becoming an effective fighting force, the RLAF lacked some vital components necessary to continue the fight after the US withdraws. 74

**Lima Sites.** A system of almost 200 airfields were developed during the early 1960s. Throughout the war, these Lima Sites proved vital to the ground operations of the Hmong irregulars. These sites insured the delivery of aid to indigenous population and refugees, as well as, supplied Vang Pao’s forces. By using these sites, the Hmong forces employed guerrilla tactics—attacking the NVA rear and lines of communication. Often built into mountain tops or along hillsides, the Lima Sites provided the ground forces mobility and maneuver. Together with tacair support, the airfields allowed these lightly equipped fighters to execute vertical operations in depth. 75

**Contract air support.** Air America, a contract airline was principal to the air campaign by providing airlift within Laos. As a private enterprise providing subsistence to indigenous population, refugee evacuation, and search and rescue, Air America was not prohibited by the Geneva Accords. Obviously, other tasks—such as, the movement of guerrillas, intelligence gathering, and the airlift of munitions and weapons—were not within the intent of the agreement. For this reason, Air America’s involvement in the war was strictly covert. Nevertheless, the airlift provided by Air America and other contractors was invaluable to guerrilla operations against the Pathet Lao and NVA forces and movement of population loyal to the Hmong cause. 76

**Command, Control, and Communications**

The US Ambassador was responsible for the “overall direction, coordination, and supervision” of US military operations in Laos. He directly controlled the war in BARREL ROLL and STEEL TIGER WEST while delegating targeting and control of the war in STEEL TIGER EAST to Seventh Air Force and MACV. Command and control of USAF tacair was performed using rules of engagements (ROE), Air Operation Centers, and Raven Forward Air Controllers. Command and control was complicated due to the command relationship, the political sensitivity of the conflict, the desire to limit civilian casualties, turnover of personnel in the many organizations providing support,

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74 Liebchen, 171; although MAP is a critical part of the US military strategy in Laos, the amount of aid and the number of organizations involved complicate coordination between each. See Pratt, “Royal Laotian Air Force,” xx.


and the unconventional nature of the war. The following excerpt from a USAF report on the war describes this command and control challenge:

*USAF FACs were flying secretly from Laos, under the control of the Air Attaché for a Meo [Hmong] ground commander advised by the CIA, to direct strikes by USAF planes based in Thailand under control of a command center in Vietnam.*

**Rules of Engagement.** The Ambassador employed a well-defined set of ROEs to restrict the employment of US tacair. Each area of operation had different rules. In addition, free strike zones, restricted areas, and special operating areas were established to provide more flexibility for the employment of tacair.

**Operations Centers.** The war in Laos was controlled through two sets of operating areas. The ground and RLAF effort was divided into five Military Regions each with its own ground forces and air force squadron. Each region had an Air Operations Center to control the employment of RLAF resources in that Military Region. Each Air Operations Center was staffed with USAF advisors who coordinate the air-ground operations in that Military Region.

The US tactical operating areas were subsets of BARREL ROLL (that is East, West, and North) and STEEL TIGER (East and West) areas. Each area had a specific ROE for employment of tacair.

**Ravens.** In 1968, the Ambassador requested the deployment of combat experienced USAF forward air controllers (FAC) to control the employment of US tacair. Ravens were volunteers with 500 combat flying hours (usually 6 months) experience as a FAC in Vietnam. They were assigned directly to the Air Attaché and operated in Laos covertly for a tour length of six months. Small groups of Ravens were attached to the Air Operations Center of each of the five Military Regions. The Ravens exercised decentralized control of airpower by formulating their own plans and operations to support the ground campaign in each Military Region. Raven FACs assisted in the

77 Blout, 5.

78 See Burditt for details of ROE during October 1972 to August 1973 timeframe.

79 Searles, End-of-Tour Report, 4.

80 Lofgren, 42.
management and control of airpower in that area. Over the course of the campaign, they directly control and employ between 1/3 and 2/3 of the tacair sent to BARREL ROLL.\textsuperscript{81}

This air campaign plan for BARREL ROLL supported US strategy and policy in Laos and SEA. The operational-level concept dictated tactical action and specific targets in support of US objectives. This information provides the "how" of BARREL ROLL. The next task is to analyze the results and costs of the campaign.

\textsuperscript{81} Blout, 5; Pettigrew, 60; for a first hand account of Raven activity see Christopher Robbins, \textit{The Ravens: The Men Who Flew in America's Secret War in Laos} (New York: Crown Publishers, Inc., 1987).
CHAPTER FOUR
ANALYSIS

The military student does not seek to learn from history the minutiae of method and technique. In every age these are influenced by the characteristics of weapons currently available and the means at hand for maneuvering, supplying, and controlling combat forces. But research does bring to light those fundamental principles, and their combinations and applications, which, in the past, have produced success.82

—General Douglas MacArthur

The idea that superior air power can in some way be a substitute for hard slogging and professional skill on the ground is beguiling but illusory. Air support can be of immense value to an army; it can fight—and not only defensively—in the face of almost total air superiority.83

—Air Marshal Sir John C. Slessor

At the time of the cease fire at 2400 hours on 21 February 1973, the NVA controlled approximately two-thirds of the land area of Laos and one-third of the population—virtually the same situation that existed at the cease fire in 1961. Over a four-year period, the expenditure of approximately 1.7 million tons of ordnance and 401,296 tacair sorties resulted in no net gain in terrain or population from the enemy. However, the RLG remained in power and the legitimate government of Laos.84

Having focused on the “why,” “what,” and “how” of BARREL ROLL, the two questions that remain are: “How much resource is applied?” and “Was BARREL ROLL effective?” The answer to these questions must consider the strategic objectives, the campaign objectives, the cost, and the results. This section will analyze the air campaign from a perspective of airpower effort, effects, and effectiveness.

83 Ibid., 47. Air Marshal Slessor was a War World I pilot and the architect of British air strategy in World War II, 212.
84 Department of the Air Force, “Summary of Air Operations,” February, 1973, 1-1. Totals are shown for BARREL ROLL and STEEL TIGER during the period 1 November 1968 to 28 February 1973. Ordnance total includes all US tacair and B-52, but not Royal Lao Air Force or Vietnamese National Air Force. The breakout by area of operations for the same period is 316,880 tacair sorties to STEEL TIGER and 84,416 tacair sorties for BARREL ROLL. Tacair ordnance is 955,544 tons and B-52 is 743,703 tons. Data obtained from Department of the Air Force, “Summary of Air Operations” for November 1968 through February 1973.
Airpower Effort, Effects, and Effectiveness

To answer the questions of cost and results, consider the employment of airpower in BARREL ROLL from three aspects: effort, effects, and effectiveness. Each of these three dimensions has tactical, operational, and strategic components. Table 5 summarizes this concept and provides examples for each dimension.85

Cost of Airpower. The cost of a campaign is a question of resource allocation and effort. With limited resources or competing military tasks, effort reflects priority. Effort translates available resources into the accomplishment of military tasks. Airpower effort considers the number and types of assets made available for employment. In its simplest form, the number of tactical aircraft deployed to SEA defines the strategic effort. The number of sorties these aircraft are capable of generating provides an indication of the priority of the objective. At the operational level, effort is measured in the amount of resources allocated for a campaign or to achieve theater

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85 Mr. Barry D. Watts and Dr. Thomas A. Keaney provided the inspiration for these dimensions in Gulf War Air Power Survey, (Washington: U.S. Government Printing Office, 1993), vol. 2, pt. 2, 27-57. They define airpower effects and effectiveness as described here. I expanded the concept to include effort along with the three dimensions of each of the aspects of cost and results.
objectives. The apportionment or allocation of sorties is an operational level measure of effort. Finally, effort at the tactical level may be viewed as the number of sorties against a target or the number of aircraft in a strike package. The expenditure of resources on the battlefield will determine the effort applied to accomplish an objective. Effort must be compared to effects and effectiveness and vice versa because some minimum level of resource exist below which objectives, whether tactical, operational, or strategic, cannot be achieved.

**Direct versus Indirect Effects.** The results of airpower strikes are direct and indirect. The implication of direct results relates to the effects of airpower, while the indirect results are considered the effectiveness of airpower. Airpower effects are the immediate outcome of the employing airpower against a target of significance to the enemy. The physical destruction or damage of the target is a “first-order” result of airpower. Because targets can be strategic, operational, and tactical, the destruction of the target will influence the conflict at these three levels. For example, the destruction of a single tank is the tactical effect of airpower, but the destruction of a division of tanks will remove that unit from the battlefield and has operational consequences. Likewise, the destruction of several operational targets may result in strategic effects.

Airpower effectiveness is the “second-order” or indirect outcome of the employment of airpower. These are not often directly apparent as they deal with objectives. Like effort and effects, effectiveness plays at the three levels of warfare. If airpower decides or influences the outcome of a battle, it has tactical effectiveness. Take the destruction of the enemy’s armor, for example. The destruction of 8 tanks is the effect of airpower but if the loss of this armor forces the enemy to withdraw or terminate an offensive, that result measures airpower’s effectiveness. Measuring effectiveness is most evident in terms of objectives achieved. If a national objective is attained through the use of airpower, then airpower effectiveness is obtained.

Airpower because it operates in three levels of warfare provides a unique asset because tactical effort may result in strategic effectiveness. Analyzing BARREL ROLL in terms of these three aspects will assist in formulating a conclusion as to the success and effectiveness of the air campaign.

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86 DOD, Joint Pub 3-56.1, “Command and Control for Joint Air Operations,” defines apportionment as the determination and assignment of the total expected effort by percentage and/or by priority that should be devoted to the various air operations and/or geographic areas for a given period of time. Allocation is defined as the translation of the apportionment into total numbers of sorties by aircraft type available for each operation/task.
Resource Allocation - Measuring Air Power Effort in BARREL ROLL

The lack of complete historical records that delineate specific airpower apportionment data during the course of the campaign, requires we find an alternate measure. Effort is derived by examining the resources committed to the theater, the sorties generated, the sorties allocated by tasks, and the ordnance expended. By analyzing this data, we can draw a conclusion on the issue of cost and priority of the BARREL ROLL campaign.

Resources Available. Table A-1 (p. 55) shows the air order of battle for USAF strike aircraft in SEA during the period of analysis. Figure A-1 (p. 58) displays this information graphically and shows a decline in total available USAF strike aircraft in SEA, which is consistent with the US policy of withdrawal. The data shows a significant decrease in the South Vietnam-based attack aircraft while the level in Thailand remains relatively constant until the 1972 North Vietnamese invasion of the South. The decline in aircraft means that less resources are available in theater and we would assume a decrease in the attack sorties available for tasking to BARREL ROLL.

Sorties Flown. Examining US sorties flown by theater is one aspect of determining priority or effort of BARREL ROLL within the context of the total SEA effort. Table A-2 (p. 56) illustrates these priorities in each phase of BARREL ROLL by showing the relative distribution of attack sorties throughout SEA for each period. The table indicates that BARREL ROLL was the third overall SEA priority until Phase 3 when the North Vietnamese invaded South Vietnam. During Phase 3, 80% of the tacair was employed in Vietnam, and BARREL ROLL is the lowest priority in SEA next to Cambodia. The other significant conclusion is that the amount of effort applied toward Laos during Phases 1 and 2 of BARREL ROLL is indicative of the area’s importance during this time frame. Overall, for the 52-month campaign, BARREL ROLL received 10% of the total US tacair effort of SEA. Thus, effort, in terms of attack sorties flown, show BARREL ROLL to be a low SEA priority during the four year period.

Ordnance Delivered. Looking at ordnance delivered (Table A-3 and A-3a, p. 57) provides a similar indication of effort. The available data does not distinguish between BARREL ROLL and STEEL TIGER, however the trends are somewhat similar to the attack sorties flown. Nevertheless, looking at the ordnance expended provides another dimension to measure effort. The addition of B-52 strike sorties adds about 2 million tons of ordnance distributed across all theaters and phases and only a minor effect on priority. Laos turns out to be one of the most heavily bombed areas during the SEA conflicts—the large majority of ordnance employed along the trail in STEEL TIGER EAST.
Sorties by task. Some apportionment data for BARREL ROLL was available for the period January 1970 to August 1971, thus enabling some conclusions. Sorties were tasked against three roles: interdiction of trucks and storage areas, distributed to Raven FACs for support of ground forces, and against enemy air defenses. Figure A-4a shows the distribution of US attack sorties. Interdiction was the top priority between June 1970 and February 1971 with approximately 75% of the sorties dedicated to this effort. The period January 1970 to April 1970 and February 1971 to June 1971 finds the support of ground forces as the primary role. This coincides with the seasonal enemy offensive. Both periods were characterized by deeper enemy starting positions, which had not occurred in previous years, along with the use of sieges around Long Tieng and Luang Prabang.

BARREL ROLL was the Third Priority in SEA. Having examined the resources available, attack sorties flown, ordnance delivered by theater, and sorties by task within BARREL ROLL, we conclude that this operation was third in priority behind South Vietnam and the interdiction effort in STEEL TIGER. Once the NVA invade South Vietnam during Phase III, 83% of the attack sorties went to directly support the war in Vietnam and BARREL ROLL draws less than 5% of SEA attack sorties.

Within BARREL ROLL, the air effort is divided between interdiction and support of ground forces with the preponderance of the air being dedicated to the interdiction effort against enemy supply lines. Since this is the enemy’s center of gravity, it follows that interdiction of enemy lines of communication is consistent with trying to stop or defeat the enemy’s offensive capability.

BDA - Measuring Air Power Effects and Effectiveness of BARREL ROLL

Translating effort into effects is measured by examining targets destroyed in comparison to sorties flown or ordnance expended. In other words, how were the resources expended converted into enemy targets destroyed or damaged. In BARREL ROLL, airpower effects were reported using Bomb Damage Assessment (BDA).

What to Measure. BDA was collected against five target sets: vehicles, buildings, anti-aircraft guns, bridges, and road cuts. BDA was the product of direct observation by the crew of the strike aircraft, the FAC or Forward Air Guide, or by post-strike reconnaissance aircraft or ground team. Results for these targets are shown in Figures A-4 and A-4a (pp. 70-71). Except for the period December 1969 to August 1970, the BDA shows good trend

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87 Forward Air Guides were US or allied personnel who help direct attack fighter sorties to the target from the ground.
correlation with attack sorties flown (also shown on Figure A-4). The Spring of 1970 was a precarious time due to
the siege of Long Tieng and many attack sorties were dedicated to support of ground forces. The effect of the
interdiction effort against vehicles, buildings, bridges and roads is reflected in these results. Likewise, the effort
against enemy air defenses also correlates with the results.

**Reporting BDA.** Using reported BDA from historical records comes with liabilities. Report of BDA in
Laos suffers from the same affliction that the Army experienced with “body count.” The management influence of the
USAF reduced each strike sortie to its contribution for the war effort. “Truck kills” became a measure of
effectiveness. Inflated reports were common. During one year, the number of trucks damaged or destroyed exceeded
the total number of trucks in North Vietnam almost by a factor of three. Other reports became equally inflated.
Accordingly, recorded BDA may not provide a totally accurate measure of effects and must be used with caution.
Since it is the only measure available, BDA is used in relative terms to compare between phases or roles. BDA may
not be valid in the absolute, for example, how many total trucks are destroyed during a given period.

Another problem in determining airpower effects is the lack of BDA report from the employment of airpower
in support of ground forces. The source of the problem is twofold. First, observations of enemy dead is more difficult
than other targets. The second source is the issue of accuracy described above. The forward air guides (FAGs) who
help direct strikes often provided BDA following the attack. FAGs reasoned that a higher kill rate would look good
for the pilot and FAG at headquarters. The standard BDA was 100 body count, which headquarters began to question
and demand a more realistic and accurate count. In one instant a US pilot received a BDA report from a FAG as “You
killed ninety-eight bad guy.” The pilot replied “Oh come on Pogo. What dya mean, ninety-eight?” After a short
silence, Pogo responds with, “Okay, you kill one hundred and two.” Because of these problems, more often, only the
second-order results of airpower or effectiveness become apparent when air is employed in support of ground forces;
that is, the overall results of the engagement in terms of terrain held or taken, sieges broken, or enemy attacks repelled.

**Congruence with National Policy - Measuring Airpower Effectiveness**

The indirect results of force employment measures airpower effectiveness. Where airpower effects are most
apparent at the tactical level (tank destroyed or damaged), airpower effectiveness manifests itself principally at the
operational or strategic level (battle won or objective achieved). Determining effectiveness must look at how well
airpower achieved the strategic and operational objectives of the campaign. An example of each level will be described.

**Tactical Level - The Siege of Long Tieng.** In March 1970, North Vietnamese backed Hmong irregulars into the Military Region 2 headquarters at Long Tieng. The enemy put intense pressure on the RLG forces hoping to capture the site. Loss of this installation would have seriously compromised the RLG's ability to maintain control of the country. As a tactical target, Long Tieng had operational level significance for the RLG forces. Airpower—tacair and B-52s—was used in support of the ground forces attempting to hold Long Tieng. Although the effects of the employment of these strike sorties may not be apparent, airpower broke the siege, which was the tactical objective of employing the airpower. Airpower's effect at the tactical level had operational and strategic level effectiveness by achieving the objectives, of support of RLG forces and preservation of the RLG.\(^\text{89}\)

**Operational Level - Allowed the Prosecution of the Trail War.** Whether or not it was an effective strategy for the war in South Vietnam, interdiction of the Ho Chi Minh Trail was a primary objective of airpower in Laos during this period of the war. Given that objective, maintaining access to Laos was critical to the US strategy and support of the neutralist government providing that access. Consequently, the second order results of the BARREL ROLL campaign was the ability of the US to conduct STEEL TIGER. Since this campaign was executed in total, we conclude that BARREL ROLL achieved its operational level objectives and was effective.

**Strategic Level - Security of Thailand.** Preventing the communist insurgency of Thailand by denying the Chinese and North Vietnamese access to Thailand was a strategic objective of the US. Although South Vietnam and Laos eventually fell, the security of Thailand was secured principally through the war fought in northern Laos. North Vietnamese forces where prohibited from using Laos as a sanctuary or staging area for action against Thailand. Since Thailand remains free of communist insurgency today, we conclude that BARREL ROLL had some effectiveness in achieving this strategic objective.

**Political Level - Royal Lao Government.** Finally, maintaining the RLG in power was a political objective of US strategy in Laos. The government remained in power through the end of the Vietnam war which allowed US access to the country to prosecute the interdiction campaign against the Ho Chi Minh trail. Consequently, while the US

\(^{89}\) Morrocco, 45.
needed access to Laos to support the withdrawal of US forces from SEA, BARREL ROLL was effective in achieving this political objective. The original objectives of keeping Laos neutral had been previously abandoned and were not objectives of this period of BARREL ROLL. The campaign's principal contribution between 1968 and 1973 was in support of US interests and objectives in SEA, mainly South Vietnam.

\[\text{Sams, 1-4.}\]
CHAPTER FIVE
CONCLUSION

The pronounced characteristics of the air war in Laos was that the USAF was reacting rather than acting in the employment of its air assets.\(^{90}\)

—Lt. Gen. James D. Hughes, Deputy Commander, 7/13 AF, 1972-73

U.S. tactical air has been the major factor in preventing wholesale reverses and making these friendly moves possible. USAF and the RLAF T-28 force have performed remarkably well in defense of friendly ground positions, in providing close air support for offensive moves, and in destroying enemy supplies, equipment and bivouac areas. But air forces cannot substitute for ground forces; they can only supplement them and increase their fire power and maneuverability.\(^{91}\)


Having addressed the four aspects of the campaign analysis—the "why," the "what," the "how," and the "results"—this section will examine the last question: "Did BARREL ROLL constitute an (implicit) air campaign plan?" The answer to this question must consider the tenets of a campaign. The "JFACC Primer" states a campaign should convey the commander's intent, define success, orient on enemy centers of gravity, phase a series of operations, provide direction, and synchronize joint forces.\(^{92}\) In addition, the campaign must link strategic objectives with tactical actions. This section concludes by providing several "lessons learned" from the campaign.

**Barrel Roll As An Air Campaign**

Throughout the period November 1968 to February 1973, BARREL ROLL was executed to protect friendly centers of gravity, exploit enemy centers of gravity, and achieve the operational and strategic objectives defined during the course of the campaign. Despite complicated command and control, the use of airpower as long-range artillery, and questionable coordination between ground and air efforts, this phase of BARREL ROLL accomplished US objectives in support of the overall SEA war effort and the force employed (resource allocated) was consistent with US policy.

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\(^{91}\) Seith, End-of-Tour Report, tab C, 3.
**Friendly Center of Gravity.** The fate of the RLG was vested in the Hmong irregular forces ability to remain in the field and engage with the Pathet Lao and NVA. The Hmong army was an operational center of gravity in Laos. Its defeat would have compromised the RLG with accompanying strategic ramifications—most of all, the lost of US access to the country for the mission of interdicting NVA supply lines into South Vietnam and supporting US objectives in Vietnam. A primary objective of BARREL ROLL was the support of the RLG forces. The US identified this as a friendly center of gravity and airpower was used to keep Gen Vang Pao's forces in the fight. Although airpower could have never won this war, the absence of airpower would certainly have resulted in the defeat of Vang Pao's forces and leads to the fall of the RLG.

Tactically, the Lima Sites were centers of gravity because the Hmong used these to gather intelligence and to prosecute a guerrilla-style war against the conventional NVA. Air mobility support by contract airlift and Lima Sites provided the Hmong an advantage over the road-bound NVA. The employment of gunships in defense of the Lima Sites demonstrated a recognition by the US of the importance of these airfields to the conduct of the ground war against the Pathet Lao and North Vietnamese.

The effectiveness of the Pathet Lao and NVA in identifying friendly center of gravity must also be discussed. The NVA focus on the Hmong guerrillas and their siege of Long Tieng demonstrates a recognition of importance of this site and the friendly ground forces. The concentration on and capture of Lima Sites also shows an NVA understanding of how the Hmong utilized these facilities. Finally, the NVA identified the importance of airpower for the RLG forces. Attacking the Lima Sites disrupted the air mobility of the guerrillas and improving the road structure inside Laos minimized the effects of air interdiction against NVA supply lines allowing the enemy to remain forward during the wet season and negate the effectiveness of tacair.

**Enemy Center of Gravity Identified.** The North Vietnamese had several vulnerabilities. Without a developed infrastructure in northern Laos, the NVA were constrain by long lines of communications for resupply. Without roads that were useable during the monsoon season, the North Vietnamese quickly confronted a culminating point and were forced to withdraw. In addition, the ability to use Vietnam as a sanctuary for supplies without the threat of interdiction was also to their advantage. The build-up of supplies prior to the start of the seasonal offensive allowed them to increase the level of force and violence in 1969 and 1970. With a larger cache of supplies and by

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92 "JFACC Primer," 19.
weatherproofing the roads, the NVA were eventually able to hold their gains and not be forced to withdraw during the monsoon season. The ability of the North Vietnamese to wage an offensive campaign was dependent on prepositioning of supplies and maintaining year-round use of their lines of communication. These were the enemy's centers of gravity. The NVA road improvements were the enemy's effort to protect these vulnerabilities. Conversely, the US recognized the importance of interdicting the NVA lines of communication. The development and use of all-weather bombing techniques and the continued emphasis on interdiction throughout the campaign demonstrate a recognition of the enemy's center of gravity. When interdiction fell short of stopping the seasonal offensive as it did in 1970 and 1971, the US intensified support for the ground forces in the besieged areas until the concentrated attacks of the enemy were defeated. In correctly identifying the enemy's centers of gravity and minimizing the friendly vulnerabilities, the BARREL ROLL air campaign was effective.\textsuperscript{93}

**Consistent Employment with US Objectives & Military Strategy.** Tactical actions supported US objectives and military strategy. The goal of the US was not to defeat the Pathet Lao or NVA in Laos but to support engaged irregulars and SGUs while keeping the RLG in power. This was accomplished through the use of strict rules of engagement, covert operations, and the employment of airpower to make up for the ground force deficiency in firepower. Given the large amount of airpower available, the US was careful not to escalate the conflict beyond the bounds determined by the enemy and the objectives. In addition, despite being a low priority for airpower with respect to other theaters in SEA, when airpower was needed to support the RLG, it was available.

**Accomplished Objectives.** From the standpoint of achieving objectives, BARREL ROLL as an effective air campaign in supporting national, strategic, and operational objectives in SEA. In this regard, BARREL ROLL supported the US withdrawal from Vietnam and the interdiction campaign against the Ho Chi Minh trail. Given the command and control structure, the political constraints, the number of agencies involved, and the environment and geography the employment of airpower carefully balanced these conditions to achieve its objectives.

Although the campaign succeeded in containing the conflict and forces a stalemate in Laos, it failed to accomplish the original policy objectives in Laos and withdrawal of all North Vietnamese from the country. The political end-state was defined as the restoration of the 1962 Geneva Agreement conditions, that is, a neutral Laos. This was never achieved as Laos fell to the communist in December 1975. Subordination of this campaign to a

\textsuperscript{93} Searles, End-of-Tour Report, 17-20.
redefined US policy and objectives in South Vietnam resulted in modifying the military strategy and course of action in Laos.

With respect to BARREL ROLL as an (implicit) air campaign, no record or description of a defined military end-state or success criteria was found in the historical documents. The lack of a military success criterion is a severe deficiency in the BARREL ROLL campaign. Today's standard for campaign planning requires these criteria be clearly identified and related to the political objectives. In this regard, BARREL ROLL cannot be considered a campaign according to current doctrine.

Cost of the Conflict. This study would be incomplete without some mention of the cost expended in execution BARREL ROLL. The cost of this effort was enormous in terms of Hmong lives, aircraft loss, and US aircrew losses. US military advisors and Ravens serve finite lengths of time in Laos: six months to one year tours. However, the Hmong fought this war until they died. An entire generation of Hmong men were killed in this conflict. Likewise, the RLAF aircrew flew until the war ended or they died. Several hundred thousand refugees lost their homes and were displaced. Ultimately, the cost to the Laotians was their country and the subsequent communist retribution taken against the minority people of Laos who fought the North Vietnamese. This punishment continued well into the 1980s.94

During the four-year period of this study US air loses numbered 80 aircraft. Total aircraft losses for BARREL ROLL starting with the first sortie on 18 May 1964 were 131. Total attack sorties for the four year period were 84,416 which was about 9% of the tacair employed in Laos. As the data shows, clearly the largest effort was in STEEL TIGER against the trail. In dollars, although there is no way to breakdown the cost by campaign, the US spent $1.4 billion in military aid for Laos.

Relevant Lessons

No analysis of a military operation would be complete without identifying the important lessons that may be applicable to future conflicts. Countless books have been written about the employment of airpower in SEA, but few

94 Hamilton-Merritt's book, Tragic Mountains focuses primarily on the Hmong people who fought with the French, the Royal Lao government, and the Americans during all three Indochina wars. The book highlights the tragic plight of these people at the hands of the communist North Vietnamese.
have looked at the unique contributions of airpower as applied during BARREL ROLL. The following four areas are recognized as being most important to the prosecution of future conflicts the US may encounter.

Central Control of Airpower. Despite enormous pressure from the Ambassador, who wanted operational control of the airpower, the USAF resisted providing the embassy with its own “private air force.” To have done so would have violated the fundamental tenet of “centralized control, decentralized execution.” By maintaining operational control of USAF air assets, Seventh Air Force was able to apportion assets where they were most needed in the theater. Several instances occurred where the embassy claimed it had insufficient air or the USAF lacked responsiveness, but given the environment—complex command and control, political restrictions, covert war, limitations on the amount of violence—airpower was employed based on prioritized needs as seen by Seventh Air Force. Future conflicts may necessitate inefficient utilization of airpower, but the tenet of central control should never be compromised.95

Fighting in an Undeveloped Country. The lack of an airpower infrastructure in Laos, the need to operate from outside the country, the use of airpower in support of indigenous troops, and the covert employment of US forces are all relevant to future US military involvement in the world. The reduction of forward presence in today’s world makes reflecting on the required infrastructure needed for operations and the ability to operate from outside the country a vital consideration. In addition, the current US aircraft inventory may not be adaptable to this type of situation. The difficulties posed by interoperability in an environment of different languages, culture, and unsophisticated weapons makes the cause for a capable special operations capability, as well as, a way to project airpower from outside an area of employment. Africa, South America, and SEA are all areas the USAF could have difficulty conducting future operations due to poor airpower infrastructure.

Use of Air in Unconventional Ways. There are many critics who feel that airpower was poorly utilized in Laos.96 These were principally USAF senior officers at 7/13 Air Force or Seventh Air Force who lacked a first-hand view and understanding of the situation in Laos. Employment of tactical air during BARREL ROLL often did not conform to airpower doctrine. The criticisms of “serving targets” or “use of air as long-range artillery” are common in historical references examined. The nature of guerrilla warfare—its mobility and light firepower—may transform

96 An example of this view is the quote of Lt. Gen. Hughes presented at the beginning of this section.
airpower into long-range artillery. However, in this manner the use of air for mobility and for fire support was invaluable to the ground scheme of maneuver. What the critics overlooked is that a guerrilla force does not fight like a conventional army. Preplanned and coordinated operations in Laos were more the exception than the norm. Accordingly, the employment of airpower had to be responsive to the politics and dynamics of the tactical situation.

The mobility provided to Gen Vang Pao’s forces by airpower must not be overlooked. The ability of these lightly-equipped forces to effectively engage a conventional and heavier-equipped force was not only due to the fighting spirit of the Hmong but also to their ability to move around the battlefield. Unfortunately the special airlift assets needed for this kind of conflict do not exist in the USAF inventory, but, the US Army’s helicopter force could provide the support needed in this type of environment.

**Employment of Special Operations Forces.** A principal success story was the effectiveness of special operations forces in this unique environment. Air commandos, through Project Waterpump, developed an air force and ground commandos trained an effective guerrilla force. The covert employment of special forces provided presence without visibility. Perhaps such employment in future operations, given the open media environment that now exists, is not possible; nevertheless, the use of special forces to train and advise foreign military units and governments maybe more necessary today than during the Cold War years. The lessons of special forces’ operations in Laos should be studied for relevant application in future situations.
The Gulf War created new standards from which to judge all future air campaigns; however, caution must be employed in light of potential future air wars. Today’s world appears to be more unconventional than the type of war encountered during Desert Storm. The desert was a unique environment that favored airpower, unlike the conditions that existed in Laos during the 1960s and early 1970s. US military forces would be wise to remember the lessons learned in Vietnam, but should especially study those learned in Laos.

The application of airpower, at times conflicting with the strict interpretation of Air Force doctrine, made a definite contribution in BARREL ROLL. Like most conflicts—airpower alone was unable to completely defeat the enemy in northern Laos, but the lack of air support would have doomed the Hmong guerrillas early in the conflict. Air made the difference in keeping pressure on the North Vietnamese and maintaining the RLG in power. The political and geographical constraints of Laos ultimately resulted in a war of attrition both on the ground and in the air.

Unfortunately, the tragedy of this story remains the loyal Hmong tribesmen who having fought so valiantly for their beloved Laos were left to wilt after the US departed. Like airpower, these individuals became a tool in achieving US objectives in Laos. Their attrition became part of US strategy to maintain the military stalemate. Sadly, this will forever remain the dark side of BARREL ROLL and US involvement in the secret wars of Laos.

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APPENDIX

The following tables and charts are a compilation of data obtained during the course of research for this project. The majority of the data was obtained from Headquarters, Pacific Air Force, “Summary Air Operations in Southeast Asia” archived at the Historical Research Agency, Maxwell Air Force Base. These documents are organized in 109 volumes, one for every month, beginning July 1964 and ending August 1973. The reports present a summary by theater (Laos, North Vietnam, South Vietnam, Cambodia) of sorties, ordnance, bomb damage assessment, losses, and an overview of the month’s activity. Most of these reports have been recently declassified and offer a wealth of data awaiting analysis.

The charts in this section provide information for the period of this study, mid-1968 to early 1973. Comparing the effort of air activity in BARREL ROLL to other areas in SEA provides a good perspective for the priorities and utilization of available tacair sorties. The data was plotted to support the analysis and conclusions of this study. Complete analysis and correlation will be a task for another study or paper. Nevertheless, this data provides an interesting perspective of the employment of airpower and relationship between theaters in SEA.
Table A-I: Air Order of Battle, USAF Attack Aircraft, July 1968 - December 1972

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| GRAND TOTAL   | 729 | 709 | 713 | 640 | 541 | 429 | 366 | 287 |

53
Table A-2: US Attack Sorties (Tacair) by Phase of BARREL ROLL

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### Table A-3: US Tacair Ordnance Delivered by Phase of BARREL ROLL (tons)

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### Table A-3a: US Tacair & B-52 Ordnance Delivered by Phase of BARREL ROLL (tons)

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Figure A-1: Total USAF Attack Aircraft (distributed by country) during BARREL ROLL, July 1968 - December 1972
Figure A-2: Total US Attack Sorties by Theater, July 1968 - August 1973
Figure A-2a: Distribution of Total US Attack Sorties by Theater, July 1968 - August 1973
Figure A-2b: Total Attack Sorties (US, RLAF, and B-52) against Laos Targets, July 1968 - August 1973
Figure A-2c: Distribution of Total Attack Sorties (US, RLAF, and B-52) against Laos Targets, July 1968 - August 1973
Laos Attack vs Total Sorties
(US Only, w/o B-52 sorties)

Figure A-2d: Comparison of US Attack Sorties against Laos Targets with Total US Attack Sorties for SEA, July 1968 - August 1973
Figure A-2e: Total B-52 Sorties by Theater, July 1968 - August 1973
Figure A-3: Total US Attack Ordnance by Theater, July 1968 - August 1973
Figure A-3a: Total Ordnance Delivered (US, RLAF, VNAF, and B-52) by Theater, July 1968 - August 1973

Total Ordnance Delivered
(includes RLAF, VNAF, & B-52)

- South Vietnam Total
- North Vietnam Total
- Laos Total
- Cambodia Total
Figure A-3b: Total B-52 Ordnance Delivered by Theater, July 1968 - August 1973
Figure A-3c: Total US Ordnance Delivered (Attack and B-52) against Laos Targets, July 1968 - August 1973
Figure A-3d: Distribution of Total US Ordnance (Attack vs B-52) against Laos Targets, July 1968 - August 1973
Targets - Damaged / Destroyed
USAF Barrel Roll

Figure A-4: Target Set Bomb Damage Assessment vs. USAF Attack Sorties (excludes B-52) for BARREL ROLL, July 1968 - August 1973
Figure A-4a: Apportionment of Attack Sorties vs Truck Targets for BARREL ROLL, January 1970 - August 1971
BIBLIOGRAPHY

U.S. Government Documents

United States Congress


United States Department of Defense


United States Office of the President


Declassified Documents Reference System (DDRS) Sources


Books


