BOMBING FOR EFFECT: THE BEST USE OF AIRPOWER IN WAR

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by

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Both joint and Air Force doctrine are clear on the intent of the US to use effects-based targeting in military conflicts for the foreseeable future. The Air Force embraced this concept as early as World War II, but has met with mixed results. This thesis answers the question of how the Air Force can improve its effects-based air campaigns. The author analyzes existing doctrine for the official guidance on effects-based operations. The current guidance is followed with the effects-based ideas expressed by prominent airpower theorists throughout history. Four case studies are then analyzed based on these ideas to indicate how the Air Force has performed in recent history. This thesis concludes that the Air Force can improve its effects-based air campaigns by improving the planning process as well as educating civilian and military leadership on the effects-based concept. Planners must understand the objectives at all levels of war, and these objectives must be clear, measurable, and achievable. Education of civilian and military leaders is crucial for the development of clearly defined objectives and successful execution of a plan designed to achieve specific effects, not just the destruction of individual targets.

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ABSTRACT

BOMBING FOR EFFECT: THE BEST USE OF AIRPOWER IN WAR by Major Patrick N. Ahmann, USAF, 73 pages.

Both joint and Air Force doctrine are clear on the intent of the US to use effects-based targeting in military conflicts for the foreseeable future. The Air Force embraced this concept as early as World War II, but has met with mixed results. This thesis answers the question of how the Air Force can improve its effects-based air campaigns.

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ACRONYMS

ACTS	Air Corps Tactical School
AI	Air Interdiction
AO	Area of Operations
ATO	Air Tasking Order
BDA	Battle Damage Assessment
C3	Command, Control, and Communications
CAS	Close Air Support
CINCPAC	Commander in Chief, Pacific
COA	Course of Action
COG	Center of Gravity
CONPLAN	Concept of Operations Plan
EBO	Effects-Based Operations
IADS	Integrated Air Defense System
ISR	Intelligence, Surveillance and Reconnaissance
JAOP	Joint Air Operations Plan
JFACC	Joint Force Air Component Commander
JFC	Joint Force Commander
KTO	Kuwaiti Theater of Operations
LOC	Lines of Communication
MOE	Measures of Effectiveness
NATO	North Atlantic Treaty Organization
NBC	Nuclear, Biological, and Chemical
NVA	North Vietnamese Army

OODA	Observe, Orient, Decide and Act
POL	Petroleum-Oil-Lubricants
ROE	Rules of Engagement
SAM	Surface-to-Air Missile
US	United States
USAF	United States Air Force
USAFE	United States Air Forces in Europe
USEUCOM	United States European Command

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CHAPTER 1

INTRODUCTION

Like many other new technologies, the use of airpower in war has gone through many changes as military leaders struggle to maximize its potential. Airpower assets have the unique capability to operate in all parts of an area of operations (AO) unrestricted by terrain and enemy fielded forces. This capability allows the military great flexibility in prosecuting targets to successfully achieve campaign objectives. However, airpower assets are a finite resource and great care must be taken to avoid minimizing the effects they can deliver.

Much has been written about effects-based operations (EBO) throughout history, and the concept seems fairly simple on the surface. The leadership sets the objectives, and the military applies force in such a manner as to achieve effects that will allow attainment of those objectives. *Joint Vision 2020* recognized the importance of EBO by stating,

> The concept of precision engagement extends beyond precisely striking a target with explosive ordnance. Information superiority will enhance the capability of the joint force commander to understand the situation, determine the effects desired, select a course of action and the forces to execute it, accurately assess the effects of that action, and reengage as necessary while minimizing collateral damage. During conflict, the commander will use precision engagement to obtain lethal and nonlethal effects in support of the objectives of the campaign. (US Joint Chiefs of Staff 2000, 22)

Most military planners have a working knowledge of this concept and focus attention on enemy centers of gravity (COGs) as a means to achieving objectives, instead of relying on attrition warfare. The Air Force in particular, has embraced this concept in order to improve the efficiency of air campaigns. As a matter of fact, both joint and Air

Force doctrine direct planning efforts to focus on desired effects. With the improved technology of weapons and aircraft, the Air Force can destroy targets with startling accuracy and minimum resources. These improvements have allowed the Air Force to achieve desired effects in its recent conflicts, but the process is not perfect. In today's world, long-protracted campaigns are deemed unacceptable. The military must strive to speed up the process without increasing collateral damage on civilian targets. In most cases, COGs will consist of numerous possible targets. Some of these individual targets are critical to the entire source of power that the COG provides the enemy. Which target sets can be destroyed, with the minimum use of power, which will have the most impact on enemy COGs and deny the enemy that source of power? For example, if an enemy's petroleum production capability is identified as a COG, the air campaign could focus on destruction of a few key major pipelines instead of numerous attacks against refineries and storage facilities. How can the military, particularly the Air Force, use all its resources in the best way to achieve the desired effects? In short, can effects-based air campaigns be done better?

Background

Throughout the short history of the Air Force, both military and civilian leaders and planners have tried to come to a consensus on the best use of airpower in war. Should the Air Force support the more traditional services of the Army and Navy or should it take on its own role and shape the outcome of war on its own merit? It has become generally accepted that the Air Force can and should operate independently and can have tremendous impact on an enemy's ability to wage war against the United States. As a matter of fact, airpower has been a very lethal and effective force in all major conflicts

since World War I. These successes do not necessarily mean that the US has used that airpower in the most efficient manner. Lessons learned from the Vietnam conflict demonstrate the ineffectiveness of air campaigns not targeted on the correct enemy center of gravity despite great destructive capability.

EBO gives planners the ability to start with a desired effect and work backwards to make the correct targeting decisions in order to achieve that effect. EBO theory has been around for a long time in various forms and is not limited to the use of airpower. Theorists throughout history have discussed the merits of striking vital centers and COGs as a more efficient method of warfare than slugging it out army against army in open fields. Second and third order effects have been studied to help define targets whose destruction will provide the most gains toward the overall desired effect. Early airpower theorists, such as Guilio Douhet and Billy Mitchell, advocated, at varying degrees, the use of strategic bombing to achieve effects against enemy infrastructure and COGs. A good example of this strategy in action occurred in World War II when the United States attacked German ball-bearing factories in an effort to disrupt German industrial capability by destroying one key component critical to countless systems. This was correctly identified as a COG, but the United States did not have the technology to do enough damage to the equipment inside the buildings to create long-term setbacks on German production (US Strategic Bombing Survey 1945, 397). The US today embraces the idea of effects-based targeting. Huge technology gains have produced the ability to strike large numbers of targets with great accuracy, improving the chances for more successful effects-based air campaigns. Additionally, technology also enhances the US's ability to assess the results of air strikes and to interpret the resulting effects.

The Vietnam War provides several different air campaigns to examine. Operation Rolling Thunder targeted the flow of men and supplies moving south to support the Viet Cong insurgency. There were numerous problems associated with this campaign that will show it to be a bad example of an effects-based air campaign. First of all, the US applied conventional tactics to an unconventional situation. Targets were severely restricted in an effort to keep the war from escalating and were not chosen to achieve any specific effect other than killing or destroying men and equipment. Operations Linebacker I and II were much more successful as both occurred later in the war. The conflict had become more conventional by then, and some of the bombing restrictions were lifted. The Air Force now struck at the industrial heart (Hanoi and Haiphong) of the enemy and had some success. Eventually, the North Vietnamese agreed to meet the US for peace talks (Pape 1996, 195). Overall, it seems that in the COG analysis, the Vietnamese ability to adapt and withstand punishment was underestimated. The key lesson learned here is to better understand the enemy to properly identify and attack COGs that will take away its ability, or will to fight.

The 1999 conflict in Kosovo is an opportunity to look at a campaign using airpower as the only military instrument of power. In the end, Operation Allied Force was a success, but once again airpower was not used optimally. This was the first time the North Atlantic Treaty Organization (NATO) had been in combat. The political goals of the many different participating nations were not necessarily complementary and this led to some unclear objectives for the air campaign. These conflicting goals, including differing goals within the US chain of command, made it difficult to plan and execute a coherent bombing campaign from start to finish. Additionally, the outright statement that

NATO would not use ground forces gave the enemy hope that they could withstand the air strikes. Without the threat of ground attack, Allied air strikes took longer than anticipated to achieve the desired goals as the enemy attempted to outlast the Allies' will to stay engaged (Clark 2002, 206). Even with these problems, airpower alone was successful in achieving Allied military goals and objectives.

Operation Desert Storm set the standard for a successful air campaign in modern times (results of Operation Iraqi Freedom yet to be determined). This time the US had fairly clear objectives and time to thoroughly plan both the air and ground campaigns. Air strikes were conducted against Iraqi COGs with what appeared to be great success. For example, key strikes knocked out electrical power in Baghdad causing a communication breakdown between Iraqi leadership and its armed forces. With minimal loss of life, the air campaign set the table for an extremely effective ground campaign.

An examination of effects-based bombing as the primary focus of the use of airpower in the US military is important since it encompasses all branches of the military and their expectations on the conduct of war. The US military has accepted effects-based targeting as the proper way to conduct operations. "In achieving the JFC's (Joint Force Commander) objectives, targeting is concerned with producing specific effects. Targeting analysis considers all possible means to achieve desired effects, drawing from any available forces, weapons, and platforms" (JP 3-60 2002, I-4). Airpower is an indispensable aspect of overall combat power and can be expected to play a major role in all major operations. The use of airpower affects American troops at all three levels of war, and a complete understanding of the capabilities and focus of combat air assets is critical for successful joint operations. Furthermore, airpower assets are a limited

resource with tremendous combat capability. Successful campaigns cannot use these scarce resources inefficiently without a negative impact on the outcome.

Research Question

Joint and Air Force doctrine are clear on the intent of the US to use effects-based targeting for the foreseeable future. According to the Joint Publication for Targeting, "The art of targeting seeks to achieve desired effects with the least risk, time, and expenditure of resources" (JP 3-60 2002, I-4). This thesis will attempt to answer how the Air Force can improve on its effects-based air campaigns. As mentioned earlier, this basic questions leads to several secondary and tertiary questions that must be answered.

Subordinate Research Questions

First, what is an effects-based air campaign? In order to discuss improving effects-based air campaigns, the concept must be understood. To understand the concept, this thesis will look at various theories on strategic bombing and explain the various cause and effects resulting from destroying specific targets. A tertiary question logically follows: Does the Air Force consciously work to deliver effects-based air campaigns? Air Force doctrine provides the guidelines for planners and is clear on its intent to achieve specific effects with minimal assets to achieve the overall political goals. This leads to another tertiary question: Are the political objectives clear enough to derive quantifiable military objectives? Unclear political objectives can make the military objective difficult to derive. However, the Air Force must provide its forces clear guidance in order to avoid diluting the power bombing campaigns offer. Additionally, political goals are dynamic and can change mid-conflict, which may alter the military objectives as well. A close

relationship with political leaders is essential to plan effectively and minimize wasted effort in a changing political environment.

The next question that must be answered is whether or not the Air Force effectively plans to achieve the desired effects. Several elements need to be addressed to answer this question: (1) Are enemy centers of gravity correctly identified and subsequently attacked with effects in mind? (2) Is the enemy's ability to adapt and withstand losses addressed when considering the desired effects? and (3) Do the other services understand the plan or compete with it with conflicting goals? A planning methodology that keeps the focus on effects all the way down to the tactical level is crucial for all war fighters, not just the Air Force.

Next, this thesis will answer whether or not the US was successful in achieving the desired 2nd and 3rd order effects during the Vietnam, Desert Storm and Allied Force bombing campaigns. It will compare the different air campaigns in terms of what went right and what went wrong as it relates to effects-based bombing. Answering these questions from recent history can help find the most efficient path to take in future conflicts. Although all wars are different, some fundamental lessons learned from all can be used to expand the capabilities base for the next one.

Finally, does the Air Force apply the effects-based concept at the tactical level, or does it try to plug in the aircraft traditionally used for particular mission sets? Misapplication of airpower can have disastrous results from the strategic all the way down to the tactical level. Traditional roles and missions for different aircraft types are not necessarily the best when thinking in terms of EBO. If the desired effect in a tactical situation were to kill tanks, asking for a four-ship of A-10s (tactical ground attack

aircraft) that are not in the area when a two-ship of B-1s (strategic bombers) is overhead might illustrate a misuse of airpower. The asset used is not important as long as it has the correct weapons on board to get the job done. It does not matter if the aircraft is a strategic bomber or tactical fighter as long as it has the capability to achieve the desired effect. These questions will be answered as a means to answer the primary research question. In addition, several assumptions and delimitations were necessary to narrow the scope of this thesis.

Assumptions

Several assumptions were made in developing this thesis in order to provide focus. The first major assumption is that effects-based targeting and effects-based air campaigns are no longer up for debate. The US is attempting to prosecute campaigns with desired effects in mind as the new joint publications indicate. The next assumption is that US intelligence and planners have the capability to identify critical target sets within a COG that will enable achievement of the desired effects. The final assumption is that planners can differentiate between desired effects for a long-term campaign versus those achievable for short-term or low-intensity conflicts. Obviously, some effects will not be apparent in a short time period, while others will manifest themselves almost immediately. In addition to these assumptions, some delimitations were needed to keep the focus appropriately narrowed.

Delimitations

First, it is necessary to restrict the analysis to the more recent air campaigns. Valuable information can be gathered through the study of the air campaigns from World War I through the Korean War, but technology has advanced so dramatically in the last

few years as to make in-depth analysis of the more recent campaigns much more relevant in terms of effects-based air campaigns. Additionally, it is necessary to select just a few of these campaigns for more than a cursory examination in order to maintain focus.

Furthermore, a detailed explanation of different weapons systems and the weapons themselves will not be addressed except to illustrate major points. A thorough discussion of the capabilities and limitations of all the systems available to the combatant commander would require much more space than available in this thesis and the information is available in various service publications.

Next, this thesis will not attempt to address all the potential COGs and the associated target sets within those COGs that may be targeted. The purpose of the thesis is not to create a targeting manual. Detailed targeting information can be found in the *Joint Munitions Effectiveness Manual*. The possibilities are endless and will only be addressed to provide examples or highlight a major idea.

Lastly, this thesis will be unclassified which limits some discussion on aircraft and weapons capabilities as well as precludes the inclusion of large amounts of information on ongoing operations. In the long run these operations may provide great information on effects-based air campaigns, but classifying this thesis will limit accessibility.

CHAPTER 2

LITERATURE REVIEW

The literature written on subjects relevant to the research topic is summarized in this chapter. The first part of the chapter examines existing joint and Air Force doctrine as it discusses EBO. Various works on airpower theory are analyzed next. This area covers the effects-based ideas of some of the more prominent airpower theorists throughout history as well as covering more recent works on the subject. The study of doctrine and airpower theory then gives a foundation to critically examine the more recent air campaigns of Operations Rolling Thunder, Linebacker I and II, Desert Storm, and Allied Force.

Doctrine

The study of US military doctrine sets the stage for an analysis of effects-based air campaigns. Effects-based targeting is emphasized in both joint and Air Force doctrine as being extremely important to successful operations. EBO is not just a theory worth discussing, but a fact of life in the United States Air Force (USAF). Joint Publication 3-0 brings up the critical nature of enemy COGs. It states that the "essence of operational art lies in being able to mass effects against the adversary's sources of power in order to destroy or neutralize them" (JP 3-0 2001, III-22). It goes on to state that neutralizing these COGs is the most direct path to victory but that they can change at any given time and may be difficult to discern. Detailed knowledge and understanding of an adversary's physical and psychological strengths and weaknesses as well as how they organize, fight, and make decisions is essential to properly identifying enemy COGs (JP 3-0 2001, III-22). Joint Publication 3-60 links the importance of the commander's objectives, COGs

and decisive points as essential to meeting the JFC's objectives and intent through joint force effects. Joint forces will typically attack COGs thoughout the AO by attacking targets or target sets to achieve specific desired effects while minimizing collateral damage (JP 3-60 [2002], V-VI). It also goes on to emphasize the importance of focusing on achieving the desired effect instead of concentrating on the weapons and delivery platforms. "The art of targeting seeks to achieve desired effects with the least risk, time, and expenditure of resources" (JP 3-60 2002, I-4).

Joint doctrine addresses information superiority as a key enabler for successful EBO. Linking sensors, delivery systems and desired outcomes is pivotal to the success of effects-based targeting. The desired outcome is critical since targeting effects are more than the results of an attack on a specific target, but are the cumulative results of actions taken on enemy target complexes, systems, or functions. Information superiority is not limited to friendly capabilities, however, understanding the adversary's intentions and needs enable the use of various means to produce effects against the enemy's critical vulnerabilities (JP 3-60 2002, I-5 - I-6).

Assessing the results of EBO is also addressed in both Air Force and joint doctrine. Measures of effectiveness (MOEs) are the tools used to determine the success of overall missions and tasks. These MOEs go beyond body count and number of vehicles destroyed. "The key is to determine when the predetermined conditions have been met that affect adversary operational employment or overall strategy and whether or not the anticipated effects are occurring" (JP 3-60 2002, I-8). Accurate intelligence will help to ensure that proper assessment is taking place. Air Force doctrine says basically the same thing but labels it "measures of success" (AFDD 2-1 2000, 43).

Airpower is the most versatile asset the US has at its disposal to conduct EBO on enemy COGs. Its unique capability to cross-traditional boundaries and strike directly at enemy vulnerabilities is a great strength of the USAF. “Unlike surface forces, modern air and space forces do not normally need to sequentially achieve tactical objectives first before pursuing operational or strategic objectives” (AFDD 1 1997, 13). The proper use of strategic attack can be the most efficient means of employing airpower. It provides the commander far-reaching effects against an enemy while avoiding loss of life and finite equipment (AFDD 1 1997, 52). COG analysis is crucial to the identification of vital target sets within each COG. These vital target sets will have the greatest effect on the enemy COGs at all levels of war if successfully attacked (AFDD 2 2000, 89).

Air Force doctrine also places emphasis on desired effects as the focus of classifying targets. Force should be applied to targets based on the effect their destruction has on the enemy, not where the targets are physically located. Additionally, the desired effects should drive the focus as all levels of war, not the specific weapons used, or the targets attacked. “A given airplane, dropping a given bomb, could comprise a tactical or strategic mission depending on the planned results” (AFDD 2 2000, 2).

AFDD 2-1 continues the theme of linking specific objectives with COGs as mentioned in joint doctrine in its description of the *Joint Air Operations Plan* (*JAOP*). “The *JAOP* links specific air and space objectives and tasks with overall military and political strategy. It also describes centers of gravity, phasing of operations, and resources required” (AFDD 2-1 2000, 2). The *JAOP* is the master air campaign plan that, when integrated with all other joint force plans, will lead to successful accomplishment of US objectives. According to JP 3-30 the *JAOP* is a six-phase process consisting of the

following steps: (1) mission analysis, (2) situation and course of action (COA) development, (3) COA analysis, (4) COA comparison, (5) COA selection, and (6) *JAOP* development (JP 3-30 2003, III-4).

The idea of EBO was not created in the writing of doctrine. It was developed over time from the ideas of a select group of airpower advocates who sought to utilize airpower in the most effective way possible.

Airpower Theory

Douhet and Mitchell

In 1921, Guilio Douhet authored *Command of the Air*, the first major theory of airpower and one of the first to consider specific effects as he developed his employment concepts. He advocated a strategy of neutralizing enemy forces by attacking the essentials of supply, transportation, and fuel. However, his primary mechanism for defeating the enemy was to bomb the vital civilian centers. He claimed victory could be achieved without annihilating the enemy, but with attacking the people's moral resistance and breaking their national resolve to fight. Douhet believed this would be quicker and more humane than the bloody trench warfare of World War I. He saw destruction as a means to achieve specific effects, which would achieve the ultimate objectives (Beagle 2000, 16).

Douhet's theory of war broke down into a few key points that can be abbreviated as follows: (1) there is no distinction between combatants and noncombatants in warfare; (2) successful offensives by surface forces are no longer possible; (3) the advantages of three-dimensional warfare have made it impossible to take defensive measures against an offensive aerial strategy; (4) massive bombing attacks must be launched at the outset of

hostilities against the enemy centers of population, government, and industry to shatter enemy civilian morale; and (5) to accomplish this, an independent air force armed with long-range bombers is the primary requirement (Paret 1986, 630). Douhet argued that gaining command of the air is best achieved by destroying the enemy's air forces on the ground. Once command of the air is gained, the next step is to exploit the advantage immediately to punish the civilians. Attacks on the cities and other critical targets would convince the population to force their leadership to give up (Mets 1999, 13-14).

Although many of Douhet's ideas still hold up today, he did make some assumptions which no longer hold true, or at least not in all cases. First, he assumed the bomber would always get through. This proved false in World War II, and air superiority is accepted as a priority in today's air wars. Next, he assumed that all wars would be total wars. This is not surprising since he based his theories on the battles of attrition in World War I. Finally, he assumed that civilian morale is unstable. Although this may be true in some cases, many leaders are so entrenched in their power that civilian morale has no impact on their decision-making process (Mets 1999, 12).

William "Billy" Mitchell shared many of Douhet's views, but his perceptions of enemy vital centers evolved over time. Shortly after World War I, he believed the principal mission of the Air Force was to destroy the enemy's air force and military forces on the ground. He later believed that defeating the will of the people, rather than its fielded forces, would be the key to victory. By 1933, he considered the enemy's industry to be the most vulnerable target for airpower (Beagle 2000, 17). This clearly shows the evolution away from attrition-based warfare to strategic level effects-based operations.

Mitchell believed that airpower could decisively attack the enemy's vital centers without first defeating his fielded forces. He believed that decisive strategic attacks on the enemy's vital targets would make war so quick that the overall loss of life would be less than conventional attrition warfare. Unlike Douhet, he opposed targeting civilians directly. He believed that the quick destruction of other vital centers, like industry and infrastructure, would break the morale of the people and would be much more humane (Mets 1999, 34-35).

Mitchell shared many of Douhet's assumptions as he developed his theories on airpower. He believed command of the air was a prime requirement, the bomber will always get through, future wars will be total wars, and civilian morale is fragile. In addition to these assumptions, Mitchell believed that the coming of aviation was revolutionary, that antiaircraft fire was ineffective, that airpower could defend the US more economically than the Navy, and finally, that airmen are a special breed of people, and they alone could understand the proper employment of airpower (Mets 1999, 34). Mitchell differed from Douhet in that he believed that air superiority would mostly be achieved through battle in the air, but he also advocated striking them on the ground. Once air superiority was achieved, airpower would be free to work on the collapse of civilian morale by conducting operations against vital centers (Mets 1999, 36-37).

The Air Corps Tactical School (ACTS) translated Douhet and Mitchell's broad concepts into doctrine for employment against the enemy industrial web. Instructors at the school began to think it might be possible, through careful study of a nation's industry, to single out particular targets whose destruction would bring an entire industry to a halt (Paret 1986, 631-632). These were the early days of COG discussions in the US.

These COGs, or “vital parts” were part of the Air Corps training manuals as early as 1926 (Murray and Millett 1996, 123). With these early theories changing the way the US thought about airpower, the stage was set for EBO with some variations.

Pape

Robert Pape maintains that coercion, at least in conventional wars, succeeds when force is used to exploit the opponent’s military vulnerabilities. Successful exploitation of these vulnerabilities make it infeasible for the enemy to achieve its political goals. He believes that the role of airpower in overseas conflicts is increasing because it can project force more rapidly and formidably than land and naval power (Pape 1996, 1). Airpower can focus on specific categories of targets, attacking either political, economic, population, or military targets in isolation or combination. Additionally, with good intelligence, airpower can attack selective target sets within these categories, which may be helpful if there are bottlenecks in key industries (Pape 1996, 45).

“Denial strategies target the opponent’s military ability to achieve its territorial or other political objectives, thereby compelling concessions in order to avoid futile expenditure of further resources” (Pape 1996, 19). Unlike Douhet and Mitchell, these denial strategies focus on the enemy’s military as the primary COG instead of vital centers or the population. For coercion through denial to succeed, the vulnerabilities of the enemy’s specific strategy must be exploited. This is key since not all military strategies share the same weaknesses. Nation-states today employ two main types of strategies: mechanized (conventional) war and guerrilla (unconventional) war. The most important thing to note here is that mechanized war is highly dependent on logistical and

communications networks, while guerrilla war is not (Pape 1996, 30). Obviously, the coercer must employ a different strategy according to what the enemy is doing.

Pape recognizes that successful coercion may take some time. Even when the costs of continuing a COA outweigh the benefits, governments tend to hold out longer because there are domestic costs to admitting defeat. Concessions may even lead to the fall of the government and the military may fear that it will be dismantled due to disarmament or domestic demilitarization initiatives (Pape 1996, 32-33).

In summary, Pape focuses on strategic effects, gained by attacking the enemy's fielded forces, not direct combat effects, or battles of attrition. His denial strategy maintains that once the enemy realizes that it cannot achieve his military and political objectives, it will concede to the demands of the coercer. He believes that since the enemy's principal means of achieving its objectives is by military force, then that military force is the COG making it vulnerable to defeat (Beagle 2000, 23-24). In order for coercion to be successful in battle, friendly forces must act quickly and keep the enemy off balance. John Boyd's has devoted a large amount of study on the issue of keeping an adversary on the defensive.

Boyd

The bulk of John Boyd's work revolves around the observe, orient, decide, and act (OODA) loop. Observation is the act of sensing yourself and the world around you. Orientation is the combination of heritage, cultural predisposition, personal experience and knowledge that affect how one reacts to the world around him. Decision is the review of COAs available and the selection of the preferred course to be tested. Action is the implementation of the decision. These four elements form an ongoing loop. In other

words, the process does not stop as soon as a decision is acted on; it starts over and continues indefinitely. The key to success in conflict is to get inside the opponent's OODA loop cycle. If successful, the opponent will always be reactive and unable to mount an offensive of his own (Hammond 2001, 4-5).

Boyd developed his OODA loop cycle theory in the air-to-air combat arena. The goal is to get the opponent in a position where he was reacting one or two moves behind what his adversary was able to do; get him out in front using speed, altitude, or direction, and finish him. The key to the process is the speed in which one could change and adapt to changes. If one could adapt faster than his opponent, he could win (Hammond 2001, 4-5). This theory can be applied to EBO planning to create a favorable environment to meet overall campaign objectives. This is what happened at the beginning of the Desert Storm air campaign. Airpower significantly impaired Iraqi radar, communications, and command and control, so they could not respond effectively to coalition attacks (Hammond 2001, 123). Fast decision making and action is only going to be effective in the long run when applied to a coherent strategy. Friendly forces must have a well thought out overall plan that will lend itself to the accomplishment of the strategic objectives. John Warden provides a model for planners to break down an adversary's strengths into defined COGs.

Warden

Colonel John Warden contends that all strategic entities can be broken down into five component parts that he puts into concentric rings. He puts the most crucial element, leadership, in the center and builds outward from there with organic essentials, infrastructure, population, and fielded forces in descending order of importance to the

overall function of the system. Organic essentials represent the enemy's economic production capability, factories, electrical grids, power plants, and refineries. Infrastructure holds the means of transportation and distribution: the bridges, highways, airfields, and ports. Population is self-explanatory, and Warden believes that moral ramifications of hitting this would be too great and unlikely to pay big dividends. The last ring is the enemy's fielded forces, which exist to protect in inner rings (Gordon and Trainor 1995, 78-79).

Warden believes that the most effective strategic plan always focuses on leadership. Even if unable to target leadership directly, the strategy must focus on the mind of the enemy leadership when selecting targets from the other rings. Within each ring there are COGs that when destroyed raise the cost of resistance in the mind of enemy leadership. His overall message is that destruction of the leadership COG will produce total physical paralysis of the system, where successful attack on COGs within the outer rings will produce partial physical paralysis and unbearable psychological pressure upon the leadership (Beagle 2000, 21-22). Basically, he recognizes that fewer COGs exist in the middle rings than the others, but they are more decisive than those on the outer rings. Targeting COGs in all rings simultaneously, or parallel attack, is more effective than sequential targeting (Mets 1999, 60).

In developing his strategic ring concept, Warden made the following assumptions: (1) Human behavior is unpredictable, (2) the effects of military action are more predictable, (3) air superiority is a prerequisite for victory, (4) the offensive is the strongest form of airpower, (5) victory is achieved in the mind of the enemy commander,

with everything directed toward that end, and (6) Americans are even more sensitive to friendly and enemy casualties than ever before (Mets 1999, 59).

Warden believes that the art of air campaign planning is vital and that once air superiority is achieved, airpower can be used either as a supporting or supported force and can even function independently to achieve decisive effects. His first priority is air superiority for all operations in the air or on the ground, although it can sometimes be achieved in parallel with other objectives rather than in sequence. Building on the idea of parallel attack, Warden believes that sometimes an air attack can serve more than one role. For example, the destruction of petroleum supplies can aid both the air superiority and interdiction campaigns. He also believes that airpower must be used efficiently. The large air battles envisioned by Mitchell would be much less efficient in the battle for air superiority than the Douhet view of destroying the enemy air forces on the ground. Additionally, Warden argues that air interdiction (AI) is preferable to close air support (CAS) on the basis of efficiency (Mets 1999, 59-60). Warden's ideas were put to the test in Desert Storm and have been expanded by a former member of his team, General David Deptula.

Deptula

As a Lieutenant Colonel, General David Deptula was a member of Warden's planning team at the Pentagon that developed the initial air campaign for Desert Storm. After Warden was sent back home by Lieutenant General Horner, the JFACC, Deptula was kept in theater to further develop the plan with Brigadier General Glosson (Gordon and Trainor 1995, 95-96). Influenced by Warden and the Desert Storm air campaign, Deptula furthered the concepts of parallel war and EBO.

> War colleges teach two primary forms of warfare--attrition and annihilation. The Gulf War demonstrated another--control through the application of parallel war. The strategies of annihilation and attrition rely on sequential, individual target destruction as the ultimate method of success and measure of progress—generally measured in terms of forces applied, or input. Using effects-based operations, the determinant of success is effective control of systems that the enemy relies upon to exert influence--output. Changing the way we think about the application of force may produce a more effective use of force.(Deptula 2001, 18)

Deptula introduced a new method of campaign planning called “EBO” in 2001. He recognized the limited initiative friendly forces could exercise while they were building up. He believes that large numbers of surface forces no longer require movement, positioning, and extensive preparation before dominant effects can be achieved over an enemy. EBO focuses on influence rather than presence, and allows planners to consider more effective ways to accomplish the same goal with fewer resources (Deptula 2001, 18-19).

Deptula advances the concept of parallel warfare introduced by Warden. It is based on achieving specific effects, not the blind destruction of targets on a target list (Deptula 2001, 3). His idea of parallel war exploits three dimensions to achieve rapid dominance: time, space, and levels of war. In Desert Storm, all three dimensions were exploited:

> Time--within the first 90 minutes over 50 separate targets were struck on the master attack plan. Within the first 24 hours, over 150 separate targets were designated for attack.
>
> Space--the entire breadth and depth of Iraq was subjected to attack. No system critical to the enemy escaped targeting because of distance.
>
> Levels of war--national leadership facilities (strategic level), Iraqi air defense and Army operation centers (operational level), and Iraqi deployed fighting units—air, land, and sea (tactical level)--came under attack simultaneously. (Deptula 2001, 5)

The object of parallel war is to control the set of systems relied on by the enemy for power and influence, such as leadership, population, industry, transportation, and military forces. Inducing specific effects rather than simply destroying these strategic systems, or COGs, is the foundation of parallel warfare. The key to these COGs is not their physical elements, but their conceptual ones (Deptula 2001, 6). The problem right now, though, is that targeting manuals include chapters about damage expectancy, probability of damage, and weaponeering to achieve levels of destruction, while just mentioning effects-based targeting (Deptula 2001, 11). All this theory is great in concept, but to gain real benefit, actual air campaigns conducted by the US must be examined.

Vietnam Air Campaigns

During the Vietnam War, the US executed two major bombing campaigns against North Vietnam. President Lyndon Johnson directed Operation Rolling Thunder from 1965 to 1968, which failed to meet US objectives. President Richard Nixon directed Operations Linebacker I and II in 1972, which succeeded in forcing concessions from the North Vietnamese (Pape 1996, 174).

Rolling Thunder

From 1965 through 1968 the USAF, together with the Navy, Marine Corps, and South Vietnamese Air Force, executed the longest bombing campaign ever conducted by the USAF (Tilford 1991, 89). Called Rolling Thunder, it was a compromise between those who advocated restraint, mostly politicians, and those who wanted a dominating offensive campaign within the USAF (Tilford 1991, 104). President Johnson wanted to gradually escalate the bombing, hoping to reach a point that the North would cease its efforts, without completely destroying the industry of North Vietnam. The campaign had

three primary objectives. The first was strategic persuasion, which assumed that there was a level of pain that would coerce Hanoi into stopping its support of the insurgents in the South. The second objective was to raise the morale of the government and military of South Vietnam by demonstrating US resolve in the struggle. The third objective was tactical interdiction. Strikes against bridges, railroads, and roads would slow the flow of men and supplies into South Vietnam (Tilford 1991, 105).

The target approval process was piecemeal and cumbersome at best, and often made no sense to an organized campaign. Target recommendations were made weekly and approved by the commander of 7th Air Force and the commander of Naval Task Force 77 at Yankee Station. Both sets of target request were then sent to the Commander in Chief, Pacific (CINCPAC) staff where they coordinated the requests before sending them to the Joint Chiefs in the Pentagon. There, military and civilian analysts joined with personnel from the Office of International Security Affairs to assess the military and political implications of each of the suggested targets. The list then was forwarded to the State Department for approval, and then back to the Joint Chiefs for one final look before being sent to the White House. At the White House, President Johnson and his advisors pruned the final list at the informal Tuesday luncheons (Tilford 1991, 109).

Further exacerbating the effort to produce a coherent strategic campaign was the restrictions placed on the bombing. Attacks were forbidden within thirty miles of Hanoi and ten miles of Haiphong as well as within a buffer zone contiguous to the Chinese border. Civilian policy makers did not want to exhaust North Vietnamese industrial targets right away, which would leave the US no prospective targets if the North did not stop its efforts. As far as the generals were concerned, the sequence of attacks were

uncoordinated and approved randomly and even illogically. The Air Force wanted to hit airfields, factories and power plants immediately but they were off limits (Tilford 1991, 109).

The interdiction objective did not work any better than the strategic persuasion. These attacks did not have the desired effect on Hanoi's military strategy, because the guerrilla campaign was largely immune to conventional air attack (Pape 1996, 175). The main problem was the misconception that North Vietnam's transportation system was susceptible to bombing. Roads were quickly repaired and bridges bypassed with dirt fords, underwater bridges, and pontoon bridges. Also, the Vietcong were not completely dependent on North Vietnam for logistics support. They were not a conventional army in need of the same supplies required by mechanized armies. They grew much of their own food and made their own medicine. They even made some of their own weapons and ammunition or just took it from dead South Vietnamese or American troops. An extensive black market also enabled the Vietcong to meet its logistical requirements (Tilford 1991, 112).

The second phase of Rolling Thunder consisted of strikes against the North's petroleum-oil-lubricants (POL) industry. This phase lasted about a month before the focus shifted back to interdiction. During that month however, it was estimated that 70 percent of North Vietnam's original POL storage capacity had been destroyed. Down to about 75,000 tons from an estimated 185,000 tons. Despite losing a significant amount of its bulk POL storage capacity, the North had plenty of dispersed sites for storage. Again, the Vietcong did not have the same POL requirements as a conventional army would have, and were able to continue operations in the South (Tilford 1991, 119-120).

In the end, the limited goals of US foreign policy and the military's goal of total victory were not compatible. The use of airpower as envisioned by the Air Force was not appropriate, as executed, to achieve limited objectives (Tilford 1991, 138). Rolling Thunder failed for two reasons. First, American civilian and military planners did not realize that North Vietnam could endure US aerial attacks. Second, civilian policymakers did not know enough about airpower to realize that their policies might be crippling its potential effectiveness. In March 1968, President Johnson announced he was restricting air and naval actions against the North to an area below 20 degrees north latitude, which essentially ended Rolling Thunder as a somewhat coherent campaign, and then ended it completely in November 1968 (Tilford 1991, 152-154).

Despite its failures, Rolling Thunder did create an expectation of damage to its industrial base in the minds of North Vietnamese leaders. Hanoi convinced its allies, the Soviet Union and China, to provide surface-to-air missiles (SAM) and some fighter aircraft (Pape 1996, 186). According to Pape, the primary problem was that the threat of limited bombing of industrial targets did not pose enough of a hardship on the civilian economy. The limited US objectives and bombing restrictions made the risk to North Vietnam's populations centers very low. Civilians actually were less vulnerable to attack as the war progressed (Pape 1996, 189-190). This remained true until 1972 and the Linebacker bombing campaigns.

Linebacker I and II

Linebacker I was designed to deny North Vietnam the ability to conduct offensive operations in the South. The campaign had two objectives: to blockade North Vietnam from receiving outside sources of supply and to destroy their ability to support the 14

divisions of soldiers that had just entered the South. The blockade would restrict the importing of supplies by ships through the harbors and overland from China. Destroying the North's internal transportation system, POL storage facilities, and power-generating plants would cripple their ability to support offensive operations in the South (Tilford 1991, 234).

Destroying the transportation system, which relied on harbors, highways, and railroads was the first step of Linebacker I. Mining closed the harbors, and the US went for the railroads next. By the end of June 1972, the air campaign had destroyed or damaged more than 400 bridges and caused more than 800 road cuts. After these successes, the air campaign turned to POL facilities, power-generating plants, military barracks, training areas, and military headquarters (Tilford 1991, 235). Airpower had greatly reduced the flow of resources to North Vietnamese in the South. Strategic interdiction created aggregate shortages while operational interdiction intensified local shortages at the battlefronts in the South. North Vietnam's import capacity was reduced by about 80 percent and shipments to troops in the South were reduced by 75 percent. Unable to execute its battlefield strategy, North Vietnam agreed to a cease-fire in October (Pape 1996, 200-201).

Unfortunately, South Vietnam refused to sign the agreement, so the North began to back away from the negotiations. The US launched Linebacker II on 18 December to bring Hanoi back to the table. The campaign, said the Air Force, "was designed to coerce a negotiated settlement by threatening further weakening of the enemy's military effort to maintain and support his armed forces" (Pape 1996, 201). Linebacker II denied the North the ability to rebuild its logistics network, which would make the resumption of the

conventional offensive against the South futile. As a result, the North returned to the bargaining table and signed the Paris Accords (Pape 1996, 202).

The Linebacker campaigns succeed where Rolling Thunder failed for several reasons. First, President Nixon was much more decisive than President Johnson. Johnson was worried about a small war growing too big and out of control. He sought consensus on targeting decisions and never got the desired effects. Nixon on the other hand, cared little for what the press, political opponents, or European allies thought of the way he conducted the war. Second, the forceful use of airpower in Linebacker caught the North Vietnamese leadership unprepared. They had gotten used to Washington's timid use of airpower during the Rolling Thunder campaign. Third, Nixon gave the military general guidelines and rules of engagement (ROE), and gave them much greater latitude in the targeting decisions, whereas Johnson was involved in all levels of targeting decisions (Tilford 1991, 238-240). Lastly, was the fact that Hanoi's military strategy had changed between the campaigns, and the conventional offensive into the South was vulnerable to interdiction by conventional air attack while the earlier unconventional war was not. (Pape 1996, 196) These lessons, and nineteen years of technology gains and training, led to a dominating air campaign against Iraq in 1991.

Desert Storm Air Campaign

> The first night of the Gulf War air campaign demonstrated that the conduct of war had changed. One hundred fifty-two discrete targets--plus regular Iraqi Army forces and SAM sites--made up the master attack plan for the opening 24-hour period of the Gulf air war. The Gulf War began with more targets in one day's attack plan than the total number of targets hit by the entire Eighth Air Force in all of 1942 and 1943--more separate target air attacks in 24 hours than ever before in the history of warfare. (Deptula 2001, 2)

Colonel John Warden's Checkmate office was tasked to come up with an initial air campaign plan for attacks against Iraq after their invasion of Kuwait in 1990. The aim of this plan was to persuade Saddam Hussein to pull his troops out of Kuwait without a ground war. If that did not happen, then the air strikes would create the conditions for Saddam's overthrow. The political objective was to make it impossible for Saddam to run his country and to create a wedge between Iraqi leadership and the Iraqi people. The military objective was to knock out the portion of the national infrastructure that was essential for the war effort (Gordon and Trainor 1995, 80).

The plan, called "Instant Thunder," reflected Warden's theories mentioned earlier. The most important targets were the leadership and telecommunications centers located in the center of his five-ring theory. Not everyone agreed with his plan though. General Colin Powell insisted that Iraqi tanks be targeted, while Warden did not want to dilute the attacks on Iraqi command centers (Gordon and Trainor 1995, 89). Lieutenant General Horner, the JFACC, rejected the plan and sent Warden home while assigning Brigadier General Glosson to come up with the air campaign. Glosson kept some of Warden's planners and they eventually came up with a plan that had the same basic concepts as "Instant Thunder" (Gordon and Trainor 1995, 89).

The operation would be a four-phased effort that would begin with the strategic air campaign against Iraq with the simultaneous winning of air supremacy over the Kuwaiti theater. As the operation progressed, airpower would eventually be used to attrit the Iraqi army in preparation for the final phase, ground operations to liberate Kuwait. The principle targets of the air campaign included: strategic air defenses; aircraft and airfields; nuclear, biological and chemical (NBC) capability; leadership targets; command

and control systems; republican guard forces; telecommunications facilities; and key elements of the Iraqi infrastructure, such as critical lines of communications (LOCs), electrical grids, petroleum storage, and military production facilities (Beagle 2000, 59).

Planners intended Phase II, air supremacy in the Kuwaiti Theater of Operations (KTO), to shift the priority of the air effort to the KTO. Iraqi air defenses would be rolled back and supply lines severed in order to provide an environment for B-52s, tactical air, and attack helicopters to operate effectively in subsequent phases. Phase III, battlefield preparation, would attack Iraqi ground forces, interdict supply lines, and destroy command, control, and communications (C3) in southern Iraq and Kuwait. This phase would open the door for Phase IV ground offensive to begin and achieve the US objective of the liberation of Kuwait (Beagle 2000, 60).

Although the air planners had effects-based ideas from the outset, destruction-based methodology served as the basis for the initial attack planning. When planning to shut down the Iraqi air defense command and control system, intelligence identified four major sector operations centers. Associated with each of these were three to five interceptor operations centers, and with each of these a number of radar reporting posts. There were not enough F-117s in theater to destroy all of these nodes, but there were enough to achieve the same effect. Planners argued that even if a 2,000-pound bomb did not completely destroy a bunker, it would damage it enough that the occupants would abandon it. An abandoned facility, though not destroyed is still inoperative thereby creating the desired effect. Using this effects-based logic, the F-117s opened the air war by striking far more targets than would have been possible using complete destruction as the criteria for targeting (Beagle 2000, 61).

The phrasing of various campaign objectives provides more evidence of an effects-based approach to Desert Storm planning. Phase I objectives include the phrases "disruption, loss of confidence, and degradation" showing the planners were anticipating the effects of their actions. The description of Phase II also showed the effects-based logic in use. The phase was to "provide a threat free environment allowing unhindered air operations in the KTO" and "provide an environment conducive to the conduct of air to ground attacks." Finally, the desired outcome of Phase III was to reduce Iraqi combat effectiveness in the KTO by at least fifty percent (Beagle 2000, 62). Clearly, the US had come a long way in the use of airpower, but could it pass the test without an accompanying ground campaign?

Operation Allied Force Air Campaign

Operation Allied Force was a response by the US and NATO against the Serbs for the atrocities that were being committed against the ethnic Albanians who made up the majority of Kosovo's population (Lambeth 2001, 5). Initial plans for the air campaign were developed by USAF planners under the direction of the United States Air Forces in Europe (USAFE) commander, General Jumper responding to a directive from the commander US European Command (USEUCOM), General Clark. This plan was called "Operation Nimble Lion" which would have gone after some 250 targets throughout the former Yugoslavia. A separate plan, Concept of Operations Plan (CONPLAN) 10601 was later developed by NATO. Although there was some overlap, the plans were conceptually different. Nimble Lion was a more aggressive plan that would have hit the Serbs hard from the outset, while 10601 was a gradual, incremental and phased approach.

CONPLAN 10601 ultimately became the basis for Operation Allied Force (Lambeth 2001, 11).

NATO's final plan was a coercive operation only from the beginning. The implied goal was to inflict just enough pain to persuade Milosevic to capitulate. The first phase would strike 51 integrated air defense system (IADS) targets and 40 "punishment" targets out of 169 targets in NATO's Master Target File. The second phase would attack military targets mainly below the 44th parallel, which bisected Yugoslavia south of Belgrade. The third phase, only if needed, would go aggressively after military facilities north of the 44th parallel and Belgrade itself (Lambeth 2001, 13-14).

President Clinton announced that the operation had three goals when the attacks started, "demonstrate the seriousness of NATO's opposition to aggression," to deter "continuing and escalating his attacks on helpless civilians," and "to damage Serbia's capacity to wage war against Kosovo by seriously diminishing its military capabilities." (Lambeth 2001, 19) He also stressed that he had no intention of putting troops on the ground in Kosovo to fight a war. (Lambeth 2001, 19)

Milosevic's strategy was the belief that he could take as much pain from a NATO air operation as Saddam Hussein had endured from Desert Fox. He most likely felt that NATO's limited tolerance for bombing would run out before his pain level got too high (Lambeth 2001, 9). By the end of the third week, well into the third phase, NATO's strategic goals had shifted from eroding Milosevic's ability to force an exodus of Albanian civilians to enforcing a withdrawal of Serb forces from Kosovo. This was caused largely because Milosevic seized the initiative early and nearly accomplished his

ethnic cleansing goals while the air campaign was bogged down with extremely restrictive ROE and bad weather (Lambeth 2001, 32).

NATO finally escalated its attacks and began taking the war directly to the Serb people. Attacks on the electrical power grid cut off electricity to 70 percent of the country. By the end of the seventh week, there were reports of Yugoslav officials admitting that the country was on verge of widespread hardship due to damage done to their economy (Lambeth 2001, 41). In June Milosevic finally accepted an international peace proposal delivered by Russia's envoy to the Balkans and Finland's president. The agreement bogged down due to disagreements on Serb withdrawals from Kosovo and NATO's refusal to halt its air attacks. Within a week, however, an agreement was finally reached that would put 50,000 NATO peacekeepers in the AO and would have the Serbs withdrawing over a period of eleven days. NATO stopped the bombing upon verification that the Serbs had begun the withdrawal process (Lambeth 2001, 56-60).

CHAPTER 3

RESEARCH METHODS

"In achieving the JFC's objectives, targeting is concerned with producing specific effects. Targeting analysis considers all possible means to achieve desired effects, drawing from any available forces, weapons, and platforms" (JP 3-60 2002, I-4). This quote illustrates the importance the US is placing on EBO for all military targeting operations, and USAF air campaigns are no exception. This thesis attempts to answer how the USAF can improve on its effects-based air campaigns. In order to answer this question several secondary and tertiary questions (listed in chapter 1) must also be answered. These questions provide the framework to properly analyze the problem and reach conclusions that will provide answers for the primary question.

The research began with a study of effects-based theory in general terms to start building the framework needed to answer questions on the subject of EBO. The logical starting point for this effort was the study of existing Joint and Air Force doctrine. Although much has been written about EBO, doctrine provides a picture of what the military has accepted as the way to conduct military operations. It provides military planners accepted and expected ways to deal with the complex issues that must be faced in successfully achieving the nation's goals and objectives. As outlined in chapter 2, doctrine discusses EBO in general terms, and is unambiguous in highlighting its importance, but does not provide meaningful detail about how to conduct effects based air campaigns. It does, however, introduce the terms needed to define EBO, which in turn will help define an effects-based air campaign.

A study of existing airpower theory as it applies to EBO was the next logical step in the effort to define an effects-based air campaign. Doctrine gives the currently accepted notions of EBO for military planners, but what else is out there that may help us improve? The USAF and US military in general, must always look to new ideas to more efficiently execute our respective missions, especially in this era of limited resources and downsizing. The ideas of Guilio Douhet and Billy Mitchell provide the earliest look at EBO applied to airpower. Although technology has changed dramatically since these two expressed their ideas, the basic principles of attacking "vital centers" and COGs still apply to successful air campaigns today. The ideas of these two, among others, set the stage for the modern airpower theorist.

Researching the ideas of modern airpower theorists Robert Pape, John Boyd, John Warden and David Deptula build on the ideas of Douhet and Mitchell. The ideas of these four men will help refine the definition of the effects based air campaign and begin to answer many of the other secondary and tertiary questions that will lead to sound conclusions and recommendations to answer the primary research question. Specifically, their work leads to answering the question of whether or not the US effectively plans to achieve the desired effects. All of these theorists look at the enemy system as a whole and give insight into how to define and attack the correct COGs to achieve the political objectives.

Pape's theory on the use of airpower to coerce enemy forces to change their will, or COA, and his analysis of the Vietnam and Operation Desert Storm air campaigns will begin to provide answers to the secondary question on whether or not the US was successful in achieving desired second and third order effects in those campaigns. His

coercion theory can also be used to address the question of whether or not the US political objectives have been clear enough to derive quantifiable military objectives and whether or not enemy COGs are correctly identified with the desired effects in mind.

The study of John Warden's "5 ring model" will shed more light on COG development by presenting a completely different way of addressing an enemy's source of power. Additionally, his ideas provide insight on Air Force planning of an air campaign during the Operation Desert Storm time frame.

John Boyd provides a slightly different view on attacking the enemy to achieve goals. His idea to find a way to operate inside the enemy's OODA loop can be used in conjunction with sound objectives, COG analysis, and effects-based targeting to produce an overall effects-based bombing campaign that the enemy will be unable to adapt to.

General Deptula's work reflects the present state of effects-based air campaign planning and execution. As a senior Air Force leader in both Operation Allied Force and Enduring Freedom, his ideas on parallel warfare and EBO reflect current ideas on acceptable objectives, COG analysis, and the problem of assessment. His ideas, combined with Warden and Pape, existing doctrine and several papers written specifically about the use of effects based airpower, will provide the bulk of the information needed to answer several of the secondary research questions. Specifically the questions of defining effects based air campaigns, objective development, planning to achieve desired effects, and COG identification.

After building a solid foundation on EBO through the study of doctrine and theory, it is necessary to look at what the USAF had accomplished in practice. Specifically what was accomplished in the air campaigns of Rolling Thunder, Linebacker

I and II, Desert Storm, and Allied Force. These campaigns were chosen due to availability of unclassified information and time elapsed which has allowed for thorough analysis.

The analysis of these campaigns will provide answers to USAF success or failure in achieving 2nd and 3rd order effects. The study of what went right and what went wrong will further develop USAF planning strengths and weaknesses and COG identification. Additionally it will allow an analysis of the relationship of US political objectives to quantifiable military objectives.

The overall methodology used in researching this thesis is modeled after Major T. Beagle's School of Advanced Airpower Studies thesis, "Effects-based Targeting: Another Empty Promise?" Major Beagle used a similar methodology including doctrine, theory, and case studies to answer his thesis question.

CHAPTER 4

RESULTS AND ANALYSIS

What Is an Effects-Based Air Campaign?

To effectively answer the primary research question, effects-based bombing or operations need to be defined. What is an effects-based air campaign? In simple terms, EBO seeks to identify and engage an enemy's COGs in the most efficient manner to produce results that match the commander's objectives (Beagle 2000, 5). Effects-based air campaigns use airpower to target specific vulnerabilities in these COGs with a goal of using minimum force to achieve maximum effects. Although airpower seeks to destroy targets or render them inoperable through nonlethal means, destruction of an entire target set is not always necessary to achieve desired effects. For example, if a desired effect is to degrade an enemy IADS so that the US can operate freely in the airspace, it is not necessary to destroy every missile, missile launcher, command vehicle, and radar associated with the entire system. It may be possible to achieve the same effect by destroying a few key command and control sites. The key is to accomplish the commander's objectives in the most effective way possible. Target destruction should be viewed as a means to the end, not the end in itself. The aim of effects-based air campaigns is to use target destruction to generate predetermined second and third order effects at all three levels of war, which will ultimately lead to successful accomplishment of US overall objectives (Beagle 2000, 5).

The tactical level of war is associated with engagements on the battlefield at the unit level. Effects at this level contribute to reducing the enemy's war-making capability on a relatively small scale and are typically limited in scale and duration. The operational

level includes planning, conducting and sustaining campaigns within a theater. Effects achieved at this level of war typically will damage the enemy's ability to continue the fight across the entire theater, not just a localized battlefield. Finally, the strategic level encompasses the enemy as a whole and includes both military and political goals. Effects at this level aim to disrupt the enemy's overall strategy, ability or will to wage war by targeting its key COGs that can include military, political and economic power held by the enemy. These effects typically are more difficult to achieve and the results may not show for quite some time. However, once achieved, these effects have far more impact on the enemy's ability to wage war than lower level effects (Beagle 2000, 8-9).

Overall, the idea of EBO, and any associated bombing campaign, is to use both lethal and nonlethal means at the tactical level to produce predetermined direct and indirect effects at the operational and strategic levels. The net result of this precise application of military resources is to generate effects that will ripple and cascade throughout the system over time, thereby denying options available to opponents and increasing those available to friendly forces (Mann, Endersby, and Searle 2002, 26). Keep in mind that airpower assets can strike at objectives at any level of war on a single tactical mission.

Does the US Consciously Plan EBO?

As discussed in chapter 2, each of the theorists touched on different mechanisms for forcing his will on the enemy. Douhet believed in targeting population centers to destroy the will of the enemy to fight. Mitchell also believed in targeting the will of the people but he believed industry could be targeted instead of the population itself. Pape believed targeting the enemy's field forces could coerce the enemy when they determined

that the cost of continuing would outweigh any benefits that could be gained. Warden contended that although there are five main categories or sources of power for the enemy, the leadership is central and the key to success. Deptula introduces the concept of parallel warfare, where the dimensions of time, space, and all levels of war are exploited simultaneously to maximize effects across the full spectrum of enemy capabilities.

The Rolling Thunder campaign used Pape's theory of coercion. The US struck at North Vietnamese and Vietcong military targets and attempted to interdict supply lines flowing south in an attempt to coerce the North into giving up the fight for the South. The problem was that there were too many restrictions on the bombing campaign, which prohibited the US from gaining any long lasting effects against the North Vietnamese leadership. Additionally, the interdiction campaign failed to correctly identify the correct COG to produce any long lasting operational effects against the insurgency campaign in the South. The roads and bridges struck were easily repaired or bypassed and the insurgents were still able to obtain supplies from outside countries due to bombing restrictions in and around the Hanoi and Haiphong areas. The limited goals of this campaign did not create enough pressure on the North for coercion to be successful.

The desired effect of the Linebacker I bombing campaign was to deny the North the ability to conduct offensive operations in the South. With that effect in mind, the US set two objectives, both supporting the desired effect. The first was to blockade North Vietnam from receiving outside sources of supply, and the second was to destroy their ability to support the troops already fighting in the South (Tilford 1991, 234). With the lifting of some of the restrictions and an aggressive campaign from the beginning, the US was able to achieve success and forced the North Vietnamese to negotiate for peace.

When the peace negotiations broke down due to South Vietnamese difficulties, the US launched Linebacker II. This campaign "was designed to coerce a negotiated settlement by threatening further weakening of the enemy's military effort to maintain and support his armed forces" (Pape 1996, 201). This campaign denied the North the ability to rebuild its logistics networks, destroyed in Linebacker I, and successfully forced the North to resume negotiations. Both Linebacker campaigns met with some success at achieving desired effects, but both were short term and came late in a conflict where the US had already scaled back its objectives for the region due to earlier failures. Desert Storm, on the other hand, had desired effects in mind from the outset.

The Desert Storm air campaign was initially planned by Warden and his staff at "Checkmate" and continued by Glosson and Deptula. The plan centered largely on leadership and communication centers in an effort to persuade Saddam Hussein to pull his troops out of Kuwait without a ground war. If that did not work, the air campaign would set the conditions for Saddam's overthrow. Ground commanders also insisted that Iraqi fielded forces be targeted in an effort to prepare for a successful US ground offensive (Gordon and Trainor 1995, 80). Deptula's efforts are reflected in the phrasing of campaign objectives for Desert Storm. Phase I objectives include the phrases "disruption, loss of confidence and degradation" which show anticipation of effects instead of pure physical destruction. Phase II also showed effects-based logic in use. The phase was to "provide a threat free environment allowing unhindered air operations in the KTO" and "provide an environment conducive to the conduct of air to ground attacks." Lastly, the objective of Phase III was to reduce Iraqi combat effectiveness in the KTO by at least 50 percent (Beagle 2000, 62).

Allied Force was a coercive operation designed to inflict just enough pain to persuade Milosevic to capitulate. It was a gradual, incremental and phased approach much like the unsuccessful Rolling Thunder campaign in Vietnam. Although the desired effect, eroding Milosevic's ability to force an exodus of Albanian civilians, was clear, the US initial bombing strategy did not apply enough pressure or pain to gain the desired effect. Instead Milosevic seized the initiative and nearly accomplished his ethnic cleansing goals. Eventually, the US did succeed in forcing the Serbs to withdraw from Kosovo, but success in achieving that goal came late due to mismatched political objectives and subsequent restrictions hampering military efforts.

Political Objectives Versus Military Objectives

Air Force doctrine spells out the importance of determining objectives and linking them to the overall strategy. It states that the most important stage of the JAOP process is objective determination since that defines exactly what the air component commander intends to achieve. These objectives must be clear, concise, attainable, and measurable and contribute to the accomplishment of the overall campaign objectives. When political leaders decide to use military force, it is critical that they define the conditions desired for successful resolution of the war or conflict (AFDD 2 2000, 87-88).

A methodology for effects-based operations should be used to ensure tasks are linked to objectives, which in turn are linked to higher-level objectives and overall strategy (see figure 1). This objectives-based methodology is ideal for planners to execute a strategy-to-task air campaign since it forces the planner to link tactical tasks with objectives and lower level objectives with higher ones. Planners at all levels need to know the desired end state before they can come up with a strategy or COA to create that

outcome. The more clearly the end state and objectives are stated at the highest levels, the more likely it is that the US will successfully achieve its ultimate political objectives (Beagle 2000, 12).

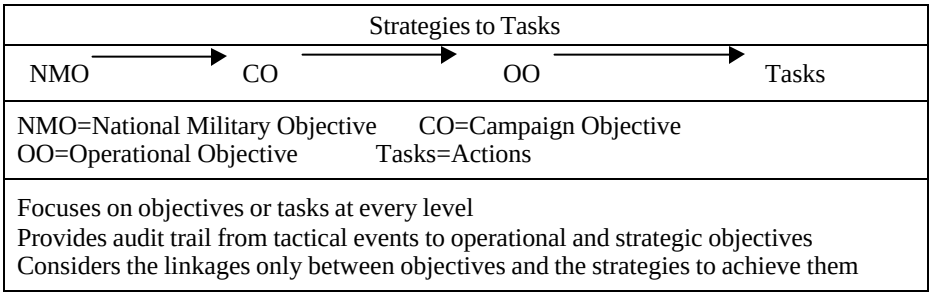

Figure 1. Objectives-Based Methodology (*Source:* Mann, Endersby, and Searle 2002, 45)

Official Guidance

Military operations have been inconsistent in applying effects-based thinking due to a lack of a specific methodology for EBO in service and joint doctrine. EBO is mentioned in both Air Force and joint doctrine, in fact, planners are directed to consider effects when planning operations, but the doctrine does not spell out how to systematically apply it. Air Force Doctrine Document 2 explains the objective-strategy-effect relationship by laying out a "Z" diagram. This diagram illustrates the relationship from objective to effects at the various levels of war. It reinforces the idea that objectives at all levels should be clear enough to form a coherent strategy for that particular level. Objectives for each level are normally derived from the objectives of the next higher level, which in turn come from higher-level strategies (see figure 2). In short, the

objectives, strategies, and tasks should be horizontally and vertically nested (Mann, Endersby, and Searle 2002, 45). This is a good starting point, but falls short of giving planners a complete methodology. A key problem right now is that US targeting manuals include volumes of information concerning probability of damage and detailed weaponeering, but only just mention effects-based targeting (Deptula 2001, 11).

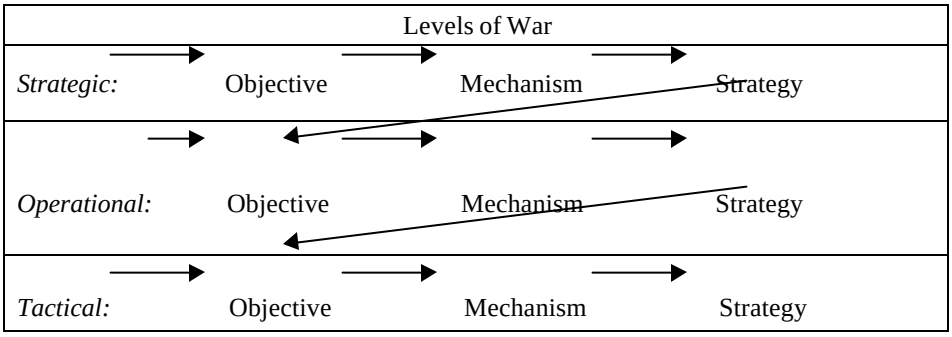

Figure 2. The Relationship Between Objectives and Strategies (*Source*: AFDD 2 2000, 88).

Planning for Desired Effects

According to Pape, the criteria for success or failure in a coercion attempt are simple. Coercion fails when the coercer stops its coercive military actions prior to concessions by the target, when the coercer's attacks continue but do not produce compliance by the target, or when the coercer imposes its demands only after complete defeat of the target (Pape 1996, 15). He goes on to say that the effectiveness of military operations can be measured as either combat effectiveness or strategic effectiveness. Combat effectiveness deals with how effectively a given force destroys a given target. This is the traditional measure the US defaults to when assessing military operations.

Strategic effectiveness can be seen as the measuring stick for EBO. It focuses on whether the destruction of specific targets achieves the political goals (Pape 1996, 45). As mentioned before, all operational and tactical objectives should be nested to the overall political goals. For example, if the commander determines that a specific enemy armored division is the military COG key to achieving US political goals in a conflict, the US may not necessarily need to destroy a given number of tanks, but only render them unable to conduct operations against friendly forces. Simply denying them fuel and ammunition may accomplish this objective by destroying key logistics nodes. The trick then, is to select the right COGs to target. Deptula's vision of parallel war takes this idea of strategic effectiveness and aims to control the set of systems relied on by the enemy for power and influence. Inducing specific effects rather than simply destroying these strategic systems, or COGs, is the foundation of parallel warfare. The key to these COGs is not their physical elements, but their conceptual ones (Deptula 2001, 6).

COG Identification and Targeting for Effect

Joint Publication 3-0 brings up the critical nature of enemy COGs. It states that the "essence of operational art lies in being able to mass effects against the adversary's sources of power in order to destroy or neutralize them." It goes on to state that neutralizing these COGs is the most direct path to victory but that they can change at any given time and may be difficult to discern (JP 3-0 2001, III-22). The Vietnam bombing campaigns highlighted the difficulty in identifying the correct COGs and the Air Force has not missed this fact in its own doctrine. Not only does the US have to identify the correct COG, but it needs to identify the vital target sets within each COG. These vital target sets need to be vulnerable to attack and have the greatest effect on the enemy

COGs at all levels of war when successfully attacked (AFDD 2 2000, 89). Part of the difficulty in successful COG identification lies in recognizing the strategy and will of the enemy itself. Not all adversaries share the same weaknesses and their leadership may wield varying levels of power. Pape asserts that for coercion to succeed, the vulnerabilities of the enemy's specific strategy must be exploited. This is important since not all military strategies share the same weaknesses. Conventional war, for example, is highly dependent on logistics and communication while guerrilla war is not (Pape 1996, 30).

Enemy Adaptability

A difficult aspect of US strategy and ultimately COG selection is enemy adaptability and will to fight. Detailed knowledge and understanding of an adversary's physical and psychological strengths and weaknesses as well as how they organize, fight, and make decisions is essential to properly identifying enemy COGs (JP 3-0 2001, III-22). Incorrect assessment of how the enemy will react to attack can seriously hamper the US ability to conduct efficient offensive operations. Understanding the adversary's intentions and needs enable the use of various means to produce effects against the enemy's critical vulnerabilities (JP 3-60 2002, I-5 - I-6). Planners must know the adversary well enough to make reasonably accurate predictions of what the enemy will do when a given COG is attacked. This includes not only how they might alter their strategy, but also how they might be able to work around difficulties created by air attack. Information superiority is not limited to friendly capabilities. Second and third order effects cannot be overlooked and must be considered in depth to ensure the effects achieved are still in line with overall objectives.

Boyd's OODA loop cycle is key to keeping the enemy in a reactive mode. As long as an adversary is reacting he will be unable to mount effective offensive operations. US superiority in information operations should enable it to perform the loop more efficiently than most organized opponents. Coupled with good intelligence information, a clear understanding of national goals and a clear understanding of the adversary, the US should be able to keep inside the adversary's OODA loop. Rapid decision-making and an aggressive air campaign that transitions all three levels of war, will enable successful EBO.

EBO Applied to All Levels of War

Effects-based targeting should not be limited to a specific level of war, but all three levels simultaneously. Tactical objectives and effects should support operational objectives and effects, which in turn should be linked to the overall national objective. Airpower gives the capability to create effects at any level of war with a single tactical sortie. The linear battlefield is rapidly becoming a thing of the past and certainly does not apply to the use of airpower. Deptula's argument for parallel warfare exploits the elements of time, space and the levels of war. Demonstrated in Desert Storm, the rapid dominance over these three dimensions can render the enemy incapable of continuing the quest for their own goals. Strategic level effects gained from the outset of a conflict will force enemy leadership to deal with the problem at that level before turning attention to operational level matters, or they risk losing control immediately. Operational level effects occurring simultaneously will further damage the adversary's ability to pursue its goals with its military. This is turn may cause tactical level decisions to occur too late or not at all.

Previous US Successes and Failures

In terms of overall targets destroyed, it can be argued that the USAF has had success in all of the major bombing campaigns discussed in chapter 2. It can also be said that the bombing campaigns failed to meet expectations. This section will look at the successes and failures of these bombing campaigns in terms of EBO.

What Went Right?

The desired effect for the Linebacker I campaign was to deny the North Vietnamese the ability to wage offensive operations in the South. In order to achieve this effect, the US strategy called for two specific tasks. One was to blockade the North from receiving outside sources of supply. The next task was to destroy the North's internal transportations system, POL storage and power-generating plants. Overall desired effect was to deny the North the ability to wage offensive operations in the South (Tilford, 1991, 234). In the end, these tasks were successful and the North was forced to agree to a cease-fire.

Why were they successful this time? Fewer restrictions brought a more decisive campaign right to the heart of North Vietnam. Leaders were under much more stress as the blockade denied them supplies they were unable to generate internally. Additionally, the war in the South had transitioned to a more conventional war and the interdictions strikes were successful against a military force reliant on the logistics tail (Pape 1996, 196). Unsuccessful cease-fire negotiations led to resumption of bombing and the Linebacker II campaign.

Linebacker II "was designed to coerce a negotiated settlement by threatening further weakening of the enemy's military effort to maintain and support his armed

forces" (Pape 1996, 201). This campaign denied the enemy the ability to rebuild its logistics network, destroyed in the earlier Linebacker campaign. As a result, the North returned to the bargaining table and signed the Paris Accords (Pape 1996, 202). The common threads to both these campaigns were a clear political goal, correctly identified COGs for that stage of the war, and fewer restrictions. These attributes enabled an aggressive bombing campaign that the North Vietnamese could not or chose not to endure for very long. This overwhelming firepower was seen again in 1991 during Desert Storm.

By the time Desert Storm rolled around, the US had improved technology introduced in Vietnam to far more accurate and lethal levels. In some cases, a single aircraft and one PGM during the Gulf War achieved the same result as a 1,000-plane raid with over 9000 bombs in World War II--and without the associated collateral damage (Deptula 2001, 8).

The plan for Desert Storm was developed with effects in mind based on a single clear political objective, the removal of Iraqi forces from Kuwait. Leadership, command and control, and critical infrastructure were targeted in the first phase in an effort to coerce Saddam Hussein to withdraw his forces. Although a ground war was ultimately needed, the effects of this targeting greatly affected Saddam's ability to command his forces. During the war some Iraqi power plant managers shut down their electric plants to avoid targeting thereby creating our desired effect without exposing Coalition members to danger, and freeing up air resources for another task (Deptula 2001, 12). The campaign then shifted to striking air defenses in the South with the desired effect being a conducive environment for strike aircraft to operate in subsequent phases. The success of this phase

is evidenced by the lack of aircraft shot down by what was a robust air defense network. The third phase had the desired effect of disrupting and destroying enemy ground forces in the KTO so that the ground war could accomplish the ultimate objective of the campaign (Beagle 2000, 59-60). Numerous attacks on Republican Guard troops and armor clearly set the stage for the quick, decisive victory by American ground forces.

Although some will argue that the air campaign was not completely effective since a ground war became necessary to achieve the overall objective, the successes far outweigh the negatives in this campaign. In the absence of total war, ground troops or at least the threat of ground troops remain a necessary force to achieve national goals unless the enemy perceives he has absolutely no chance of gaining his own objectives.

What Went Wrong?

In contrast to the aggressive Linebacker campaigns, Rolling Thunder was a compromise between politicians who wanted restraint and the USAF who wanted an aggressive offensive campaign. This campaign attempted to achieve several effects: (1) coerce Hanoi into stopping its support of insurgents in the South, and (2) slow the flow of men and supplies into South Vietnam. This campaign did not work for several reasons. First, the target approval process was piecemeal and cumbersome at best, and often made no sense to an organized campaign (Tilford 1991, 104-109). It is essential to have a coherent plan and to be persistent in order to achieve strategic effects such as coercion of a foreign government. The gradual escalation then subsequent relaxing of pressure did not put sufficient pressure on North Vietnamese leadership. Next, the restrictions on bombing around the Hanoi and Haiphong areas denied the air campaign the ability to even remotely achieve the desired goals. The Air Force was reduced to striking bridges,

railroads, and roads that had little impact on the insurgents. These LOCs were easily repaired or bypassed by an enemy that was not reliant on a significant logistics tail. In short, the Air Force was not able to get approval to attack an enemy COG vulnerable to air attack. The air campaign was unable to achieve effects required for success within the boundaries set by the political leadership. Basically, the limited goals of US foreign policy and the perceived military goal of total victory were not compatible (Tilford, 1991, 138). The gradual escalation of Rolling Thunder was seen again in the skies over Serbia during Allied Force.

CONPLAN 10601 was a gradual, incremental and phased approach that became the basis for Operation Allied Force (Lambeth 2001, 11). This plan was developed by NATO and differed significantly from an aggressive campaign developed by Air Force planners. President Clinton announced that the operation had three goals when the attacks started, "To demonstrate the seriousness of NATO's opposition to aggression," to deter "continuing and escalating his attacks on helpless civilians," and "to damage Serbia's capacity to wage war against Kosovo by seriously diminishing its military capabilities." He also stressed that he had no intention of putting troops on the ground in Kosovo to fight a war (Lambeth 2001, 19).

The first phase struck 51 IADS targets in an effort to create a permissive environment for further air strikes and forty "punishment" targets to demonstrate NATO's resolve. The second phase would attack military targets below the 44th parallel leaving Milosevic free from attack in Belgrade. The third phase, if needed, would go aggressively after military facilities north of the 44th parallel and Belgrade itself

(Lambeth 2001, 19). This lack of aggressiveness, coupled with extremely restrictive ROE allowed Milosevic to nearly accomplish his ethnic cleansing goals (Lambeth 2001, 32).

Like the North Vietnamese earlier, Milosevic did not feel enough pressure to yield to NATO's demands. Despite the desires of Air Force leadership to attack decisively, the political realities involved when dealing with competing goals of numerous allied countries proved difficult to manage. Additionally, the lack of a threat of ground invasion probably encouraged Milosevic to hold out a little longer. When NATO did finally take the fight into the heart of Serbia, they began to see positive results, with reports from Yugoslav officials admitting that the country was on the verge of widespread hardship due to damage done to their economy (Lambeth 2001, 41). Despite unclear and conflicting goals from NATO leadership, Milosevic eventually accepted a peace proposal and withdrew his troops from Kosovo as a result of the bombing escalation backed with diplomatic pressure.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

This thesis set out to answer the question of how the Air Force can improve on its effects-based air campaigns. It began with a summary of directive EBO guidance included in both joint and Air Force doctrine, and then summarized the ideas of some of the more prominent airpower theorists within the context of EBO. Next, four modern air campaigns were analyzed for successes and failures in pursuit of answers to the primary research question. This chapter provides these answers in the areas of planning and education, as well as providing some areas of possible future study.

Planning

In order to plan a successful effects-based air campaign, planners must have clearly defined objectives and the end-state. Commanders and political leaders need to be able to articulate specific objectives that accurately convey their desired effects. Planners, in turn, must learn to focus on these effects and not on managing a target list where success is measured only by destruction of targets. These desired effects must also be conveyed to and understood by the operators who will execute the missions (Beagle 2000, 106). “Everyone involved in planning, executing, assessing, and providing feedback must understand the plan. They must know the objectives and comprehend the tactics that planners want employed to strike targets in ways that achieve desired effects” (Beagle 2000, 107). This knowledge of the plan and its intended effects is equally important for those tasked with assessment. Assessors need to understand what it is that they are assessing. This entails more than just the knowledge of the enemy and the

systems being targeted, but also the results planners sought in striking that target (Beagle 2000, 100).

The air tasking order (ATO), in its current form, does not convey these desired effects to the tactical level operators. The Army uses the term “in order to” in many written orders to explain why units have been given specific tasks. They make a point to have subordinate commanders understand how their specific tasks fit into the larger picture. Perhaps the Air Force can use similar terminology in ATO taskings to enhance aircrew understanding of how their mission fits into the bigger picture and the commanders intent. Armed with this knowledge, aircrew can more easily flex to alternate targets to achieve the desired effect when unable to prosecute assigned targets for various reasons.

There are many factors that influence the ability to conduct EBO at the strategic level. Personalities at the senior political and military levels as well as the international situation at the time armed intervention becomes necessary greatly impact effects that can be achieved (Beagle 2000, 96). These variable make it critical for US leadership to set realistic goals and subsequent effects for the level and duration of force we plan to use in a given conflict. Limited duration conflicts generally call for limited, or short-term effects. For example, it is completely unrealistic to achieve the desired effect of changing a nation’s entire political system in a one- or two-month air campaign. Grand strategic level effects will take some time, and the US decision makers need to shape the national and international environment to have that time, or accept the opposition and do what is necessary with the realization that the overall objectives may have to be reduced. Domestic and international opposition to the use of force in a conflict can also lead to

strict ROE being imposed on the combatants. Again, leaders must shape objectives and effects that fit with the amount of force that can be used against enemy forces. If strict ROE is to be adhered to, then the objectives must be similarly reduced.

The use of the JFACC since Desert Storm has helped the Air Force conduct operations in an effort to achieve the objectives set forth by a single commander. This arrangement is excellent in helping to concentrate airpower where it is needed and not diluting its effects over too broad an area with the competing goals of different commanders. However, even this arrangement has difficulties when US and Allied leaders do not have a clear, agreed upon idea of what they want to achieve as was demonstrated in Allied Force. The USAF cannot control the formulation of political and strategic objectives (Beagle 2000, 96). That is the job of our senior level civilian leadership with advice from the Joint Chiefs. This arrangement is fine, but the senior leadership owes the operational level leaders clear objectives and the freedom to execute the mission as they deem necessary to accomplish their given objectives. In the case studies examined, although to different extremes, airmen were never completely free to select the targets they desired to achieve the objectives. Rolling Thunder and Allied Force both had high levels of government involvement in the targeting process, while both Linebacker campaigns and Desert Storm were left more in the hands of the combatant commanders. The success of the latter two campaigns, in terms of efficient attainment of goals, shows how important it is to allow airmen to conduct their own planning within the guidelines set forth by the senior leadership.

Despite efforts to shift thought processes to an effects-based mindset, current targeting manuals are all destruction oriented. These manuals focus on the ways and

means to attack individual targets to a given level of destruction. “The challenge is to shift from input to output-driven planning for military actions, or more specifically in the case of targeting, away from a mentality of servicing targets to one of producing effects that accomplish specified objectives” (Mann, Endersby, and Searle 2002, 26). Individual target destruction methodology is still key, since ultimately both lethal and non-lethal effects will be targeted against these individual components. However, the linkages between direct effects and the subsequent 2nd and 3rd order effects need to be documented in a way for the average planner to think in terms of overall effects. Obviously, not every possible effect can be documented this way but generic effects matrices could precede the actual target destruction information in these manuals in an effort to put planners on the path to targeting success, within the constraints put on them by overall objectives, ROE, assets available, and other assorted outside influences. Planners must then do a better job disseminating the reasoning behind their plan.

Education

So far this chapter has discussed specific things needed for planners to put together a successful effects-based air campaign, but how will these things come about? “Only education and training can break the lineage of destruction-based targeting. As this is really a top-down operation, ideally, this mindset would begin with the president and extend downward through the operational chain of command” (Beagle 2000, 105-106). This education needs to encompass all levels of a military officer’s career. A true change of mindset will only occur when all levels of professional military education embrace the EBO concept. Commanders trained on EBO principles throughout their careers will be more likely to be successful in envisioning and articulating their intent and desired effects

to subordinates. Furthermore, lower level planners, operators and assessors trained in the EBO concept will be less likely to fall back on the old target list destruction methodology. Unfortunately, our professional military schools do not focus on EBO yet. According to General Deptula:

> War colleges teach two primary forms of warfare--attrition and annihilation. The Gulf War demonstrated another--control through the application of parallel war. The strategies of annihilation and attrition rely on sequential, individual target destruction as the ultimate method of success and measure of progress--generally measured in terms of forces applied, or input. Using effects-based operations, the determinant of success is effective control of systems that the enemy relies upon to exert influence--output. Changing the way we think about the application of force may produce a more effective use of force. (Deptula 2001, 18)

Although US senior civilian leadership cannot be forced to attend schools teaching the EBO concept, senior military leadership can help the education process at that level. If the joint chiefs are educated and advocate an effects-based methodology to armed conflict, they can influence our civilian leadership to provide the kind of objectives that fit specific conflicts. Education should not be limited to the formulation of objectives, desired effects and execution of the plan. Analysis of our potential adversaries is just as critical.

Over the years, the Air Force has substantially improved its intelligence, surveillance, and reconnaissance (ISR) capabilities. This has allowed planners to better identify and target adversary structures and systems but does not allow us to determine how the enemy will react and adapt to attacks on these systems. Vietnam and Allied Force showed that although airpower was very effective at destroying targets, the US failed to anticipate enemy reaction to the air campaign. Even if militarily achievable objectives are clearly stated and planners get to select their own targets, large amounts of intelligence are still required, some of which may not be readily available. Analysts must

understand both the physical layout of an enemy system and how that enemy employs that system (Beagle 2000, 98). Psychological and cultural aspects of a potential adversary must also be taken into account when determining the best way to achieve effects. Country experts need to be included on planning staffs to lend expertise on how an enemy might react to different kinds of attacks and to analyze the implications of 2nd and 3rd order targeting effects.

Future Study

To aid planners with effects-based campaign planning, targeting manuals need to include an effects-based methodology. Although no manual can outline completely what systems will yield desired results for every possible desired effect, a generic model can provide planners a framework to work with. Targeting manuals currently identify key components of systems that can be targeted to cause the most damage with the least amount of firepower. This idea can be expanded to entire systems that may represent an enemy COG. For example, targeting manuals today may tell the planner which part of a oil pumping station may be targeted to render the entire station incapable of distributing its product. This could be expanded to a nation-wide petroleum distribution system with key points for delivery of lethal and non-lethal fires that will cripple the entire system. Planners could then take this generic distribution system and apply country specific attributes to come up with a targeting plan. There is no limit to the possibilities is this area.

Another area that could aid in the furthering of effects-based strategy is the study of how to incorporate the subject into all areas of professional military education. What would the curriculum look like and how could it fit into all the different service schools?

Are there any equivalent civilian schools that could teach the subject and educate the civilian leadership?

Finally, Operations Enduring Freedom and Iraqi Freedom should be studied from an EBO standpoint as soon as the information is declassified and available for public consumption. EBO has been gaining prominence in recent years and these two air campaigns will yield valuable information as to the future of effects based-air campaigns.

Conclusion

The bottom line is that EBO is an accepted fact by both joint and Air Force doctrine. The Air Force has gotten very good at destroying targets with great precision and little collateral damage, but there remains work to be done to maximize the effectiveness of the air campaign. The USAF needs to solidify its approach to effects-based air campaigns, in other words:

> Effects must not be an afterthought of the targeting process or the sole domain of assessors attempting to determine if a target was destroyed. Rather effects should be the integral linchpin that binds together the planning, execution, and assessment of all military actions and the actions of other agencies as well. (Mann, Endersby, and Searle 2002, 26-27)

GLOSSARY

2nd, 3rd, nth order effects. a causes b causes c causes--For example, disruptions in the electrical grid yields rolling blackouts, which disrupt petroleum deliveries to airfields, which disrupt air operations (Mann, Endersby, and Searle 2002, 95).

Center of gravity. Those military, political, economic, or informational points from which an adversary derives its freedom of action, physical strength, or will to fight (AFDD 2-1 2000, 37).

Coercion. Efforts to change the behavior of a state by manipulating costs and benefits (Pape 1996, 4).

Cumulative effects. Result when direct or indirect effects aggregate and may occur at the same or different levels of war as their contributing lower-order effects. For example destroying numerous SAM sites at the tactical level results in increased operational level air superiority (Beagle 2000, 10).

Deterrence. Seeks to maintain the status quo by discouraging an opponent from changing its behavior (Pape 1996, 4).

Direct effects. Immediate, first-order effects (weapons employment results). They are the results of actions with no intervening effect or mechanism between act and outcome (Mann, Endersby, and Searle 2002, 96).

Effects assessment. The evaluation of the overall effectiveness of military actions in terms of measures of merit in relation to stated objectives and policy goals (Mann, Endersby, and Searle 2002, 96).

Effects-based. An action taken with the intent to produce a distinctive and desired effect (Mann, Endersby, and Searle 2002, 96).

Effects-based operations. Actions taken against enemy systems designed to achieve specific effects that contribute directly to desired military and political outcomes (Mann, Endersby, and Searle 2002, 96).

Maneuver. The ability to integrate a force quickly and to strike directly at an adversary's strategic or operational COG (AFDD 1 1997, 17).

Measures of Effectiveness. MOEs in military operations are defined as tools used to measure results achieved in the overall mission and execution of assigned tasks. MOEs are a prerequisite to the performance of combat assessment (JP 3-60 2002, I-8).

Operational effect. The link between tactical results and strategy; typically, the cumulative outcome of missions, engagements, and battles. An operational effect

also may result from the disruption of systems or areas of operational value (Mann, Endersby, and Searle 2002, 97).

Precision Engagement. The ability of joint forces to locate, surveil, discern, and track objectives or targets; select, organize, and use the correct systems; generate desired effects, assess results; and reengage with decisive speed and overwhelming operational tempo as required, throughout the full range of military operations (*Joint Vision 2020* 2000, 22).

Strategic effect. Disruption of the enemy's overall strategy, ability, or will to wage war or carry out aggressive activity (Mann, Endersby, and Searle 2002, 98).

Synergistic effects. The proper application of a coordinated force can produce effects that exceed the individual contributions of the individual force employed separately (AFDD 1 1997, 24).

Tactical effects. Effects, which are the result of action(s) at the individual unit, mission, or engagement level. Tactical effects influence activities at the tactical level of employment and focus on battles and/or engagements to accomplish military objectives. These effects can be either direct or indirect, and typically are acts in concert with other tactical effects to produce results at higher levels of employment (Mann, Endersby, and Searle 2002, 99).

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