Germans successfully reconciled the two approaches in their tactic of Blitzkrieg in WWII. At the time, the Germans did not possess far superior technology – their way of fighting made the difference. Their forces understood their roles, communicated well, and made decisions at the lowest level possible to maintain initiative. Other prominent examples include Napoleon’s Corps-based army, Ludendorff’s “storm trooper” tactics in WWI, and Dowding’s air defense system over England in WWII.<sup>13</sup> From these historical examples, we see a properly functioning theater-level C2 system helps build situational awareness, translates the commander’s intent, and pushes decisions as low as practical. It will be appropriate to the technology available, the situation, and the mission. The 2012 JOAC prudently applies these capabilities to prescribe C2 requirements for the joint force.

## **C2 Requirements**

In the 2012 JOAC, the Chairman outlined what capabilities our forces would need to accomplish the mission in an A2/AD environment. To its credit, C2 functions and capabilities are given considerable attention. There are four major implications for C2 requirements: 1) Forces will have to fight for situational awareness (SA) and be able to share SA across domains.<sup>14</sup> This will require technical solutions along with increased emphasis on education and theory to promote personnel adaptability. 2) We expect a reduced overseas defense posture for US forces.<sup>15</sup> This will drive requirements for systems to operate over longer distances and/or for longer times. 3) We will need capabilities with “long legs” and “reach”. This extended battle space will drive friendly forces to push assets forward and task them or be able to change their task enroute, similar to “push CAS” air operations over Iraq in 1991 and 2003. 4) Lastly, the JOAC identifies the need for adaptable relationships and authorities to enable decentralized execution, which will affect doctrine and training.<sup>16</sup>

In addition to these specified capabilities, others can be inferred based on technological assumptions and by looking deeper at the JOAC’s requirements. First, forces will need to be as jam-resistant as possible, utilizing both active and passive capabilities. Active solutions could entail active signal modulation and/or deception; passive solutions might include “self-healing” networks able to detect degradation, alert operators, and automatically adjust. Redundancy (a low-tech concept) can localize effects geographically and temporally. Second, using history as a guide, forces would need to get rapid approval and engagement authority to maintain the initiative. Our recent experience over Libya in 2011 demonstrated the usefulness of delegating authority and decisions forward. While not an A2/AD environment, the poor real-time SA available to Air Operations Center (AOC) personnel and their adaptation to push authorities forward is a useful parallel. The targeting process went from 20 minutes (a lifetime when the

target is mobile) to seconds, ensuring only the most important decisions were elevated to higher headquarters.<sup>17</sup> It is worthwhile to note the importance of targeting through digital data links in Libya – Internet Relay Chat (IRC) “chat rooms” enabled a network of players to maintain SA and kept an automatic digital log of events.<sup>18</sup> C2 systems incorporating useful elements of social media systems should be encouraged. Third, the JOAC concept of using temporary or limited advantage in one domain to enable operations in other domains dictates a responsiveness only possible through lower-level execution authority for all domains. Of these, cyber and space authorities are currently held at high levels. Fourth, if a more “offshore control” plan is to be used, standoff, wide-area surveillance capabilities will be necessary. Fifth, other C2 functions than our current doctrine specifies should be considered. Several of these were elaborated by Tikhachevski: 1) coordinating cross-theater fires, 2) weighing the strategic value of tactical actions, 3) delegating authority to maximize independent action, 4) ensuring interoperability, 5) cross-nation coordination, 6) issuing dynamic orders, and 7) controlling phases.<sup>19</sup>

For some strategic thinkers, these capabilities neglect what they expect to be a net-centric A2/AD “infospace war”, where information is paramount. Lt Col Kieran Denehan, in his study of A2/AD warfare, says our inability to penetrate the A2/AD “fog” due to a lack of ISR could have serious consequences.<sup>20</sup> Lt Gen David Deptula, former commander of ISR Command, expects us to utilize stealth platforms, 5<sup>th</sup>-generation fighters, and unmanned aircraft as ISR assets, with a critical challenge being getting data back to analysts for processing.<sup>21</sup> However, lack of ISR will not be our biggest concern. Our biggest concern will be our resulting inability to take the initiative due to a loss of situational awareness and inability to C2 forces. Lt Col Christopher Smith, RAAF argues command is about driving events and reduces (but does not eliminate) the need for accurate, timely information. Essentially, commanders overcome an

information deficit through their actions.<sup>22</sup> The German concept of *Ausfragtaktik* and today's "Mission Command", which both empower lower-level decision-making, are based upon a lack of information.<sup>23</sup> A decade of irregular warfare has made us comfortable with information driving action, but in conventional warfare action often drives information. Information is important for effective C2, but it becomes a lesser function of command.<sup>24</sup> Information can be utilized when strong and compensated for when weak by utilizing initiative and adaptability.

Historically, the best way to maximize initiative and adaptability is to decentralize. In WWI, the British High Command tailored its objectives to the extent it could maintain control and prevented its forces from capitalizing on opportunities.<sup>25</sup> The Germans, convinced that confusion was the normal state on the battlefield, decentralized and lowered decision thresholds with success.<sup>26</sup> Such arrangements also enable localized sensing and the ability to "seal off" a system breakdown.<sup>27</sup> From German forces in WWI to today's prevalence of "push CAS", tactical success has been found by empowering subordinates.<sup>28</sup>

### **Recommendation: C2 Forward**

By comparing historical examples emphasizing the importance of C2 and the advantages of decentralized C2 structures with the expectations in the JOAC, it is clear C2 in the A2/AD environment will require a hyper-empowered tactical C2 element, at least by today's standards. But this should be no surprise. By Vietnam standards, our current level of decentralization would be remarkable; by WWI standards it would be simply astonishing. In order to face the A2/AD environment, the Air Force should adopt a concept of *C2 Forward*. This concept will take time to be fully realized, but it can be applied to current capabilities. C2 Forward rests on two imperatives: 1) Push authority out of the AOC and other theater-level C2 agencies toward

the battle space; and 2) Utilize multiple C2 nodes with shared SA to enhance survivability, utilize all domains, and quickly gain the initiative.

Working groups at PACAF, ACC, and the Air Staff have begun to put similar ideas to paper, but little has been published in academic circles. Gen Mike Hostage, former Commander of ACC, recently tried to reconcile what would happen when the AOC went offline due to a physical or cyber attack. He proposed what airmen have always been mentally equipped to do – keep operating based on the commander’s intent until communications are re-established. Like many senior airmen, Gen Hostage recognized “The battlefields of Iraq and Afghanistan have grown a generation of Airmen accustomed to leveraging a robust, unparalleled C2 architecture...”, but the ability to operate without centralized control has always been in our DNA.<sup>29</sup> Accordingly, he proposed a concept called distributed control, changing the Air Force dictum of centralized control, decentralized execution to **centralized command, distributed control, decentralized execution**.<sup>30</sup> His concept focused on subordinates continuing operations semi-independently utilizing a thorough understanding of commander’s intent, instructions, and ROEs, empowered by explicit and implicit authorities while temporarily separated from the AOC.<sup>31</sup> This is similar to the JSTARS role over Libya in 2011.

This line of reasoning is on target. However, if our doctrine, acquisitions, and training are based on flexing to and from a state where the AOC has centralized control, we will not pursue distributed control properly. Gen Hostage notes extended periods without AOC contact would probably require self-organization of subordinate units.<sup>32</sup> This is something far different from what we have become accustomed. Consequently, our developmental aim should be focused on autonomous operation, where an online AOC is the exception rather than the rule. General Deptula notes, “[...]moving] beyond large, centralized, and static C2 facilities...[to] a

mobile, distributed C2 structure...will call for a reappraisal of how we deal with information flow.”<sup>33</sup> Recognizing the substantial leap for what it is will help us begin to contemplate new ATO constructs, local intelligence-gathering and processing, and numerous other ways of thinking about air campaigns. We can think in terms of the “art of C2” and the “art of ISR” rather than the science or management of them. In this regard, the development of the modern AOC is not an end, but a stepping stone in the development of air power employment.

Since the advent of desktop computing, satellite communications, and networking, the AOC has been the focus and source of rapid evolution in airpower concepts. Establishing the AOC as a weapon system enabled us to professionalize our theater C2 capabilities, improved joint airpower integration, and helped us establish what information and systems were necessary to command and control air forces. These capabilities will be required in C2 Forward systems, but concepts that increase the role of AOCs will have significant limitations.

The most feasible of the AOC-centric concepts involves linking them together so when one goes down, one or more of the others could pick up the mission. Using cyber warfare modeling and simulations at Carnegie Mellon University, Lanham, Morgan, and Carley concluded that networked C2 nodes, instead of being more vulnerable to cyber attack, are more resilient.<sup>34</sup> However, there are currently two problems. First, the AOCs, though ostensibly standardized, differ significantly due to theater, partner nation, inter-agency, and sister service requirements. Organization, processes, systems and software would need to be baselined and training programs implemented. Second, the AOCs are generally manned for Phase 0, steady-state operations. Making them ready to pick up the load of an AOC at war would require manpower to handle their own theater load plus the wartime load.

Frankly, the cyber threat to an AOC may not be as bad as we think. The Carnegie Mellon study showed the modern AOC to be remarkably resilient to cyber attack.<sup>35</sup> This means cyber warfare may take on the character of strategic bombing in WWII. Cyber attacks, like our bombers, will not always get through; and it will be hard for them to create lasting effects. It is entirely possible that cyber warfare will see the evolution of offensive and defensive capabilities and experience Clausewitzian culminating points. The AOC would only be down temporarily, or degraded in a way that could be adapted to. In this case, our biggest vulnerability would not be the AOC going offline. Rather, it would be in the battlespace itself (its fog and tempo) and its distance from the AOC. Networking AOCs would be useful for other reasons, but not in an A2/AD fight.

### **C2 Forward Provides Balance and Flexibility**

Lt Col Michael Kometer, in his book *Command in Air War*, discusses the utility of decentralizing air C2 in an uncertain, dynamic environment where maintaining the initiative is vital to mission success.<sup>36</sup> However, centralization is more useful when a high level of information surety is required due to political ramifications.<sup>37</sup> By distributing C2, we gain a faster Observe-Orient-Decide-Act (OODA) loop and better balance information gathering with decision-making.<sup>38</sup> We hedge against fog, friction, and uncertainty through, as Col Henry Cyr posited in the July-August 2014 ASPJ, “continuous, in-battlespace problem solving with on-scene SA.”<sup>39</sup> It is just as important, however, to ensure strategic chaos does not result. Van Creveld explains this in terms of uncertainty. The more a commander decentralizes, the more uncertainty he encounters.<sup>40</sup> To maintain the best balance, authority will need to be given to those with the proper experience, education, and training. This would likely require senior leaders of the rank of O-6 to O-8 in the forward C2 nodes. They would share SA as much as

possible for two reasons: to give each other additional information to confirm or adjust their mental models and enable them to act as the primary controller as the situation unfolds or if they are degraded or compromised.

A useful way to understand this shared SA model is to apply Boyd's concept of energy management. According to Boyd, the best fighter aircraft were those who could best transform energy from one state to another with the least loss of energy in the process (e.g., converting speed to G's in a turn, and then back to speed). C2 systems capable of moving SA between elements with the least loss of SA "signal" will be the most responsive and adaptive in combat.<sup>41</sup>

This "shared mental model" can convey commander's intent, so subordinates can act in the absence of direction. Crew Resource Management strives for a shared mental model among the crew and formation for the same reason. In this way, shared SA among C2 nodes takes the idea to the theater level. However, as Lyle correctly points out, we must not make the mistake of assuming we can "automate SA and eliminate the fog of war through technology." The "humans in the loop...working in concert" deduce social context.<sup>42</sup> In accordance with the JOAC, C2 Forward would balance local synchronization with opportunities for cross-domain synergy. This is conceptually the same as Mission Command.<sup>43</sup> With proper training and command relationships, Mission Command enables forces to balance their higher commander's intent with local initiative.

C2 Forward also allows C2 systems to adapt to the situation. A flexible C2 system is a logical partner to flexible airpower.<sup>44</sup> For example, at the beginning of operations, when anti-access capabilities play the largest role, a more centralized C2 system will be required to conduct initial strikes on known targets in all domains. If more swarm-oriented tactics are used, a more decentralized C2 structure will be necessary to exploit initiative gained at weak points. In the



access-denial phase, higher-tempo operations will be enabled by local initiative resulting from a more decentralized C2 structure.

The systems most closely resembling C2 Forward today are the E-3 AWACS and E-8 JSTARS for the USAF; naval C2 systems like the USS Blue Ridge, Mt. Whitney and E-6 TACAMO, and the Army's division and corps-level HQs. At first glance, shortfalls are obvious. They all share relatively few common SA systems and are rarely utilized as interdependent pieces of a greater whole. Yet C2 Forward must be Joint in order to provide C2 of, from, and through each domain seamlessly. Accordingly, C2 Forward has informs recommendations across the joint force for doctrine, culture, acquisitions, and training.

### **Doctrine & Culture**

The first and most important doctrinal element to be addressed should be authority. The doctrinal levels of authority given by each service differ due to the characteristics of warfare in their respective domains. Army doctrine generally favors decentralization as much as feasible to maintain initiative, adaptation, and speed; Navy doctrine favors mission-type orders due to the tendency of their forces to be operating semi-independently; Marines focus on tight coordination between air and ground forces, but tend to put more stress on flexibility over mass due to the smaller scales and tighter focus of their operations; and Air Force doctrine has held centralized control and decentralized execution to be the best way to employ air forces that can range over a larger area with high mission versatility. C2 Forward most closely resembles Navy doctrine, and would require adjustments to other service doctrine to make it situation-specific. It is naïve, however, to imagine all of the services buying into this concept simultaneously. The USAF culturally values broad battlespace awareness and is psychologically equipped to lead this transformation, but will need to adjust its own doctrine. In *The Command or Control Dilemma*,

Lt Col Gregory Roman argues Air Force doctrine has been overdue for changes to make its C2 structure more adaptive.<sup>45</sup> Simply put, centralized control/decentralized execution may work for some cases, but not all. In a politically sensitive or risk-averse environment, more centralized execution is appropriate, while in the A2/AD environment, more decentralized control is appropriate. Consequently, the JFC would need to adjust the level of decentralization based on the situation.<sup>46</sup> We have to be “multi-sport” athletes, able to play both football and soccer, switching from one to the other as the character of the fight changes. The key point to remember is the amount of *authority* delegated will determine how well a subordinate C2 node integrates with other components. More delegation usually results in greater integration.<sup>47</sup>

Similarly, staff scope should be addressed. Martin Van Creveld believes a small, highly-capable staff like Moltke’s in the 1860s, has advantages.<sup>48</sup> Rather than a large staff to maximize information surety, a small theater-level staff would use “directed telescopes” to ensure forward commanders are not fighting “with a telegraph machine tied to their back.”<sup>49</sup> Theater commanders would take as much information up-channeling off the backs of their subordinates by using dedicated channels for information-gathering. This could be done by pushing key staff personnel forward and accepting irregular information updates as a cost of business.<sup>50</sup>

This would require the Air Force to rethink the relationship between Tactical C2 and the AOC. These nodes could be imagined as “forward AOCs” for some; others would see them as a rebirth of the Air Division and operational-level air command. They would think (and control) across multiple domains. Surprisingly, such a change does not violate current Air Force doctrine. Appendix 1 shows C2 functions at the different levels of war. C2 Forward simply pushes some operational functions to the tactical level. No doctrinal functions are lost, making it doctrinally sound.

## Acquisitions

It is not hard to envision some of the technical capabilities required to execute this concept fully. The simplest approach is to imagine pushing AOC capabilities and functions forward, identifying specific SA tools and functions, and then prioritizing. Envisioning an airborne or forward Time-Critical Targeting cell is a place to start.<sup>51</sup> The JOAC requirement for operation in multiple domains dictates interoperable air, land, and sea-based C2 systems seeking to attain the most common operating picture possible. Each node would seek to maximize high-quality information (which requires information quality identification and filtering), and would attempt to layer, fuse, and cross-reference information as much as possible with standardized representation at all levels.<sup>52</sup> The Joint Interface Control Officer (JICO) community could be used to work through these challenges, since they focus on reconciling and standardizing information presented to force commanders. Resiliency (withstanding or evading enemy action) and redundancy (effective operation with partial compromise of the system) are also necessary. This will require robust, jam-resistant line-of-sight data links and radios. Encryption is a baseline requirement, but should not be allowed to excessively hinder information flow when high-tempo is required. This is hard enough to do at the Joint level; but, given the importance of space and cyber, we will likely have to go further, towards an inter-agency encryption system. The networks must be self-aware to a degree in order to detect compromise and they will need to identify and warn of physical and information threats. They should automatically link into local and theater networks.<sup>53</sup> This is similar to General Deptula's "combat cloud" concept. When pushing SA and authority forward, there is a scaling principal – depending on the nature of the fight, the forces involved, and C2 Forward capabilities there will be a limit to span of control. Therefore, some measure of overall performance criteria is required to match capability with

span of control. As a rough starting point, the Air Force's ABCCC system, a relatively low-tech, high-reliability platform focused on CAS, used 12 consoles and 23 radios and could control up to 150 sorties per hour. With data links, integration, and automation, a larger possible span of control could be expected. The upper limit might be governed more by the ability to manage information than physically control assets. Lastly, a C2 node's ability to gather 'organic' SA through onboard ISR systems cannot be overemphasized. This should be considered, with allowances for future expansion. However, a force cognizant of its technical limitations, actively seeking ways to avoid them or make use of them, according to van Creveld, is usually superior.<sup>54</sup> Historical C2 advantages are usually more a function of finding new ways to use existing technologies rather than technological superiority. These methods are institutionalized through doctrine and training.<sup>55</sup>

## **Training**

“It is not enough, however, simply to allow subordinate commanders wide latitude and then demand that they fill it with their initiative; to do so they must first be properly trained and then provided with the right organizational means.”<sup>56</sup>

- Martin Van Creveld, *Command in War*

In order to function at the high level envisioned in this concept, training will need to be joint and robust. In Hugh Dowding's British air defense system, “operator skill was paramount...For the system to work, everybody in it had to practice.”<sup>57</sup> The AOC is rarely “killed” in exercises and over the past decade Green Flags have become more COIN/CAS exercises than the intense electro-magnetic environment they were originally designed to be. C2 Forward will require training across the spectrum from permissive to contested environments, with changes from one to the other. Successful militaries thoroughly master and counter technology in training before, rather than during, hostilities.<sup>58</sup> Training should utilize joint

exercises and simulations (our investment in virtual distributed simulation could be leveraged for massive savings); as well as incorporate recent real-world experience in cyber and daily operations near Iran and China. Partner nation experiences would be valuable, as some of them have been dealing with these realities for years. In some cases, we may have to re-learn older practices like utilizing reconnaissance, sweep, and strike “packages”.<sup>59</sup> Smith argues, “rather than optimizing a force for net-centric warfare, Western armies [should instead put] greater emphasis on selection and education of future operational and strategic-level commanders.”<sup>60</sup> C2 Forward personnel should have real-world AOC experience and Component Headquarters C2 competency in order to understand what is possible and reasonable. They would be a “cadre of professionals” for operational C2, they should preferably be Mission Command qualified, and encouraged to learn multiple specialties for maximum operational flexibility.<sup>61</sup> This mental flexibility will require a greater emphasis on education and theory than technical expertise. Kometer stresses the importance of “depth of command relationships”, which makes previous experience with superiors, subordinates, and peers through training and education desirable.<sup>62</sup>

### **Today’s Capabilities Can Be Used as a Starting Point**

The Air Force and the rest of the DoD have a long way to go to fully realize this concept; but should not be dissuaded. There is a great deal of capability in existing systems, and Airmen have been working on these challenges for years (albeit in a stove piped manner). Kometer argues that a forward control node must have SA and authority, so doctrinal, material, and skill improvement must be pursued in concert.<sup>63</sup> We can use existing systems like JSTARS and AWACS in joint exercises and training scenarios to develop operating procedures and requirements. Navy units have already begun incorporating JSTARS into their simulated and live training scenarios to develop concepts for Air-Sea Battle. Maj Dalman, Capt Kopp (both

JSTARS), and Navy LT Redman showed the benefits of empowering JSTARS in Africa: the ability to translate commander's intent, increase the quality and speed of decision making, speed-up the kill chain and problem-solving, bridge the tyranny of distance, and provide C2 of ISR assets.<sup>64</sup> Clear C2 arrangements with today's systems can be very high-functioning.<sup>65</sup>

## **Conclusion**

Whether it is called distributed control, C2 Forward, or something else is irrelevant. A "next phase" of air operations – a phase where the defense appears to have become more effective, requiring adaptation of the offense – has begun. As with most challenges for the US military, countering the A2/AD environment is a matter of changing paradigms, applying willpower, and devoting time, money, and energy to the task. When US forces are faced with an adversary capable of negating their industrial and technological strengths, their asymmetric advantage is the ability to empower lower echelons to capitalize on fleeting opportunities. Developing empowered C2 Forward elements enhances survivability and plays to this strength by enabling shared situational awareness and utilizing all domains to quickly gain and maintain the initiative.

## Appendix A

### C2 Functions

<b>JP 3-0<sup>66</sup></b> <b>Focus: JFC</b> <b>Level: Strategic to</b> <b>Operational</b>	<b>AFDD 3-30</b> <b>Focus: COMAFFOR</b> <b>Level: Theater</b>	<b>AFI13-1AOCV3</b> <b>Focus: JFACC</b> <b>Level:</b> <b>Operational</b>	<b>AFTTP 3-1, TACS</b> <b>Focus: C2 Authority</b> <b>Level: Tactical</b>
Establish, organize, & operate joint force HQ			
Command subordinate forces		Function as supported & supporting cmdr, as directed	
Prepare & modify plans, orders, & guidance	Planning	Develop Joint Air Operations Plan	
		Apportionment recommendation	
Establish command authorities among subordinates	Directing	Direct allocation & tasking of available forces	Speed decisions
Assign tasks & operational areas			Solve problems
Prioritize & allocate resources			
Manage Risk			
Communicate & maintain the status of information			Orient assets
Coordinate & control employment of capabilities	Controlling	Control, oversight, & guidance of execution	Pair assets
Coordinate, synchronize, & integrate with partners	Coordinating	Coordinate & integrate with others	Bring order
Assess progress	Assessing	Assess results	Produce Assessments

## Notes

<sup>1</sup> Martin Van Creveld, *Command in War* (Cambridge, MA: Harvard University Press, 1985), 175.

<sup>2</sup> CAPT Philip Dupree, "Air-Sea Battle: Clearing the Fog," *Armed Forces Journal* 149, no. 10 (June 2012): 12.

<sup>3</sup> Andrew Robert Marvin, "ISR Support to Operational Access," *Joint Force Quarterly* 71 (4<sup>th</sup> Quarter 2013): 55. John A. Tirpak, "Fighting for Access," *Air Force Magazine*, July 2013, 25.

<sup>4</sup> Lt Col Kieran T. Denehan, "Examining the 'Inflection Point': Anti-Access/Area Denial Strategies, the Air-Sea Battle Concept, and USAF Limitations" (Research Report, Air University, April 2012), 7-9.

<sup>5</sup> Joint Operational Access Concept (JOAC), Joint Chiefs of Staff, 17 January 2012, 9, 12. The Air-Sea Battle Office put forth five characteristics they expect to see: 1) we will have little or no warning, 2) we will likely have friendly forces inside the environment at the start, 3) US and allied territory supporting operations will be attacked, 4) all domains will be contested, and 5) no domain can be completely conceded to the adversary. Air-Sea Battle Concept, unclassified summary of the classified Air-Sea Battle Concept, version 9.0, dated May 12 and the Air-Sea Battle Master Implementation Plan (FY13), dated Sep 12. Air-Sea Battle Office, May 2013, 3-4. The last one sounds more like an objective than a characteristic.

<sup>6</sup> William W. Momyer, *Air Power in Three Wars (WWII, Korea, Vietnam)* (Washington, DC: US Government Printing Office, 1983), 97.

<sup>7</sup> Van Creveld, *Command in War*, 231.

<sup>8</sup> Amitai Etzioni, "Air-Sea Battle: A Dangerous Way to Deal with China," *The Diplomat*, 3 September 2013. <http://thediplomat.com/2013/09/air-sea-battle-a-dangerous-way-to-deal-with-china/> (accessed 23 September 2014).

<sup>9</sup> Wendell Minnick, "China Threat: Air-Sea Battle vs. Offshore Control?" *defensenews.com*. 23 June 2014. <http://www.defensenews.com/article/20140623/DEFREG03/306230019/China-Threat-Air-Sea-Battle-vs-Offshore-Control-> (accessed 23 September 2014).

<sup>10</sup> Lt Col Dave Lyle, "The Rest of the C2 Iceberg," *Air and Space Power Journal* 28, no. 4 (July-August 2014): 41.

<sup>11</sup> Lt Col Paul J. Maykish, "C2 Rising: A Historical View of our Critical Advantage," *Air and Space Power Journal* 28, no. 4 (July-August 2014): 16.

<sup>12</sup> Van Creveld, *Command in War*, 269.

<sup>13</sup> Creveld *Ibid.*, 97.

<sup>14</sup> JOAC, 19, 29, 34.

<sup>15</sup> *Ibid.*, 11.

<sup>16</sup> *Ibid.*, 28.

<sup>17</sup> Maj Damon Matlock, Maj Jonathan Gaustad, Maj Jason Scott, and Capt Danielle Bales, "Command and Control in Africa: Three Case Studies before and after Tactical C2," *Air and Space Power Journal* 28, no. 4 (July-August 2014): 74.

<sup>18</sup> Matlock *Ibid.*, 77-78.

<sup>19</sup> Maykish, "C2 Rising," 27.

<sup>20</sup> Denehan, "Examining the 'Inflection Point'," 9.

<sup>21</sup> Lt Gen David A. Deptula, "A New Era for Command and Control of Aerospace Operations," *Air and Space Power Journal* 28, no. 4 (July-August 2014): 6. LaGrone.



- <sup>22</sup> Smith, *Network-Centric Warfare*, 50.
- <sup>23</sup> Joint Publication 1, *Doctrine for the Armed Forces of the United States*. 25 March 2013, 15.  
Lt Col Christopher R. Smith, *Network-Centric Warfare, Command, and the Nature of War* (Canberra, AUS: Land Warfare Studies Centre, 2010), 59.
- <sup>24</sup> *Ibid.*, 58.
- <sup>25</sup> Van Creveld, *Command in War*, 161-162, 166.
- <sup>26</sup> *Ibid.*, 169. German Army Headquarters ordered: "It is strictly forbidden to delay local counterattacks while permission of the next higher headquarters is requested"
- <sup>27</sup> Kometer, *Command in Air War*, 61.
- <sup>28</sup> Michael W. Kometer, *Command in Air War: Centralized Versus Decentralized Control of Combat Airpower* (Maxwell AFB, AL: Air University Press, 2007), 125.
- <sup>29</sup> Gen Gilmory M. Hostage III and Larry R. Broadwell Jr., "Resilient Command and Control: The Need for Distributed Control," *Joint Force Quarterly* 74 (3<sup>rd</sup> Quarter 2014): 40.
- <sup>30</sup> Hostage, "Resilient C2," 38.
- <sup>31</sup> *Ibid.*, 39.
- <sup>32</sup> *Ibid.*, 39.
- <sup>33</sup> Deptula, "A New Era for Command and Control," 7.
- <sup>34</sup> Lanham, Morgan, and Carley, 44; also see Kometer, *Command in Air War*, 264.
- <sup>35</sup> *Ibid.*, 50.
- <sup>36</sup> Kometer, *Command in Air War*, 17.
- <sup>37</sup> Baltrusaitis, 28.
- <sup>38</sup> John R. Boyd, *Organic Design for Command and Control*, (Maxwell AFB, AL: Air University, May 1987), 26.
- <sup>39</sup> Col Henry Cyr, "Describing the Elephant: Framing a Discussion on Command and Control," *Air and Space Power Journal* 28, no. 4 (July-August 2014): 13.
- <sup>40</sup> Van Creveld, *Command in War*, 274.
- <sup>41</sup> Maj John R. Boyd and Thomas P. Christie, *Energy-Maneuverability Theory*, (Air Proving Ground Center and Det 4, Research and Technology Division: Eglin AFB, FL, May 1964), 6.
- <sup>42</sup> Lyle, "The Rest of the C2 Iceberg," 43.
- <sup>43</sup> Joint Publication 1, *Doctrine for the Armed Forces of the United States*. 25 March 2013, 15.
- <sup>44</sup> Gerber, 102.
- <sup>45</sup> Lt Col Gregory A. Roman, *The Command or Control Dilemma: When Technology and Organizational Orientation Collide*, Maxwell Paper No. 8 (Maxwell AFB, AL: Air University Press, February 1997), 2. Kometer, *Command in Air War*, 16.
- <sup>46</sup> Kometer, *Command in Air War*, 280.
- <sup>47</sup> Kometer *Ibid.*, 78.
- <sup>48</sup> Kometer *Ibid.*, 115.
- <sup>49</sup> Kometer *Ibid.*, 146.
- <sup>50</sup> Kometer *Ibid.*, 172.
- <sup>51</sup> Kometer, *Command in Air War*, 180, 187, 285.
- <sup>52</sup> Marvin, "ISR Support to Operational Access," 56. Kometer, *Command in Air War*, 43.
- <sup>53</sup> Deptula, "A New Era for Command and Control," 8.
- <sup>54</sup> Van Creveld, *Command in War*, 188.
- <sup>55</sup> Creveld *Ibid.*, 275.
- <sup>56</sup> Creveld *Ibid.*, 271.

<sup>57</sup> Maykish, “C2 Rising,” 20.

<sup>58</sup> Van Creveld, *Command in War*, 192.

<sup>59</sup> Tirpak, “Fighting for Access,” 27.

<sup>60</sup> Smith, *Network-Centric Warfare*, 68.

<sup>61</sup> Kometer, *Command in Air War*, 102.

<sup>62</sup> Kometer, *Command in Air War*, 16, 77.

<sup>63</sup> *Ibid.*, 62.

<sup>64</sup> Maj Gerrit H. Dalman, Capt Daniel M. Kopp, and LT Gary A. Redman Jr, “The Imperative to Integrate Air Force Command and Control Systems into Maritime Plans,” *Air and Space Power Journal* 28, no. 4 (July-August 2014): 56-69. These lessons include: the ability to translate commander’s intent, increase the quality and speed of decision making through local SA (creating three “rights”: right target, right time, and right purpose), speeding the kill chain and problem-solving, bridging the tyranny of distance, and providing C2 of ISR assets to improve information quality.

<sup>65</sup> Maykish, “C2 Rising,” 18.

<sup>65</sup> “Conduct Public Affairs from operational area” excluded since it was not relevant to the primary thrust of the paper.

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