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**CREATING DESIRED EFFECTS: REVISIONING AIR  
FORCE CAPABILITIES FOR THE JOINT WARFARE TEAM IN  
IRREGULAR WARFARE, SPACE, AND CYBERSPACE**

by

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## Preface

This research paper begins by navigating through the fog and friction of the effects-based operations (EBO) debates within the Armed Forces of the United States (US) to discover the actual role of effects as an element of operational design. Focusing on desired effects that clarify the relationship between objectives and tasks leads to the relationship between creating desired effects and critical vulnerabilities (CVs) of an adversary's centers of gravity (COGs). This relationship highlights the essential role of the military means available to a Joint Force Commander (JFC) and the ability to attack CVs to create the desired effects to achieve the objectives and accomplish the assigned mission. The relationship of means, CVs, and desired effects amplifies the criticality that the Military Services organize, train, and equip their forces (within fiscal constraints) to maximize the capabilities they present to the JFC.

The latter half of this paper focuses on Air Force military capabilities (or "military means") in Irregular Warfare (IW), space, and cyberspace. Analyzing current USAF organization, IW, space, and cyberspace are underemphasized mission areas. Based on the current and emerging threat environment, the Air Force must increase its capabilities in IW, space, and cyberspace in order to provide sufficient means to JFCs in current and future conflicts. While preserving superiority in conventional air and nuclear operations, the Air Force can rapidly increase a JFC's ability to create desired effects in IW, space, and cyberspace through reorganization to increase capacity (IW) and create unity of command (space and cyberspace).

This paper is designed to provide a quick orientation to the EBO debate while pointing the reader to joint doctrine as the appropriate starting point. Next, the critical linkage of means to desired effects is established to show the importance of the Service's organize, train, and equip

responsibilities to the joint warfare team. Finally, the Air Force must find the right balance of forces and capabilities by looking beyond its strategic attack heritage (whether via fighters, bombers, or ICBMs) in order to “Fly, fight, and win...in air, space, and cyberspace” across the spectrum of military operations including small wars. Hopefully, this work will help spur critical thinking and lead to innovative solutions as we strive to “support and defend the constitution against all enemies, foreign and domestic.”

First, and foremost, I would like to thank my wife for successfully managing our household. Our journey is a joint endeavor; I would have accomplished nothing in the military without her unwavering commitment and selfless service throughout our 21 years and 11 PCS moves (including two one year remote tours). She inspires me because I know she has the tougher job.

My rich ACSC experience is tied to key relationships. The members of the Brute Squad and EKI-TRIs have helped me see the world from their viewpoints and opened my eyes to different perspectives and also reinforced guiding principles I have learned along the way. While all the faculty members have added to my ACSC education, four, in addition to my research advisor, have had a major and lasting impact. Dr. Bill Dean always inspires me to keep learning the lessons from history to apply to today’s problems. I must thank Dr. Jeff Reilly and his team for opening my eyes to the world of operational design and joint planning—what I had always believed was the primary purpose of JPME. Both Lt Col Tom Jahn and Maj Greg Kendrick maximized our seminar time to help us look at things from multiple angles in order to get a closer vision of reality. Finally, I am grateful to my research advisor, Col (ret) Richard ‘Kemo’ Perry, for his patience as I changed my topic, his ability to explain the complexities of operational design and joint planning, and his insight which has greatly improved this paper.

## **Abstract**

While effects-based operations and thinking have created significant debate, joint doctrine focuses on effects as an element of operational design rather than the many variations of effects-based operations theory. There is a critical relationship among desired effects, critical vulnerabilities, and military means. The Joint Force Commander's ability to create desired effects against an adversary's critical vulnerabilities (in order to attack the enemy's center of gravity) using military means is limited to the capabilities of the forces the Military Services have organized, trained, and equipped. While the Air Force mission statement includes the air, space, and cyberspace domains, its current organizational structure underemphasizes Irregular Warfare, space, and cyberspace forces. Based on the historical frequency of small wars as well as the counterinsurgency operations in Iraq and Afghanistan, the Air Force can greatly enhance the joint warfare team by increasing the size and capabilities of its Irregular Warfare forces. Examining the current and potential threats to US access to space for national security purposes, many states and organizations are increasing their use of space while developing capabilities to limit or deny our access to satellites or desired effects from or through the space domain. Analyzing current threats in cyberspace, the Air Force does not enjoy the same degree of superiority in cyberspace as it does in the air domain. In order to establish dominance in space and cyberspace, the creation of separate MAJCOMs for space and cyberspace forces would encourage creative problem solving and innovative thought to operations in each of those distinct domains in a similar fashion to the pioneering airpower theories of Douhet and Mitchell. Fortunately, the Air Force can rapidly increase capacity in its Irregular Warfare, space, and cyberspace military means through reorganizing and balancing the Service while maintaining superior capabilities in conventional air and nuclear operations.

## INTRODUCTION

Since the early 1990s, the concepts of effects and effects-based operations (EBO) have generated spirited debate within the Department of Defense (DOD) and among those involved in the greater national security community including academia, think tanks, defense policy makers, and others with a vested interest in the national defense of the United States (US). Military professionals within the Armed Forces of the US require a common understanding of effects in the planning and execution of joint operations since “Joint warfare is team warfare.”<sup>1</sup> A few of the concepts and ideas that seem to generate the most disagreement include: EBO, effects-based approach to operations (EBAO), network-centric warfare (NCW), operational net assessment (ONA), and system-of-systems analysis (SoSA).<sup>2</sup> The joint military professional needs both a contextual framework built from pertinent background information and clarity as to what joint doctrine actually states (or does not state) about these concepts. This work will focus primarily on the concept of effects in joint doctrine, how creating desired effects is tied to the military means available, and the resulting Title 10 implications for the United States Air Force (USAF).

There are four primary theses driving the organization of this research project:

1. How a Military Service chooses to organize, train, and equip its forces will determine the effects it can offer to the joint warfare team to achieve military objectives.
2. Based on the organization of the USAF, Irregular Warfare (IW), space, and cyberspace forces are underemphasized.
3. Analyzing the threat environment, the USAF needs more robust IW, space, and cyberspace capabilities.

4. Through specific and focused changes in organizing, training, and equipping forces, the USAF can rapidly increase the effects it can offer the joint warfare team in the space and cyberspace domains as well as IW.

The first section will build a contextual framework in order to better understand the concepts of EBO from its origins in the first Gulf War. After distilling the thoughts and ideas of the primary USAF proponents of EBO, the prominent opposing views will be examined. The conclusion to draw, however, shows that the concept of effects is found in joint doctrine but not EBO. This finding leads to the second section which works through the joint doctrine to understand the role of effects. The key relationship among desired effects, critical vulnerabilities (CVs), and military means presents significant implications for the Services and their Title 10 organize, train, and equip responsibilities. This section concludes by asserting the first thesis.

In the next four sections of this work, theses two through four are presented to establish the link between desired effects and the USAF's military means and then applied to IW, space, and cyberspace forces within the Air Force. In other words, the current force structure and threats are analyzed before recommendations are presented to rapidly improve USAF capabilities in each of these three critical areas. Finally, the conclusion will pull all four theses together to encapsulate the "So what?" for the reader.



## **PERSPECTIVES OF EFFECTS AND EBO: A CONTEXTUAL FRAMEWORK**

One can trace the origins of recent EBO thought to the INSTANT THUNDER air campaign planning in 1990-1991 for Operation DESERT STORM. As Colonel John Warden and then Lieutenant Colonel David Deptula led the planning efforts in Washington D.C. and Saudi Arabia respectively, they focused on how the desired effect of destroying a specific target (as a component of a larger system such as the target engagement radar of a SAM battery) would have on the function of the entire system.<sup>3</sup> In 1995, Warden described his thinking in terms of desired effects, “Well before it makes any sense to talk about mechanics, it is imperative to decide what effect you want to produce on the enemy. Making this decision is the toughest intellectual challenge; once the desired effect is decided, figuring out how to attain it is much easier if for no other reason than we practice the necessary tactical events every day, whereas we rarely (far too rarely) think about strategic and operational problems.”<sup>4</sup>

In 2001, then Brigadier General Deptula authored *Effects-Based Operations: Change in the Nature of Warfare*. Deptula described how more targets were struck in the first 24 hours of Operation DESERT STORM than the entire Eighth Air Force hit in 1942 and 1943 combined; nevertheless, he asserted, “It was not the number of sorties however, that made this first day of air attacks so important, but how they were planned to achieve specific effects.”<sup>5</sup> In describing what he saw as the fundamental change in the conduct of warfare, Deptula went on to describe and contrast what he called serial or sequential warfare compared to parallel or simultaneous warfare.<sup>6</sup> He continued to explain that parallel war is not simply cramming sequential attacks into one huge simultaneous attack but instead seeks to rapidly achieve dominance across time, space, and all levels of war concurrently.<sup>7</sup> Deptula then described what he viewed as the essence of EBO, “Simultaneous application of force (time) across each level of war uninhibited by

geography (space) describes the conduct of parallel warfare. However, the crucial principles defining parallel warfare are how time and space are exploited in terms of what effects are desired, and for what purpose, at each level of war—the essence of effects-based operations.”<sup>8</sup>

Both Warden and Deptula saw value in looking at enemy systems across the levels of war. Warden asserted that all organizations (he used examples of: human body, nation state, drug cartel, and electric company) have the same basic system attributes: Leader, Organic Essential, Infrastructure, Population, and Fighting Mechanism which comprise the labels of his five rings from the inner ring (Leader) to the most outer ring (Fighting Mechanism).<sup>9</sup> Deptula explained how the conceptual thinking about the conduct of warfare is a key change because, “The object of parallel war is to achieve effective control over the set of systems relied on by an adversary for power and influence—leadership, population, essential industries, transportation and distribution, and forces. Action to induce specific effects rather than simply destruction of the subsystems making up each of these strategic systems or ‘centers of gravity’ is the foundation of the concepts of parallel war, rapid decisive operations, or any other concept that seeks to achieve rapid dominance over an adversary.”<sup>10</sup>

As expressed by both Warden and Deptula, the fundamental change EBO brings to warfare is a new alternative to the traditional strategies of attrition and annihilation. Warden described how this new way of using the military means to rapidly achieve political objectives works in that “Parallel war brings so many parts of the enemy system under near-simultaneous attack that the system simply cannot react to defend or to repair itself.”<sup>11</sup> Deptula argued that the character of war is changing with technological innovations and this revolution requires a “basic realignment in war planning” because of EBO and the new option of parallel warfare.<sup>12</sup> He summarized by stating, “It is imprudent to ignore the implications and potential advantages of

EBO. The implications of EBO include: First, EBO offer a viable alternative to attrition and annihilation as the means to compel an adversary's behavior. Second, EBO exploit current weapon systems while transitioning to emerging technology. Third, to best exploit the potential of EBO, the military must institute organizational changes."<sup>13</sup> These ideas along with others such as EBAO, NCW, ONA, and SoSA have generated considerable thought and debate during the almost two decades since the conclusion of the first Gulf War.

Fast forward to October 2008 when the Commander of US Joint Forces Command (USJFCOM), General James Mattis, US Marine Corps (USMC), authored a memorandum entitled "USJFCOM Commander's Guidance for Effects-based Operations" that was published in the *Joint Forces Quarterly (JFQ)*, issue 51, 4<sup>th</sup> quarter 2008. When it comes to the Joint Doctrine Development System, the USJFCOM Commander has significant responsibilities assigned to him by the Chairman of the Joint Chiefs of Staff (CJCS) including but not limited to: "1) Assist the CJCS, the combatant commanders (CCDRs), and the Chiefs of the Services in their preparation for joint and multinational operations through the conceptualization, analysis, development, dissemination, assessment, evaluation, and revision of current joint and multinational doctrine; 2) Assist the Joint Staff/J-7 with the joint doctrine development process; and 3) As required, conduct liaison on doctrinal matters with the combatant commands, Service doctrine organizations, other government agencies, and multinational organizations, as appropriate."<sup>14</sup> Therefore, the USJFCOM Commander's opinion carries considerable weight regarding the development, formulation, evaluation, and approval of joint doctrine.

General Mattis began his EBO memo explaining his intent to share his perspective and to give clear guidance to his staff concerning EBO usage in joint doctrine, training, concept development, and experimentation.<sup>15</sup> Mattis stated that, "I am convinced that the various

interpretations of EBO have caused confusion throughout the joint force and among our multinational partners that we must correct. It is my view that EBO has been misapplied and overextended to the point that it actually hinders rather than helps joint operations.”<sup>16</sup> He went on to provide his perspective on other concepts as well, “After a thorough evaluation, it is my assessment that the ideas reflected in EBO, ONA, and SoSA have not delivered on their advertised benefits and that a clear understanding of these concepts has proven problematic and elusive for U.S. and multinational personnel.”<sup>17</sup> General Mattis concluded with his clear commander’s intent by unambiguously directing “*Effective immediately, USJFCOM will no longer use, sponsor, or export the terms and concepts related to EBO, ONA, and SoSA in our training, doctrine development, and support of JPME.*” (italics in original)<sup>18</sup> He then points to approved doctrine in Joint Publication (JP) 3-0, *Joint Operations* and JP 5-0, *Joint Operations Planning* as the “authoritative source for information on how we use effects in joint operations in terms of desired outcomes.”<sup>19</sup> This memo sparked a public joint debate in the next issue of *JFQ* featuring a letter to the editor and a commentary supporting EBO and a forum article and another commentary supporting the USJFCOM Commander’s position.

Analyzing General Mattis’s memo, one can perceive how his military experience has facilitated the shaping of his perspective on warfare and joint operations. Looking at his biography, he is an infantry officer who has commanded at all levels with a significant amount of combat experience. As an infantryman, the focus is generally on defeating the enemy’s fielded forces in order to seize and hold key terrain or physical territory. Interestingly, the vast majority of his cited and directly referenced sources (including the U.S. Army Combined Arms Center, Field Manual 3–24/Marine Corps Warfighting Publication 3–33.5, *Counterinsurgency*, and U.S. Army Training and Doctrine Command Pamphlet 525–5–500, *Commander’s Appreciation and*

*Campaign Design*, to list a few) come from a ground combat perspective. Additionally, within the USMC, his units have fought as Marine Air-Ground Task Forces (MAGTFs). MAGTFs are organized, trained, and equipped to fight as a combined arms team with the air component focused on the ground fight providing dedicated and organic close air support (CAS), airlift, aerial resupply, aero medical evacuation, and airborne intelligence, surveillance, and reconnaissance (ISR) to the ground component. The USMC can focus on projecting power through MAGTFs since it does not have overarching missions required by the entire joint warfighting team; conversely, the USAF must provide strategic airlift, aerial refueling, global positioning system (GPS) satellite coverage, airborne ISR, and more for the joint and coalition teams to succeed. His professional development within the MAGTF construct allowed General Mattis to focus on the combined arms fight in the littorals and further inland when required. That experience probably limited his appreciation for the application of airpower in parallel warfare where the fielded forces can be targeted at the same time as the enemy's other sources of power depending on the centers of gravity (COGs) and the national strategic objectives driving an operation.

In response to the Mattis memo, five authors' perspectives were published in *JFQ* issue 52, 1<sup>st</sup> quarter 2009. Colonel (retired) Stephen Chiabotti, USAF, highlighted the differing perspectives of the infantryman and the Airman based on the capabilities of their forces and the ranges of the weapons at their disposal.<sup>20</sup> While Chiabotti agreed that EBO is incomplete as a theory and hard to define, he echoed Deptula's thinking by arguing that EBO still has merit because "If nothing else, EBO argue for economy of force as an alternative to attrition in formulating strategy and prosecuting war. Attrition and its older cousin annihilation are the defaults in strategic thinking."<sup>21</sup> Two USAF Colonels, P. Mason Carpenter and William F.

Andrews from the National Defense University (NDU), argued that EBO is combat proven (citing Operations DESERT STORM and ALLIED FORCE as positive examples) and that EBO concepts should be retained in joint doctrine by severing any ties to the “highly deterministic computer-based modeling of ONA and SoSA” that promise “unattainable predictability.”<sup>22</sup>

Supporting the Mattis position, Lieutenant General Paul Van Riper, USMC (Retired), found merit in the initial Warden and Deptula approach where he viewed their intent as “working to ensure that everyone involved in planning and executing an operation understood *why* they sought to achieve certain *ends*.”<sup>23</sup> However, he identified the version of EBO that originated from USJFCOM J9 in 2000 as “the most egregious of the three [EBO] varieties and the one that has most damaged operational thinking within the U.S. military.”<sup>24</sup> Mainly, Van Riper asserted that this manifestation of EBO claimed that the combination of ONA and SoSA could always produce predictable outcomes seemingly “oblivious to the realities of interactively complex systems. These nonlinear systems are not ones in which the cause and effect are straightforward, but ones in which effects cascade throughout the system in unpredictable ways, causing the emergence of wholly unanticipated additional phenomena.”<sup>25</sup> Van Riper concluded that the “USJFCOM version of EBO is a ‘non-idea’ that survived far too long.”<sup>26</sup> The final author, Dr. Milan Vego of the Naval War College, contrasted what he saw as the relative new (mid 1990s) systems or systemic view of warfare (including the concepts of NCW, EBO, and systemic operational design) versus the traditional Clausewitzian approach to warfare.<sup>27</sup> Vego thought SoSA and EBO are inextricably linked and that systems advocates (who he believed tend to overemphasize innovations in technology) believe that uncertainties stemming from fog and friction can be minimized if not completely eliminated thereby producing very predictable results from the warfare machine.<sup>28</sup> Vego concluded that “Warfare has remained a domain full of

uncertainties, friction, chance, luck, fear, danger, and irrationality. No advances in technology will ever change that. Finally, any new or emerging military theory, including the systems approach to warfare, must fully meet the test of reality. And if the theory conflicts with reality, then it must be modified, radically changed, or abandoned.”<sup>29</sup>

In issue 53 of *JFQ*, 2<sup>nd</sup> quarter 2009, the Joint Staff J7, Joint Doctrine and Education Division Staff put the discussion into perspective in their article “Effects-based Thinking in Joint Doctrine.” They set the record straight that the terms EBO, EBAO, ONA, and SoSA are not present in current joint doctrine.<sup>30</sup> Joint doctrine includes effects as an element of operational design and JP 3-0 describes the “Systems Perspective of the Operational Environment” which “supports operational design by enhancing elements such as centers of gravity, lines of operations, and decisive points. This allows commanders and their staffs to consider a broader set of options to focus limited resources, create desired effects, avoid undesired effects, and achieve objectives.”<sup>31</sup> The JS J7 team clearly articulated that “The ‘systems perspective’ and the inclusion of ‘effects’ as an element of operational design in both JP 3–0 and JP 5–0 should not be construed as U.S. joint doctrine blanket acceptance of EBO/EBAO in the fullness of those ideas.”<sup>32</sup> Both General Mattis and the JS J7 staff agree that all parties would do well to study joint doctrine to understand what it actually purports and which ideas are not included.

## THE RELATIONSHIP BETWEEN DESIRED EFFECTS AND MILITARY MEANS

Since EBO is not found in joint doctrine, the focus of this section is to gain an understanding of the relationship between effects (specifically desired effects) and military means and the implications of that link or connection for the Military Departments. According to JP 1, *Doctrine for the Armed Forces of the United States*, “Joint doctrine presents fundamental principles that guide the employment of US military forces in coordinated and integrated action toward a common objective.”<sup>33</sup> Therefore, the doctrinal definition of effects is the logical starting point.

To establish the joint definition of effects, there are three key doctrine documents to consider: JP 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 12 April 2001, (As amended through 31 October 2009); JP 3-0, *Joint Operations*, 17 September 2006 (Incorporating Change 1, 13 February 2008); and JP 5-0, *Joint Operation Planning*, 26 December 2006. All three of these joint publications define an effect as “1. The physical or behavioral state of a system that results from an action, a set of actions, or another effect. 2. The result, outcome, or consequence of an action. 3. A change to a condition, behavior, or degree of freedom.”<sup>34</sup> This three part official definition codified in JP 1-02 is mirrored in the Glossaries of JP 3-0 and JP 5-0. However in the body of the text, both JP 3-0 and JP 5-0 narrow the scope of effect to definition one.<sup>35</sup> Unfortunately, this results in a definition where the word being defined (effect) is found in its own definition i.e. *the physical or behavioral state of a system that results from ... another effect*. This direct approach might actually cause more confusion than illumination in the military professional’s quest to understand the doctrinal concept of effects.

A more indirect approach would seek to understand where the concept of effects fits into joint operation planning. Both JP 3-0 and JP 5-0 categorize effects as an operational design



element within the Joint Operation Planning Process (JOPP).<sup>36</sup> Going further into the doctrine, effects are part of the commander's guidance at both the military strategic (JP 3-0)/theater strategic (JP 5-0) and operational levels of war.<sup>37</sup> Within the JOPP, effects connect, link, and help clarify the relationship between objectives and tasks at the military (theater) strategic and operational levels of war.<sup>38</sup> (The divergence of terminology between JP 3-0's *military strategic* and JP 5-0's *theater strategic* is a point of friction within joint doctrine; the term *theater strategic* will be used throughout the rest of this work since that term is found in JP 1-02 as amended through 31 October 2009 and *military strategic* is not.<sup>39</sup> JP 5-0 muddies the water even more by introducing *strategic military* objectives but reverts to the *theater strategic* wording on the next two pages.<sup>40</sup>) Widening the aperture shows where effects fit into the JOPP starting from the top level guidance. When the President and Secretary of Defense (SecDef) decide to order the employment of US military capabilities, they will approve a national strategic end state and a set of national strategic objectives that, when achieved, should result in the envisioned end state.<sup>41</sup> This national guidance will help the supported CCDR establish the termination criteria: "The specified standards approved by the President or the SecDef that must be met before a joint operation can be concluded."<sup>42</sup> As part of the mission analysis step of the JOPP, operational design aids the CCDR in establishing the theater strategic military end state and objectives that use the termination criteria as a bridge to the national strategic end state and objectives.<sup>43</sup>

At both the theater strategic and operational levels of war, effects are the link between the objectives and the tasks that must be accomplished in order to achieve the commander's objectives.<sup>44</sup> Jointly JP 3-0 and JP 5-0 agree that, "**Objectives** prescribe friendly goals. **Effects** describe system behavior in the operational environment. **Tasks** direct friendly action."<sup>45</sup> (emphasis included in the original text)<sup>45</sup> However, effects can be desired or undesired. Desired

effects “are the conditions related to achieving objectives”<sup>46</sup> while undesired effects can be described as “a condition that can inhibit progress toward an objective.”<sup>47</sup> Therefore, commanders (and their staffs and subordinate units) seek to create and maximize desired effects while simultaneously working to prevent and minimize undesired effects in order to achieve the military objectives.

Focusing on desired effects uncovers another doctrinal friction point. Although JP 3-0 and JP 5-0 consistently describe desired effects in terms of contributing conditions that support the achievement of military objectives,<sup>48</sup> JP 1-02 confuses the issue by defining desired effects as “The damage or casualties to the enemy or materiel that a commander desires to achieve from a nuclear weapon detonation.”<sup>49</sup> Based on the context of joint operation planning, the JP 3-0/5-0 definition of desired effects will be used and the JP 1-02 definition ignored in this paper. JP 5-0 suggests four key considerations when formulating and defining a desired effect: 1) linkage to one or more objectives; 2) it is measureable; 3) ways and means are not specified; and 4) as a condition for success, it needs to be distinguishable from the objective it supports and not simply another objective or task.<sup>50</sup> Since an effect results from an action or set of actions to change the state of a system, this raises the question of what or who needs to be acted upon in order to create the desired effect. The answer is found through the proper identification of the adversary COG and the conduct of critical factor analysis to reveal the CVs of the enemy COG.

Joint doctrine asserts that “The essence of operational art lies in being able to produce the right combination of effects in time, space, and purpose relative to a COG to neutralize, weaken, defeat, destroy, or otherwise exploit it in a manner that best helps achieve military objectives and attain the military end state.”<sup>51</sup> In other words, operational art attempts to create desired effects against an adversary COG in order to achieve the military objectives. However, the problem is

much more complex than the previous sentence might lead one to believe. While a COG is always linked to the objective, COGs are not static because they exist at all levels of war and can change in different phases of an operation, over time, or when the objectives change.<sup>52</sup> Once an enemy COG is determined during the mission analysis step of the JOPP, critical factor analysis will reveal the CVs which are “those aspects or components of the adversary’s critical requirements (CRs) which are deficient or vulnerable to direct or indirect attack that will create decisive or significant effects disproportionate to the military resources applied.”<sup>53</sup> So, the CVs are the “what or who” of the enemy COG that the Joint Force Commander (JFC) seeks to create desired effects against in order to achieve his/her objectives.

This leads to an examination of the relationship among CRs, CVs, means, and desired effects. A CR is “an essential condition, resource, and means for a critical capability to be fully operational.”<sup>54</sup> The CV is some part of the CR that is inadequate or lacking in some way or susceptible to attack that gives a JFC more bang for the buck (the desired effect is greater than the means required to achieve it). Therefore, the CV is dependent on a JFC having the means to achieve the desired effect. In other words, the resources accessible to a JFC can increase or decrease the CVs of an enemy COG’s CRs. The CRs do not change; the CVs can change based on the means the JFC can obtain in order to create desired effects. For example, imagine that the strategic COG for hypothetical Country X is the political leadership. One of the critical capabilities (CCs) of the political leadership is to defend Country X’s capital city (Xcap). In order to defend Xcap (the CC), one CR is defensive military forces. Now, Xcap was built on a peninsula and could be vulnerable to attack from the sea or the air rather than a ground campaign that would require defeating Country X’s fielded forces in order to reach Xcap. If the JFC has amphibious, air assault, or airborne capabilities (means), then Xcap’s vulnerability to indirect

military attack would be a CV. However, if the JFC did not have the means to attack Xcap by sea or air, indirect attack against Xcap would not be a CV. So the number of CVs that a JFC can attack to create desired effects is directly tied to the means he has available to him.

Since the fundamental goal of operational art is to produce effects against the adversary's COG to accomplish one's objective, the desired effects a JFC can create are limited based on the resources he or she is provided to achieve the military end state. JP 3-0 states, "Operational art is the application of creative imagination by commanders and staffs that integrates ends, conditions, ways, and means to achieve operational and strategic objectives."<sup>55</sup> Within the context of the National Military Strategy (NMS), JP 5-0 describes *means* as "the military capabilities required to execute the strategy."<sup>56</sup> JP 1-02 defines *military capability*: "The ability to achieve a specified wartime objective (win a war or battle, destroy a target set). It includes four major components: force structure, modernization, readiness, and sustainability."<sup>57</sup> Delving deeper into joint doctrine, the instruments of national power (IOPs) are "All of the *means* available to the government in its pursuit of national objectives. They are expressed as diplomatic, economic, informational and *military*." (italics added)<sup>58</sup> Therefore, the military IOP encompasses the *military means* or *military capabilities* that a country possesses. Although the term *military means* is not found in joint doctrine, it is consistent with the doctrinal concepts of the military IOP and military capabilities. In this work, the term military means will be used to distinguish military capabilities from other means or IOPs (diplomatic, informational, and economic) available to the US in order to achieve national objectives.

In the Armed Forces of the US, the Military Departments (Air Force, Army, and Navy) are responsible for "organizing, training, equipping, and providing forces to fulfill specific roles..."<sup>59</sup> In fact, "The Military Services and USSOCOM (in areas unique to special

operations) share the division of responsibility for developing military capabilities for the combatant commands.”<sup>60</sup> JP 1 stresses that, “Service skills form the very core of US military capability,”<sup>61</sup> and “All service components contribute their distinct capabilities to the joint campaign.”<sup>62</sup> It is then the JFC’s responsibility to determine the right mix of joint capabilities required to “most effectively and efficiently ensure success.”<sup>63</sup> The gap emerges when the JFC wants to create desired effects against a COG (specifically a CV of that COG) but none of the Military Services have the capability (means) to effect the CV. The existence of the enemy’s vulnerability is rendered irrelevant due to the lack of means to exploit the CV. This situation limits the options available to the JFC.

Realistically, all the Military Departments and the DOD as a whole are constrained by the fiscal realities of the defense budget. Any JFC will be limited to the capabilities that have already been organized, trained, and equipped within the Military Services. Since “Successful joint operations are made possible by the capabilities developed and embodied in each Service,”<sup>64</sup> the Services must prioritize their limited budgets in order to maximize the capabilities they can present to the President, SecDef, CCDRs, and JFCs. The Military Departments balance their requirements by relying on the strengths inherent in the entire joint force because “All Service components contribute their distinct capabilities to the joint campaign; however, their interdependence is critical to overall joint effectiveness. Joint interdependence is the purposeful reliance by one Service on another Service’s capabilities to maximize complementary and reinforcing effects of both; the degree of interdependence varying with specific circumstances.”<sup>65</sup>

For example, the Air Force must decide how to organize, train, and equip air, space, and cyberspace forces in order to present capabilities across all the Air Force operational functions which “are the broad, fundamental, and continuing activities of air and space power ... together

they do represent the means by which Service forces accomplish the missions assigned to JFCs by the President, SecDef, and CCDRs.”<sup>66</sup> According to Air Force Doctrine Document (AFDD) 1, the operational functions of air and space power are: Strategic Attack, Counterair, Counterspace, Counterland, Countersea, Information Operations (IO), Combat Support, Command & Control (C2), Airlift, Air Refueling, Spacelift, Special Operations, ISR, Combat Search & Rescue (CSAR), Navigation & Positioning, and Weather Services.<sup>67</sup> The Secretary of the Air Force (SECAF) and the Chief of Staff of the Air Force (CSAF) must decide how to balance the capabilities of the force in order to provide the operational functions to the joint warfare team across the domains of air, space, and cyberspace.

Therefore, how a Military Service chooses to organize, train, and equip its forces will determine the effects it can offer to the joint warfare team to achieve military objectives. How the USAF balances its force structure determines what potential effects are brought to the joint/coalition fight. If the Air Force starts by determining the effects desired, this would drive the requirements the SECAF and CSAF emphasize as they determine the appropriate mix of USAF air, space, and cyberspace forces within the current fiscal constraints. This approach is consistent with DOD force planning which is “shifting toward capabilities-based planning (CBP), changing the way warfighting needs are identified and prioritized. The essence of CBP is to identify capabilities that adversaries could employ and capabilities that could be available to the United States, then evaluate their interaction, rather than over-optimize the joint force for a limited set of threat scenarios.”<sup>68</sup> This organizational planning approach looks at building forces and capabilities that can create desired effects across the range of threat capabilities rather than focusing on very specific threats (i.e. the Soviet Union during the Cold War). Using this model, the USAF would take a global view of potential enemy capabilities, determine the desired effects

required to counter or defeat those threats, link the effects to operational functions, and organize the Air Force accordingly.

A country or coalition can only use the capabilities they already possess to achieve desired effects. In other words, a commander and his staff can do the best mission analysis, correctly identify the COGs, and reveal the CVs through good critical factor analysis; but if the JFC does not have the military means to attack a CV, all the staff planning is for naught. The key is increasing the tools available to the President, SecDef, CCDRs, and JFCs to create desired effects in order to achieve military objectives supporting national security objectives.

Consequently, this section concludes with the first thesis: *How a Military Service chooses to organize, train, and equip its forces will determine the effects it can offer to the joint warfare team to achieve military objectives.*

## **LINKING DESIRED EFFECTS TO THE AIR FORCE'S MILITARY MEANS**

Since the September 11, 2001 (9/11), attacks on the US homeland, the US Armed Forces have spent the bulk of their time, energy, personnel, and resources in three named military actions: Operation NOBLE EAGLE (ONE), Operation ENDURING FREEDOM (OEF), and Operation IRAQI FREEDOM (OIF). ONE and OEF began in late 2001 while OIF was launched in 2003; all three operations are still ongoing today (April 2010). Three primary terms that broadly define the goals of these efforts are homeland defense, counterterrorism, and counterinsurgency. However, those terms do not tell the whole story. The early phases of both OEF and OIF (especially OIF) included considerable force on force battles involving conventional airpower operations to seize control of the air and produce desired effects on enemy land forces as part of the joint/coalition team. A very large part of the ONE mission is the defense of US air space by conventional airpower found primarily in the reserve components. In fact, ONE successfully completed its 55,000 sortie on January 14, 2010.<sup>69</sup> So, even though these post-9/11 operations have not focused on primarily traditional military fights, they have shown that the Air Force needs to maintain its formidable conventional capabilities in the air domain.

On September 16, 2009, at the Air Force Association's 2009 Air & Space Conference and Technology Exposition held in Washington D.C., the Honorable Robert M. Gates in his position as the SecDef stated that "In this dangerous new century, our country faces a fiendish and complex array of threats, and our military confronts a bewildering array of tasks."<sup>70</sup> In light of these challenges, the SecDef said that the members of the US defense establishment must be willing to "stretch their comfort zones and rethink long-standing assumptions" about how the US military should be structured and equipped.<sup>71</sup> In addressing how the Air Force should respond in such times, Secretary Gates pointed to Billy Mitchell's example saying Mitchell had the "vision



and insight to see that the world had changed” and then “pressed ahead in the face of fierce institutional resistance” to bring his vision to reality.<sup>72</sup>

Two days earlier at the same convention, the Honorable Michael B. Donley, SECAF, asserted that the Air Force had reached nothing less than “another inflection point in its history, where changes in the strategic environment, new technologies, and changes in resources together combine to reshape our capabilities and to set us in new directions.”<sup>73</sup> Secretary Donley went on to contrast what the Air Force of 2020 was forecasted to look like through a year 2000 lens compared to a clearer 2009 vision: the actual force will have far fewer fighters, bombers, people, and satellites than envisioned in 2000.<sup>74</sup> He explained that there has been a “consistent shift away from investment in just the combat forces and toward the joint force enablers” which he identified as ISR, aerial refueling, airlift, and cyber operations.<sup>75</sup> In addition, the SECAF said that the 2020 Air Force will have a much more robust special operations capabilities, a reinvigorated nuclear enterprise, and instead of the 80 unmanned aerial vehicles (UAVs) forecasted, “today’s glide path takes us to over 380, with the strategic and cultural implications vastly greater than those numbers alone would indicate.”<sup>76</sup>

General Norton A. Schwartz, CSAF, spoke the day after the SECAF and emphasized how much effort had been expended to reinvigorate the Air Force’s nuclear enterprise over the last year.<sup>77</sup> As of that date (15 September 2009), the USAF had successfully stood up its new Air Force Global Strike Command (AFGSC), the Air Staff office for nuclear matters, and a fourth operational B-52H bomber squadron.<sup>78</sup> General Schwartz said, “We invested \$4.4 billion in areas that, frankly, had been neglected,” referring to creation of AFGSC, reinstatement of regular operational readiness inspections, and boosted funding for testing and safety support functions related to the Air Force’s nuclear mission.<sup>79</sup> The CSAF emphasized the resolve of Air Force

senior leadership to stay on the path of restoring the strength and readiness of USAF nuclear capabilities asserting that “Secretary Donley and I will not take the counsel of those who say ... the job is complete. Our commitment is to follow through.”<sup>80</sup>

Clearly, the SecDef, SECAF, and CSAF do not believe that now is the time to continue organizing, training, and equipping USAF forces the exact same way it has been done over the last decade. The combination of fiscal realities and constraints in the DOD budget coupled with a growing and multifaceted threat environment have helped to motivate change and to examine all parts of the Air Force’s budget and organization to find the right balance of forces and capabilities. As the SecDef suggested, now is the time for the innovative and forward-looking thinkers, following Mitchell’s example, to propose and implement out of the box solutions to the hard Title 10 decisions facing the USAF leadership today. The Air Force has committed itself to reinvigorating the nuclear enterprise and not lost focus on maintaining its robust conventional airpower capabilities. This leads one to wonder what other military means within the Air Force need increased emphasis in order to provide JFCs with the ability to create desired effects across the air, space, and cyberspace domains.

One innovative approach is offered in the final three theses of this paper: *1) Based on the organization of the USAF, IW, space, and cyberspace forces are underemphasized. 2) Analyzing the threat environment, the USAF needs more robust IW, space, and cyberspace capabilities. 3) Through specific and focused changes in organizing, training, and equipping forces, the USAF can rapidly increase the effects it can offer the joint warfare team in the space and cyberspace domains as well as IW.* The next three sections will expand upon and support these theses looking separately at IW, space, and cyberspace capabilities in the Air Force.

## IW CAPABILITIES IN THE AIR FORCE

History shows we must be prepared to fight small wars. According to Colonel (retired) John D. Jogerst, USAF, the US has “used military force over 300 times in our history—a number that includes only 11 declared wars and a few more sustained conventional conflicts (e.g., Korea, Vietnam, the two Gulf Wars, etc.).”<sup>81</sup> Since the creation of the Department of the Air Force in 1947, we have fought in many IW (primarily counterinsurgency (COIN) and foreign internal defense (FID) operations), unconventional warfare, counterdrug, and counterterrorism conflicts in the Philippines, Vietnam, Grenada, Panama, El Salvador, Colombia, Afghanistan, Iraq and many more locales across the globe. This continuing threat of small wars has expanded as terrorist organizations migrate to weak and failing states with both ungoverned and poorly governed areas that can be used as safe havens and training bases for terrorist groups.

AFDD 2-3, *Irregular Warfare*, includes both COIN and support to COIN operations within IW.<sup>82</sup> The key relationship in support to COIN operations is between the legitimate partner nation (PN) government and US forces which sets the conditions for building partnership capacity (BPC).<sup>83</sup> Air Force doctrine states, “The role of the Air Force in BPC is to provide expertise and assistance that supports the overall IW strategy of the US government in assisting the PN address an insurgency. Ensuring PN military institutions can provide security for their citizens and government is a key priority in any BPC effort.”<sup>84</sup> BPC efforts occur across all phases (especially Phase 0—shaping) of military operations and include security assistance (SA), foreign military sales (FMS), and FID activities.<sup>85</sup> This concept nests into joint doctrine where CCDRs seek to shape their geographic areas through ongoing security cooperation (including SA and FMS) activities to help remedy, remove, or prevent the causes of crisis before an insurgency develops or a PN’s internal situation deteriorates and requires US military intervention.<sup>86</sup> In BPC activities, the US works by, with, or through PN forces and institutions

with the goal of developing PN capabilities and improving “collective capabilities and performance to prevent internal security risks from becoming transnational threats of US security interests.”<sup>87</sup>

The Air Force currently has one major command (MAJCOM), Air Force Special Operations Command (AFSOC), with one numbered air force (NAF), 23 AF, which is organized, trained, and equipped to potentially fight in small wars. Within the BPC spectrum of activities, FID capabilities are critical to helping our allies and potential partners build, employ, and sustain their own air forces to provide the capabilities they need for both internal defense and civil support (disaster relief, humanitarian crisis, etc.). In April 2010, only the 6<sup>th</sup> Special Operations Squadron (6 SOS) was organized to provide FID capabilities.<sup>88</sup> The 6 SOS’s mission statement is “to assess, train, advise and assist foreign aviation forces in airpower employment, sustainment and force integration. Squadron advisors help friendly and allied forces employ and sustain their own airpower resources and, when necessary, integrate those resources into joint and combined (multi-national) operations.”<sup>89</sup> Assuming (hypothetically) that the 6 SOS has about 200 Airmen assigned, one could assess that the squadron’s ability to meet global mission requests is limited due to lack of personnel. While USAF transport, CAS, and ISR assets have all performed well in both Iraq and Afghanistan in support to COIN operations, US success in FID will be critical to enable PN security forces to take successful responsibility for their own internal defense and reduce the need for US forces.

To better fight today’s support to COIN, to help prevent future insurgencies by improving the internal security capabilities of our friends and allies, and to prepare for future small wars, the Air Force needs to create an IW wing under 23 AF and AFSOC. Within the IW operations group, at least four flying squadrons would fly trainer, light transport, light attack, and ISR fixed

wing aircraft. A fifth squadron would include multi-purpose helicopters. For internal security, these are the types of platforms that will give PN air forces the capabilities to create the desired effects they need. On the fixed wing side, these planes would be the less expensive and more easily maintained propeller driven aircraft. The MC-12 Liberty program is a successful example of an organic, sustainable PN ISR capability. Most PN air forces do not need a platform like the U-2 to provide for their internal security.

The Air Force must organize, train, and equip its FID forces to match the capabilities that our partners need and can maintain and sustain after the US military presence is reduced to a small security cooperation team working SA and FMS issues within the local US embassy. The T-6A Texan II, which is used extensively by Air Education and Training Command (AETC) in undergraduate pilot training, would be a good option as a trainer aircraft while the AT-6 version could serve as a light attack aircraft. AFSOC's FID forces could then offer an affordable and sustainable option to our partners using an aircraft AETC already flies which would increase USAF credibility with PN airmen. Several aircraft are capable in the light transport role and could be quickly procured and easily maintained by US partners. PN forces already possess many multi-role helicopters. The Air Force needs to build its FID capabilities to match the existing aircraft inventories and fiscal constraints of PNs.

Considering the budget constraints facing the Air Force, the stand up of a new IW wing would probably be at the expense of an existing wing. There are currently 17 active duty fighter wings plus another five flying wings that include fighter aircraft.<sup>90</sup> In building a balanced air force, more desired effects would be available to the joint warfare team from an Air Force with 16 fighter wings and one robust IW wing than the current structure. No doubt, one less fighter wing would reduce the capacity for conventional air capabilities but that loss would be balanced

by the IW capacity gained. This relatively small and inexpensive (in terms of the total Air Force) investment in dedicated IW forces could help preserve the total force by reducing the number and duration of contingency operations and deployments requiring significant conventional commitment of both combat and mobility air forces. The benefits of effective BPC activities derived from an IW wing would include less wear and tear on fighter, bomber, tanker, and airlift platforms. Based on current operations in Afghanistan and Iraq and the frequency of small wars requiring IW expertise, one FID squadron does not provide enough Air Force capacity for the joint team. If the Air Force invests now to create an effective IW force, the US and its friends and allies will reap future benefits by helping to prevent or defeat insurgencies possibly without the need of conventional US forces and by bolstering standing IW forces to fight and win future small wars.

## **SPACE CAPABILITIES IN THE AIR FORCE**

While the Air Force (and the entire joint team) relies heavily on space assets to fight in the air today, emerging threats from other countries and the current organization of space forces cast doubt on the USAF's future ability to "fly, fight and win" in space. US conventional military forces that operate in the land, sea, and air domains rely on access to space capabilities for an asymmetric advantage to dominate enemies in combat operations. If potential adversaries could deny, disrupt, degrade, or destroy the US military's access to space capabilities, they could significantly "level the playing field" when fighting US forces in the air, on the land, and at sea. Present and future threats plus a divided command of space forces threaten US space power.

While Michael O'Hanlon's proposed space policy (that the US should hedge its bets by delaying the weaponization of space for as long as possible but not enter into any binding agreements that prevent the US from using space weapons in the future)<sup>91</sup> is sound, many countries already pose a threat to US dominance in the use of space for military operations. Since intercontinental ballistic missiles (ICBMs) transit through space, any country with an operational nuclear ICBM could potentially target satellites in Low Earth Orbit (LEO). Referring to China's (People's Republic of China) successful shoot down of one of their LEO satellites in early 2007, the Air Force Space Command (AFSPC) Commander, General C. Robert Kehler said, "We certainly have seen the Chinese demonstrate a kinetic kill anti-satellite (ASAT) weapon."<sup>92</sup> When the US Navy successfully shot down an inoperable National Reconnaissance Office (NRO) satellite in February 2008, the US also demonstrated an ASAT capability.<sup>93</sup> In addition to direct threats to satellites, potential adversaries could chose to attack both the communications links to satellites (via jamming or other means) as well as the ground stations that control the satellites (through the physical and/or cyberspace domains). General Kehler

stated, “We have seen evidence from a number of places around the world that our potential adversaries or others are developing capabilities here that can challenge us in all three of those pieces of our space capability: the space segment, the link segment, and the ground segment.”<sup>94</sup>

Satellites are also threatened (intentionally or unintentionally) by the growing volume of space debris in orbit and the real possibility of collisions in space.<sup>95</sup> On February 10, 2009, an operational commercial Iridium satellite collided with an inoperable Russian military communications satellite over Siberia; both spacecraft were destroyed creating a significant field of space junk in their orbit.<sup>96</sup> Manned spacecraft are also at risk from both increasing numbers of satellites and space debris (especially in LEO). When the space shuttle *Atlantis* flew a mission to repair the Hubble telescope, it returned “pockmarked with more debris hits than any other shuttle in history” as it had to transit through and work in the junk-strewn LEO band.<sup>97</sup> There are multiple threats to vehicles in space as well as US military access to space-based effects.

The Air Force has one MAJCOM, AFSPC, currently responsible for two of its three war fighting domains: space and cyberspace. Within AFSPC, there is only one NAF (14 AF) organized for space operations. Looking deeper, two of 14 AF’s wings are focused on space launch, two provide space situational awareness, and the fifth specializes in command and control and space operations such as the MILSTAR satellite communications system and the global positioning system (GPS) constellation.<sup>98</sup> Except for space situational awareness, ISR capabilities are not found in 14 AF. According to the NRO’s official website, as a DOD agency with both Central Intelligence Agency (CIA) and DOD personnel, the NRO is the primary operator of space-based ISR platforms for the US rather than the Air Force.<sup>99</sup> This creates a lack of unity of command for US space assets and could have disastrous consequences if space becomes a battlefield.



One positive development was the creation of the Space Protection Program (SPP) on March 31, 2008, as a joint NRO and AFSPC effort with Dr. Andrew W. Palowitch as the first Director.<sup>100</sup> General Kehler and Mr. Scott Large, director, NRO, established the SPP mission to “preserve national security space effects through an integrated strategy and to articulate vulnerabilities, assess threat impacts, identify options, and recommend solutions leading to comprehensive space protection capabilities.”<sup>101</sup> After the Russian and Iridium satellites collided, 14 AF’s Joint Space Operations Center (JSpOC) started tracking approximately 800 maneuverable satellites (out of 1,300 currently on orbit) as well as 19,000 other space objects.<sup>102</sup> JSpOC personnel perform “conjuncture” (defined by Palowitch as “close proximity between two space objects”) analysis on as many as 700 objects daily to prevent collisions in space.<sup>103</sup> Palowitch believes that two satellite protection schemes are enduring and worth pursuing: “First is to reduce man-made hazards in space and threats to space systems—which includes debris creating events. Second is to achieve comprehensive space situational awareness focused on identifying hazards, ascertaining intent, and attributing actions.”<sup>104</sup>

DOD uses space today much like the US Army used airpower in WWI (targeting, communications, ISR, navigation/mapping, weather, etc.) to support and enable military operations in the air, land, and sea domains. The primary difference between the air domain in WWI and space today is the deployment and employment of weapons since airmen engaged in both air to air and air to ground combat in WWI. In order to posture ourselves to maintain a dominant position in space operations, we must develop new capabilities and create a unified military space force structure.

The Air Force, DOD, and NRO need to create a true “Space Command” solely focused on space operations. One approach is to make AFSPC the focal point for space-mindedness

rather than simply a supporting domain for air and surface forces and create unity of command by placing the NRO and any other military space assets under AFSPC. Remove the cyberspace domain responsibility from AFSPC so it can focus on one domain to maximize future capabilities in space. The Air Force needs innovative, forward thinkers and problem solvers to lead us into the space domain like Douhet and Mitchell pioneered airpower theory and to imagine what can be done in space that is fundamentally different from air, land, and sea due to the unique environment. We need to marshal our resources to develop new options in space such as: offensive capabilities, garbage (space debris) removal, improved satellite protection and survivability, and potential manned systems for military operations. Unless we continue to lead the way in innovating space operations, our competitors will continue to develop counter-measures to our current capabilities and potentially deny our effective use of space as an asymmetric advantage in both our current and future military operations.

In January 2001, the “Space Commission” emphasized the real possibility that conflict in space would occur. One of the commission’s five concluding recommendations read “we know from history that every medium—air, land and sea—has seen conflict. Reality indicates that space will be no different. Given this virtual certainty, the U.S. must develop the means both to deter and to defend against hostile acts in and from space. This will require superior space capabilities.”<sup>105</sup> From a military perspective, this necessitates unity of command for space forces. The commission’s report also highlighted the importance of investing in and developing space expertise in individuals, concluding that “investment in science and technology resources—not just facilities, but people—is essential if the U.S. is to remain the world's leading space-faring nation. The U.S. Government needs to play an active, deliberate role in expanding and deepening the pool of military and civilian talent in science, engineering and systems

operations that the nation will need. The government also needs to sustain its investment in enabling and breakthrough technologies in order to maintain its leadership in space.”<sup>106</sup> This requires a determination of the key barriers (physical, technological, scientific, etc.) to a revolution in space operations (whether manned or unmanned) to focus our efforts on finding ways to break through or go around those barriers using innovative scientific, engineering, and problem solving methods. A unified AFSPC is the right organization for this herculean task.

Rather than questioning whether or not the Air Force can afford AFSPC as a unified “Space Command,” one should instead consider whether the US can afford to risk losing our dominant position in space. No doubt, the stakes are high. If we lose or miss the opportunity to continue leading the way in space operations and technologies, we not only concede our asymmetric military advantages in, from, and through space, but this could also significantly shift the balance of international power, the world economy, and our national defense capabilities. What would draw the best and brightest scientists and engineers to the Air Force: air operations or revolutionary space operations? The US would benefit as more young people chose to study math, science, and engineering as AFSPC inspired and rewarded innovative ideas and revolutionary thinking. One can only imagine the increase in job opportunities directly within the space sector as well as scientific byproducts that would benefit civilians like those resulting from the lunar landing efforts (microwave ovens, personal computers via microchip technology, Teflon skillets, WD-40, and more). In WWII, the US had time to prepare our industrial base and our population for war before the Japanese attacked in December 1941. If we wait to react to an event like Pearl Harbor in the space domain, it may be too late to win the conflict. We must continue to lead the way in space as we have in the air domain; too much is at stake to choose another path.

## CYBERSPACE CAPABILITIES IN THE AIR FORCE

All US war fighters either operate in cyberspace or rely on technology and tools that utilize cyberspace for connectivity. On November 2, 2006, when he was the SECAF, the Honorable Michael W. Wynne said, “All the military’s C2 [command and control] information flow moves in the cyber domain, meaning the entire flow can be vulnerable to a cyberspace attack ... How shall we defend the communication net on which all our capabilities depend? This question is critical. Our ability to fight in ground, sea, air, and space depends on communications that could be attacked through cyberspace.”<sup>107</sup> JP 1-02 defines cyberspace as “A global domain within the information environment consisting of the interdependent network of information technology infrastructures, including the Internet, telecommunications networks, computer systems, and embedded processors and controllers.”<sup>108</sup> DOD expects to freely use cyberspace and depends on communications via cyberspace, but this is a very vulnerable domain.

Unlike operations in the air and space domains, the Air Force has peer competitors in cyberspace. In what some called the first war in cyberspace in April 2007, Estonia was hit primarily by distributed denial of service attacks originating from Russia (although the Russian government denied any role in the attacks) targeted multiple government agencies (including the president, the prime minister and Parliament), Estonia’s largest bank, and many daily newspapers creating a national security crisis in the small Baltic country.<sup>109</sup> Richard Halloran wrote, “the Chinese are assembling a cyber apparatus intended to gather intelligence from US telecommunications and , if hostilities erupt, to close down US electronic communications and computers.”<sup>110</sup> Lieutenant General William T. Lord, the Air Force’s Chief Information Officer and Chief of Warfighting Integration in the office of the SECAF and the former Commander of

Air Force Cyberspace Command (Provisional), in contrasting enemy jamming attacks with potential data manipulation where an enemy injects false information into an otherwise fully operational network, said intruders changing data “is quite frankly, more frightening to me, because you make incorrect decisions based on information that has been changed.”<sup>111</sup> In his address on September 14, 2009, Secretary Donley observed that no US service member had come under attack by enemy aircraft in over 55 years “and certainly we intend to keep it that way;” but he contrasted the threat in cyberspace stating that the last time a service member came under cyber attack “was at the beginning of this sentence.”<sup>112</sup> Clearly, offensive cyberspace capabilities are not an Air Force, DOD, or even a US monopoly.

In narrowing the aperture to focus on China’s cyberspace capabilities, China has already “organized, trained, and equipped” significant numbers of cyber warriors who have both the tools and expertise to hack into US (civilian, military, and government) systems.<sup>113</sup> In a study of Chinese cyberspace operations, the Congressionally established US-China Economic and Security Review Commission reported that the People’s Liberation Army (PLA) is tasked (in future conflicts) to attack ISR platforms with ASAT weapons and multiple jamming capabilities while widely employing computer network tools very early in a conflict (even preemptively) in order to delay US military deployments and reduce the combat effectiveness of troops already located in the region.<sup>114</sup> The report explains that the PLA is recruiting and incorporating people with specialized computer skills from academia, industry, and even certain parts of the hacker community in China.<sup>115</sup> Both the US government and private industry are intelligence collection targets for China’s maturing cyberspace capabilities.<sup>116</sup> “I’m often asked what keeps me up at night. Number one [is] the cyber threat,” said Deputy Secretary of Defense William J. Lynn III;

“If we don’t maintain our capabilities to defend our networks in the face of an attack, the consequences for our military, and indeed for our whole national security, could be dire.”<sup>117</sup>

Before looking at the current organization of USAF cyberspace forces, a fundamental understanding of the domain, doctrinal terms, and the link to IO is required. According to joint doctrine, cyberspace is “A global domain within the information environment consisting of the interdependent network of information technology infrastructures, including the Internet, telecommunications networks, computer systems, and embedded processors and controllers.”<sup>118</sup> Cyberspace is fundamentally different from the domains of air, space, land, and sea because cyberspace must be created and, to a certain extent, maintained by people. No, the electromagnetic spectrum is not created by humans. However, cyberspace requires an infrastructure to exist (servers, routers, switches, cables, satellites, etc.). Therefore, the cyberspace domain must be established and maintained in order to exist.

Joint and Air Force doctrine use different terms to describe similar activities in cyberspace. Joint doctrine refers to computer network operations (CNO) as an overall term that includes attack, defense, and exploitation enabling operations while the Air Force uses the term network warfare operations (NW Ops).<sup>119</sup> Attacks using computer network capabilities to affect information within the network or the actual networks themselves are called computer network attack (CNA) in joint doctrine and simply network attack (NetA) by the Air Force.<sup>120</sup> Defensive actions to protect both friendly networks and information are referred to as computer network defense (CND) and network defense (NetD).<sup>121</sup> The final area combines the collection of information and data from both friendly and adversary automated information systems and networks which is computer network exploitation (CNE) or network warfare support (NS) in the Air Force.<sup>122</sup> CNE/NS is the critical link to both the CNA/NetA and CND/NetD actions in

cyberspace “to find, fix, track, and assess both adversaries and friendly sources of access and vulnerability for the purpose of immediate defense, threat prediction and recognition, targeting, access and technique development, planning, and execution in NW Ops.”<sup>123</sup> CNO/NW Ops are fundamentally different from military activities that simply utilize cyberspace (such as C2 and communications); CNO/NW Ops require highly specialized training and skill sets and the proper authorities (such as Title 10 and Title 50) to execute cyberspace missions.<sup>124</sup> However, like all military operations, the goal is to “achieve desired effects” through or in cyberspace.<sup>125</sup>

Just as there are differences in CNO/NW Ops terminology between USAF and joint doctrine, there are also slight differences in IO. Joint doctrine identifies five core capabilities in IO: electronic warfare (EW), CNO, psychological operations (PSYOP), military deception (MILDEC), and operations security (OPSEC).<sup>126</sup> Air Force IO doctrine identifies three capabilities: influence operations (which includes PSYOP, MILDEC, and OPSEC *plus* counter-intelligence operations, counterpropaganda operations, and public affairs operations), NW Ops (CNO), and EW operations.<sup>127</sup> CNO/NW Ops is the only capability in both doctrines that is a relatively new IO capability. While EW is a relatively young capability compared to all the others (except CNO/NW Ops), EW was well established before the creation of computer networks in cyberspace. Both joint and Air Force doctrine agree that CNO/NW Ops is a core capability of IO.

While the Air Force operates daily in the cyberspace domain, based on my experience in the 67<sup>th</sup> Network Warfare Wing, this is the domain where our doctrine, thinking, and operations are still immature when compared to air and space operations. Even more so than space, the Air Force does not yet have the forces to effectively “fly, fight, and win” in cyberspace when compared to current threat capabilities. In January 2010, the Air Force’s first cyberspace NAF

(24 AF) achieved initial operational capability.<sup>128</sup> Subordinate to AFSPC, 24 AF has three subordinate wings: Network Warfare, IO, and Combat Communications.<sup>129</sup> But this tells only part of the story of Air Force cyberspace organizations.

On November 2, 2006, Secretary Wynne said, “Today I am announcing the steps the Air Force is taking towards establishing an Air Force Cyberspace Command. The aim is to develop ultimately a major command that stands alongside Air Force Space Command and Air Combat Command as the providers of forces on whom the President, combatant commanders, and the American people can rely for preserving freedom of access and commerce in air, space, and, now, cyberspace.”<sup>130</sup> Although a provisional Air Force Cyberspace Command (AFCYBER) was activated in October 2007, the Air Force decided to create a cyberspace NAF (24 AF) instead. In October 2008, AFSPC was designated as the lead MAJCOM for cyberspace capabilities. During this period, the Air Force decided to activate Air Force Global Strike Command (AFGSC) in order to create unity of command for all Air Force nuclear forces. One could conclude that the Air Force priorities changed and it did not have the resources to activate two new MAJCOMS (AFCYBER and AFGSC). So, AFCYBER went from a MAJCOM to a NAF.

In order to become dominant in cyberspace operations, to win the current cyberspace fight, and to develop future capabilities in cyberspace, the Air Force needs to activate AFCYBER as a new MAJCOM solely dedicated to operations in cyberspace. In the current construct, cyberspace and space priorities must compete against each other for resources *within* AFSPC even before they compete against all the other MAJCOM priorities at the corporate Air Force level. This puts both space and cyberspace forces at risk in gaining the required resources and personnel to create desired effects for the joint warfare team. Because cyberspace is such a different domain, we need innovative Airmen dedicated to operations in cyberspace. Unlike the



physical domains, the cyberspace domain can be attacked and degraded, disrupted, and even destroyed to varying degrees. This creates a critical difference from the other domains—the requirement to protect the Air Force (and DOD) cyberspace domain. Questions of attribution and defining an act of war in cyberspace make operations both difficult and ambiguous. US reliance on technology and the use of cyberspace to communicate, conduct reachback operations, C2 military forces, conduct ISR operations, and use of GPS (for precision guided munitions, navigation, and timing) make US operations very vulnerable to attacks in and through cyberspace. From a CNO/NW Ops perspective, the Air Force must team with US Cyber Command (USCYBERCOM) and the National Security Agency (NSA) to successfully conduct CNA/NetA, CNE/NS, and CND/NetD. All of these operations are inextricably linked in cyberspace and require specialized skill sets and understanding of the domain to conduct successful operations. The threats are real and the risks are high. The Air Force must preserve and maximize friendly use of cyberspace to conduct effective operations in the air, space, land, and sea domains. With three and a half years of perspective, Secretary Wynne’s vision of an AFCYBER MAJCOM makes even more sense.

## CONCLUSION

In a memorandum to all Airmen dated September 15, 2008, Secretary Donley and General Schwarz unveiled the new Air Force mission statement, which reads: “The mission of the United States Air Force is to fly, fight, and win...in air, space and cyberspace.”<sup>131</sup> This draws on the rich history and heritage of the Air Force since we became a separate service in 1947 while also looking forward as to how we will defend our country in the future. Theorists such as Douhet and Mitchell saw fundamental differences in the desired effects that could be achieved through the air domain. In fact, airpower leaders such as Arnold, Spaatz, and LeMay, in working to create an independent Air Force, pointed to strategic bombing as a military means to achieve decisive desired effects as Tami Davis Biddle recounted, “During World War II, British and American air forces sought to prove the soundness of the central claim of the interwar years: that modern societies and economies are vulnerable to aerial bombardment.”<sup>132</sup> As a military service, Airmen are enamored with technology; in analyzing our culture, Carl Builder asserted that “The Air Force could be said to worship at the altar of technology. The airplane was the instrument that gave birth to independent air forces.”<sup>133</sup> Builder went on to conclude that “For the Air Force, the aerodynamic performance and technological quality of its aircraft have always been a higher priority than the number.”<sup>134</sup> Airmen want their aircraft to fly higher and faster with stealth and precision munitions to maintain their tactical and technological advantage in the air. Realizing the need for economy of force when applying precious and limited air assets, Warden and Deptula emphasized the desired effects of air operations with a vision beyond the traditional military strategies of attrition and annihilation. Notwithstanding Warden and Deptula’s insightful focus on desired effects in warfare, strategic bombing using both conventional and nuclear munitions is still a defining trademark of the USAF.

Unfortunately, our preoccupation with bombing campaigns deep into enemy territory bypassing the enemy's fielded forces has sometimes left us ill-prepared for our nation's wars. Two examples include Vietnam where our jet fighters and strategic bombers were not the most effective platforms in a primarily IW campaign and the current support to COIN fights in Iraq and Afghanistan where the Air Force has been slow in building up the capacity of those two PN air forces based on their needs and capabilities. More importantly, the Air Force brings so many other important military means to the joint warfare team in addition to strategic attack. Imagine the US military without USAF forces performing nuclear deterrence, air superiority, ISR, air refueling, airlift (including medical evacuations), space operations (such as GPS, early warning, communications, and spacelift), IO, special operations, CSAR, and weather services.

As Air Force leaders make tough decisions in a fiscally constrained environment, they must focus on building the military means that will create desired effects needed by the joint warfare team in future conflicts. Maintaining conventional superiority in the air domain and reinvigorating the nuclear enterprise clearly remain top priorities for the Air Force. In pledging his support of the F-35 program, Secretary Gates said, "It would be irresponsible to assume that a future adversary—given enough time, money, and technological acumen—will not one day be able to directly threaten US command of the skies."<sup>135</sup> In highlighting the efforts to reinvigorate the Air Force's nuclear capabilities, General Schwartz asserted, "We have to continue to be vigilant and focus to ensure that we produce the level of precision and reliability that's demanded of us."<sup>136</sup> It is imperative that the Air Force continue to provide superior conventional air forces and professional nuclear deterrent ICBM and bomber forces for future joint operations.

While sustaining conventional superiority in the air domain and reinvigorating the nuclear enterprise, the Air Force must combine its expertise in cutting edge technology,

offensive operations, and innovative problem solving to prepare for future small wars and conflicts in both the space and cyberspace domains as well. IW is a critical part of the USAF's special operations forces where more capacity and capabilities are required. The SecDef acknowledged the increase in Air Force IW spending but said IW is "not exactly an existential threat to overall modernization accounts" and is still a small portion of the overall Air Force budget.<sup>137</sup> At the same time, Secretary Gates insisted that rushing new COIN tools into the current fights as quickly as possible is "the most important thing to do."<sup>138</sup> Gates applauded the Air Force for looking at "inexpensive, rugged light strike and mobility aircraft suited to IW [irregular warfare]."<sup>139</sup> The Air Force has a rich history in Lansdale, Aderholt, and others in fighting small wars and has started down the right path in bolstering its IW capabilities. The military means inherent in a robust IW wing are critical to the joint team.

In addition to the US armed forces, the US public and private sectors as well as numerous countries are heavily invested in Air Force space capabilities such as GPS.<sup>140</sup> For example, China relies on GPS for targeting and precision navigation.<sup>141</sup> US space systems face a myriad of threats across all domains and suffer from a lack of unity of command which inherently degrades unity of effort. Threats to all segments of US space systems range from ASAT to overly crowded orbital bands filled with both orbital vehicles and space junk to terrestrial-based jamming which can now reach satellites in medium Earth orbits.<sup>142</sup> Although 14 AF's JSpOC actively tracks more than 19,000 major space objects, NASA believes space may actually be littered with ten times more objects in orbit.<sup>143</sup> Dr. Palowitch, the first Director of the joint NRO-AFSPC Space Protection Program, explained that from 1989 to 2007 the US greatly increased its space-based capabilities in sensing, communications, positioning, navigation, and timing (resulting in a massive increase in dependence on those functions) without investing

much in the defense of those critical space-based assets.<sup>144</sup> While there is significant international interest in minimizing space debris, solutions such as laser ablation of space junk or ways to move an object to a lower orbit where it would burn up in the Earth's atmosphere are still in the conceptual stages of development.<sup>145</sup> Considering the variety of threats to the space enterprise, Palowitch emphasized the importance of finding alternatives to activities that rely heavily on access to space and said, "We're not trying to save satellites. We're trying to preserve our national space effects."<sup>146</sup> Until responsibility for USAF's cyberspace forces is removed from AFSPC, resources (personnel, money, thought, equipment) will be divided as space and cyberspace priorities are forced to compete against each other within the same MAJCOM. Additionally, all national security space forces should be aligned under AFSPC to create both unity of command and effort. A top priority mission in AFSPC will remain the expansion and preservation of its ability to provide space effects to joint forces in combat.<sup>147</sup>

As USCYBERCOM is activated as a sub-unified, four-star command subordinate to US Strategic Command and collocated with the NSA at Fort Meade, Maryland, 24 AF is slated to become the Air Force component command to USCYBERCOM.<sup>148</sup> DOD leadership must have determined that the old Joint Force Component Command-Network Warfare and the Joint Task Force-Global Network Operations were insufficient to meet national security requirements in cyberspace. The Air Force would do well to follow DOD's lead. Former Secretary Wynne explained how air, space, and cyberspace are fundamentally different domains when he said, "Just as the air domain is governed by aerodynamic forces, and the space domain by orbital mechanics, cyberspace has mathematical and electromagnetic principles at work."<sup>149</sup> The Air Force needs an AFCYBER MAJCOM to: create unity of command and effort, prioritize resource requirements for cyberspace forces, expand and hone expertise in all areas of CNO/NW

Ops, develop cyber warriors and cyber-mindedness, and determine how cyberspace can best integrate with the other IO capabilities. Wynne described the complexity of this domain when he said, “Due to the size of the global information grid and easy access to the electromagnetic spectrum, effects in cyberspace can take place nearly simultaneously at many places. Effects can be massive or precise, lasting or transitory, kinetic or nonkinetic, lethal or nonlethal,”<sup>150</sup> and creating cyberspace forces to achieve desired effects for the joint warfare team is what must drive Air Force Title 10 decisions in this realm.

The Air Force’s performance since 1947 has shown the wisdom in creating a separate service dedicated to operations in the air domain and has added an Airman’s perspective to enhance the joint team’s thoughts, perspectives, and capabilities. While the Air Force is dominant in conventional air operations, it needs improved capabilities in IW, space, and cyberspace to effectively defend the US and win both current and future conflicts. In addressing the complex threats to US national security, Secretary Donley said the Air Force is working to create “more strategic balance” and emphasized that threats “should not be classified as regular or irregular, high end or low end,” for the Air Force must possess “a portfolio of military capabilities with maximum versatility.”<sup>151</sup> General Schwartz explained a new theme of “calibrated ambition” where some tasks will aim to achieve sufficiency rather than dominance because mission requirements are multiplying with no change in personnel numbers.<sup>152</sup> The CSAF noted that while the Air Force has had to put out some “wildfires” recently, the time has come when “we must raise our sights to focus on the longer-term vision.”<sup>153</sup> In this vein, he has directed Werner J.A. Dahm, the Air Force’s chief scientist, to “identify the most promising technologies our Air Force can adopt, to give us the flexibility to respond to the changes in all aspects of warfare—irregular, conventional, and nuclear.”<sup>154</sup> Putting the current situation in

perspective, Secretary Donley said, “The strategic environment, new technologies, and a full cycle of resource changes—first up, then down, then flat—have brought us to a different place, and they compel us in new directions.”<sup>155</sup> His conclusion was that the Air Force “must be bold and embrace change. ... We have been challenged many times in our history, and this is yet another test.”<sup>156</sup>

## APPENDIX A: ACRONYMS & ABBREVIATIONS

ACSC	Air Command and Staff College
AETC	Air Education and Training Command
AFCYBER	Air Force Cyberspace Command
AFDD	Air Force Doctrine Document
AFGSC	Air Force Global Strike Command
AFSOC	Air Force Special Operations Command
AFSPC	Air Force Space Command
ASAT	anti-satellite
BPC	building partnership capacity
C2	command and control
CAS	close air support
CBP	capabilities-based planning
CC	critical capability
CCDR	combatant command
CIA	Central Intelligence Agency
CJCS	Chairman of the Joint Chiefs of Staff
CNA	computer network attack
CND	computer network defense
CNE	computer network exploitation
CNO	computer network operations
COG	center of gravity
COIN	counterinsurgency
CR	critical requirement
CSAF	Chief of Staff of the Air Force
CSAR	combat search and rescue
CV	critical vulnerability
DOD	Department of Defense
EBAO	effects-based approach to operations
EBO	effects-based operations
EW	electronic warfare
FID	foreign internal defense
FMS	foreign military sales
GPS	global positioning system
ICBM	intercontinental ballistic missile
IO	information operations
IOP	instrument of national power
ISR	intelligence, surveillance, and reconnaissance
IW	irregular warfare



JFC	joint force commander
<i>JFQ</i>	<i>Joint Forces Quarterly</i>
JOPP	Joint Operation Planning Process
JP	Joint Publication
JPME	Joint Professional Military Education
JS	Joint Staff
JSPOC	Joint Space Operations Center
LEO	Low Earth Orbit
MAGTF	Marine Air-Ground Task Force
MAJCOM	major command
MILDEC	military deception
NAF	numbered air force
NASA	National Aeronautics and Space Administration
NCW	network-centric warfare
NDU	National Defense University
NetA	network attack
NetD	network defense
NMS	National Military Strategy
NRO	National Reconnaissance Office
NS	network warfare support
NSA	National Security Agency
NW Ops	network warfare operations
OEF	Operation ENDURING FREEDOM
OIF	Operation IRAQI FREEDOM
ONA	operational net assessment
ONE	Operation NOBLE EAGLE
OPSEC	operations security
PCS	permanent change of station
PLA	People's Liberation Army
PN	partner nation
PSYOP	psychological operations
SA	security assistance
SECAF	Secretary of the Air Force
SecDef	Secretary of Defense
SOS	special operations squadron
SoSA	system-of-systems analysis
SPP	Space Protection Program
UAV	unmanned aerial vehicle
US	United States
USAF	United States Air Force

USCYBERCOM	United States Cyber Command
USJFCOM	United States Joint Forces Command
USMC	United States Marine Corps
USSOCOM	United States Special Operations Command

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