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ANTI-INFILTRATION BARRIER TECHNOLOGY AND THE BATTLE FOR SOUTHEAST ASIA

1966 - 1972

by

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14. ABSTRACT

Early in 1966, with American bombing efforts in Viet Nam achieving limited affect in stemming the flow of support to communist forces in the south, the U.S. defense establishment began casting about for alternatives. By late summer this research had crystallized into a plan for a ?barrier? that stretched from the Gulf of Tonkin into Laos across the 17th parallel. Comprised of both physical and electronic components, the idea caught the eye of Secretary of Defense Robert S. McNamara who established a Joint Task Force to implement the program. Given one year to have a system in place, the Defense Communications Planning Group (DCPG) pulled out all the stops to bring the program to fruition. Gradually shifting emphasis from the physical barrier in the DMZ region to the electronic system further west, DCPG oversaw all phases of the program from Washington, D.C. to Eglin AFB, to Panama to Southeast Asia. A detailed examination of the successes and failures of DCPG and by extension the barrier system was conducted utilizing all facets of the historical record. Emphasis was placed on accurately rendering the history and contribution of the program using primary sources. This electronic anti-infiltration barrier was variously called Practice Nine, Muscle Shoals and Igloo White and came to be popularly called McNamara?s Line referring to the Secretary?s support for the system. Running from September 1966 through December 1972, Igloo White involved thousands of people in the design, development, deployment and employment of a system of systems and cost, conservatively, more than $2 billion. From November 1968 through April 1969, Igloo White directly supported the U.S. COMMANDO HUNT I interdiction effort in Laos. During this time all aspects of the program came together providing a clear view of system capabilities and limitations. From 1969 to 1972, as the system and technologies matured, capabilities increased and specialization flourished. Igloo White also formed the springboard for many other important unattended sensor technology programs. Clearly DCPG and the systems it developed played a key role in the interdiction efforts in Southeast Asia. The overall accomplishment of those efforts must, however, be questioned in light of the tremendous amount of resources expended and the actual anti-interdiction successes achieved. In retrospect it is easy to see that an interdiction program, supported by air assets alone, stood little real chance of success in the physical and politically constrained environment of the Viet Nam war. The outcome of this program should provide a poignant reminder that airpower, regardless of its advances or pairing with superior technology, cannot and should not be considered the only solution when fighting this nation?s wars.

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Preface

Several years ago I read military author, Mark Berent's fictionalized accounts of F-4 combat operations in Southeast Asia. At the time I didn't know the extent of his experiences nor did I know that the retired Lieutenant Colonel had also written historical pieces on the war. When I began looking for a research topic one element of his story stuck with me. Berent's discussion of dropping sensors disguised as branches or small trees was intriguing. When I approached Dr. Tim Castle, my Faculty Research Advisor, on the subject he opened my eyes to the range and depth of the 'Igloo White' sensor program and enthusiastically endorsed the topic. Defense Secretary Robert McNamara initiated this air supported anti-infiltration barrier concept in 1966. Called variously Practice Nine, Muscle Shoals and then, in 1968, Igloo White -- the system migrated from a physical barrier system along the DMZ to an electronic sensor system monitoring the so-called "Ho Chi Minh Trail" network in Laos. Operating until the summer of 1972, the Igloo White system paired with the U.S. COMMANDO HUNT air interdiction missions to amass a significant record countering North Vietnamese infiltration of personnel and material to communist forces in the South. This paper examines the Department of Defense (DoD) effort to design, develop, deploy and employ what is acknowledged as an almost exclusively air supported barrier system that would assist in ending the war in Southeast Asia. Although not the primary focus, where practicable I comment on the Strong Point Obstacle System (SPOS) along the DMZ as well as use of sensor technology in South Vietnam.

Specifically, I will examine the inception of the program, its growth and development, deployment to Southeast Asia, improvement and operations in numerous campaigns and finally lessons learned and the direction sensor technology was taking as the war ended. What was the program's genesis and political environment of the time? How did chartering a DoD level organization outside traditional channels help or hinder development of the program? What efforts were necessary to deploy a whole new technology suite to a hostile physical environment half a world away? Was the deployment successful? Could the process have been improved? How did the system work in actual practice? Did it successfully respond under combat conditions? Was there a real-time feedback loop? Did DoD successfully implement system improvements throughout the lifecycle? What was the state of technology in 1972 as the war was winding down? What were the lessons along the way and given today's environment, what can be learned from this program? A careful examination of Igloo White will not only add to the body of work on our engagement in the Second Indochina War but will also serve as a 'lessons database' for future operations that endeavor to utilize airpower alone to achieve national objectives.

I owe a debt of gratitude to several people whose assistance and support greatly improved this effort. Dr. Tim Castle provided direct support as my Faculty Research Advisor and also endeavored to better merge the educational efforts of the Air Command and Staff and Air War Colleges. Mr. Joe Caver from the Air Force Historical Research Agency (AFHRA) did yeoman's work finding seminal primary documents making this effort better and more accurate. Of particular note were the Task Force Alpha Histories, which provided volumes of data and many of the original photographs and diagrams used in this paper. AFHRA's Ms. Essie Roberts and Ms. Deanna Kendrick also assisted in providing me access to their fine collection.

Mr. Archie DiFante, also of the AFHRA, provided prompt and extremely helpful declassification assistance. Ms. Diana Simpson, Air University Research Library, provided amazing support by tracking down rare and otherwise obscure material. She was always cheerful when her e-mail beeped with another message from me, asking the seemingly impossible. Thanks also to Dr. Lew Ware, Chair of the ACSC Electives Department for allowing me to audit Dr Castle's Viet Nam War elective. Last, but certainly very important, thanks also to my family who were extremely understanding during this project when I spent many hours buried in the stacks of one library or another.

Abstract

Early in 1966, with American bombing efforts in Viet Nam achieving limited affect in stemming the flow of support to communist forces in the south, the U.S. defense establishment began casting about for alternatives. By late summer this research had crystallized into a plan for a "barrier" that stretched from the Gulf of Tonkin into Laos across the 17th parallel. Comprised of both physical and electronic components, the idea caught the eye of Secretary of Defense Robert S. McNamara who established a Joint Task Force to implement the program. Given one year to have a system in place, the Defense Communications Planning Group (DCPG) pulled out all the stops to bring the program to fruition. Gradually shifting emphasis from the physical barrier in the DMZ region to the electronic system further west, DCPG oversaw all phases of the program from Washington, D.C. to Eglin AFB, to Panama to Southeast Asia. A detailed examination of the successes and failures of DCPG and by extension the barrier system was conducted utilizing all facets of the historical record. Emphasis was placed on accurately rendering the history and contribution of the program using primary sources. This electronic anti-infiltration barrier was variously called Practice Nine, Muscle Shoals and Igloo White and came to be popularly called McNamara's Line referring to the Secretary's support for the system. Running from September 1966 through December 1972, Igloo White involved thousands of people in the design, development, deployment and employment of a system of systems and cost, conservatively, more than $2 billion. From November 1968 through April 1969, Igloo White directly supported the U.S. COMMANDO HUNT I interdiction effort in

Laos. During this time all aspects of the program came together providing a clear view of system capabilities and limitations. From 1969 to 1972, as the system and technologies matured, capabilities increased and specialization flourished. Igloo White also formed the springboard for many other important unattended sensor technology programs. Clearly DCPG and the systems it developed played a key role in the interdiction efforts in Southeast Asia. The overall accomplishment of those efforts must, however, be questioned in light of the tremendous amount of resources expended and the actual anti-interdiction successes achieved. In retrospect it is easy to see that an interdiction program, supported by air assets alone, stood little real chance of success in the physical and politically constrained environment of the Viet Nam war. The outcome of this program should provide a poignant reminder that airpower, regardless of its advances or pairing with superior technology, cannot and should not be considered the only solution when fighting this nation's wars.

Part 1

System Background

> *…My expectations of it were never very high. …Secretary McNamara asked me if I would go out with General Taylor to talk to the JASON group out at Santa Barbara, where they were working on some electronics. And they outlined this whole scheme to us, and neither Taylor nor I thought very much of it. I didn't think it would be very useful.*
>
> — Ambassador William H. Sullivan[1]

Project Genesis

On March 2, 1965 the United States initiated Operation Rolling Thunder, a sustained bombing campaign against North Vietnam. From inception, debate over its effectiveness raged in American political circles and the media eventually influenced two early bombing pauses. To demonstrate that the U.S. sought a peaceful solution to the war, bombing was stopped for six days in May 1965 and again for 37 days during the 1965-66 Christmas and New Year holidays.[2] Several months into the operation, bombing results were at best mixed. Clearly, infiltration into the South continued. Not only were there no serious negotiations, but it was becoming obvious to even the most casual observer that the will of the North was growing stronger. Into an environment ripe for novel solutions, the barrier concept was introduced. In January 1966 Roger Fisher, a Harvard Law School Professor, sent a letter to Assistant Secretary of Defense John T. McNaughton. In the missive, Fisher explained his plan to isolate South Vietnam using a multi-faceted barrier concept. The idea of a barrier was certainly not new, the Great Wall of China

providing perhaps the most significant example. Barrier ideas in Viet Nam dated to the First Indochinese War and again gained momentum in 1958 as the French, long since gone from Vietnam, exhibited some success with a barrier system in Algeria.[3] Fisher outlined such a cogent argument that McNaughton, with few changes, passed it directly to Secretary McNamara. In fact, "McNaughton's changes added little to the Fisher ideas: they served merely to tone down some of his assertions and hedge the conclusions. The central argument for the barrier concept proceeded from a negative analysis of the effects of bombing."[4] The crux of the Fisher plan was an "on-the-ground barrier" along the 17th Parallel from the coast of Vietnam across Laos and the Ho Chi Minh Trail to the Mekong River. Various details included minefields, razor wire and a 10-mile wide defoliated strip. Concurrent with forwarding this plan to the Secretary of Defense, McNaughton also requested the Joint Chiefs of Staff (JCS) comment on the proposal. On March 24, 1966 the JCS, in an effort to gauge field reaction to the plan, sent a copy to Commander in Chief, Pacific (CINCPAC). The April 7, reply was swift and clear calling the barrier concept a "static defense effort which would deny us the military advantages of flexibility in employment of forces." Admiral Sharp recommended "against such a barrier as an inefficient use of resources with small likelihood of achieving U.S. objectives in Vietnam."[5] On April 16, 1966 McNamara, with the plan still fresh in mind, formally requested that the Institute for Defense Analysis (IDA) consider "technical possibilities in relation to our military operations in Vietnam."[6] Ten days later he placed McNaughton in charge of the study effort directing that the group should review concepts relating to "A 'fence' across the infiltration trails, warning systems, reconnaissance (especially night) methods, night vision devices, defoliation techniques, and area-denial weapons."[7] IDA's JASON group initiated their study on June 13, 1966 at Wellesley College in Massachusetts with ten days of background and intelligence briefings. The elite group of

academics then spent the next month examining specific aspects of the war. With the study barely underway word had already reached the public. An August 1, 1966 Op/Ed piece by Rowland Evans and Robert Novak in the *Washington Post* noted that "high-level officials here are now seriously restudying an old idea that conceivably could transform the Vietnamese war." The piece laid out in-detail the plan "to construct a double-apron barbed wire barrier across the south edge of the Demilitarized Zone near the 17th Parallel dividing North and South Vietnam." Focusing on infiltration of communist support to the South the report added "The barrier or shield against infiltration would be progressively extended across Laos to the Thailand border."[8] While the Evans and Novak article encapsulated mostly Fisher's ideas, its timing during the JASON study established an interesting precedent of tacit public knowledge of this super secret concept -- one that would continue throughout the life of the program.

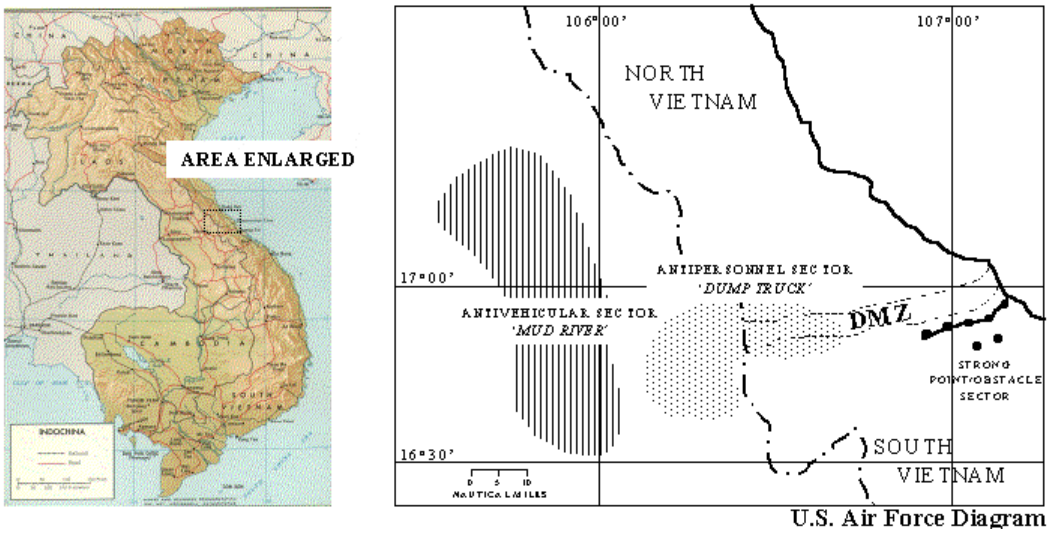

Figure 1. Detailed Map of Anti-Infiltration Areas

On August 30, 1966 the JASON group met with McNamara and McNaughton, submitting a report called "An Air Supported Anti-Infiltration Barrier". This study, S-255, was one of four interlinked reports and essentially provided the alternative to their stinging condemnation of the bombing effort. S-255 outlined "an air supported barrier system specifically designed against the

North Vietnamese infiltration system through Laos, based on further development of components that in the main are available, may be obtainable in about a year after the decision to go ahead." Details indicated:

> The barrier would have two somewhat different parts, one designed against foot traffic and one against vehicles. The preferred location for the anti-foot traffic barrier is in the region along the southern edge of the DMZ to the Laotian border and then North to Tchepone, to the vicinity of Muong Sen. The location of choice for the anti-vehicle part of the system was further to the west where the road network was more open to traffic (see Figure 1 above).[9]

The Secretary, impressed with the study, sent it to General Wheeler and the Joint Chiefs for comment on September 3, 1966. Predictably it was forwarded to CINCPAC for field review. Seeking additional details, McNamara and McNaughton traveled to Massachusetts on September 6, 1966 for a private conference with the JASONs. General Wheeler's preliminary response agreed with the Secretary's suggestion to establish a project manager, but expressed concern that, "the very substantial funds required for the barrier system would be obtained from current Service resources thereby affecting adversely important current programs."[10] Admiral Sharp's examination of the proposal reached Washington on September 13, in part reprising his concerns from April. Specifically he felt: "The combat forces required before, during and after construction of the barrier; the initial and follow-on logistics support; the engineer construction effort and time required; and the existing logistic posture in Southeast Asia with respect to ports and land LOCs make construction of such a barrier impracticable."[11] Certainly the Joint Chiefs concerns were pragmatic and budgetary while CINCPAC's issues were deeper, desiring a tie between plans, capability and U.S. objectives. Throughout this early wrangling over a barrier system most objections were focused on the cost, in manpower and material, to build the physical barrier opposite the DMZ. Little differentiation was made between this physical barrier and the electronic sensor supported areas farther west in Laos. In spite of less than glowing

recommendations from his senior commanders, McNamara formally implemented the barrier plan on September 15, 1966. In a letter of the same date, the Secretary appointed Lieutenant General Alfred D. Starbird, U.S. Army, as director of Joint Task Force (JTF) 728. JTF 728 was charged with developing the following: "An infiltration interdiction system to stop (or at a minimum to substantially reduce) the flow of men and supplies from North Vietnam is to be designed, produced and put in place… as a matter of the highest priority." General Starbird was assigned a one-year Initial Operational Capability (IOC) timeline with very specific guidance from the Secretary:

> There will be required experimentation and further development for such features as foliage penetration, moisture resistance, and proper dispersion of gravel; development of a better acoustic sensor than currently exists; aircraft modifications; possible modifications in BLU-26B fusing; refinement of strike-navigation tactics; and total system tests. Production of components will have to be increased, personnel will have to be trained, a unit and command structure to operate and supply the system will have to be created, and a doctrine for its operations will have to be developed. Communist infiltration practices and the location of civilian populations will have to be studied. Political groundwork will have to be laid. Public relations questions will have to be addressed. Furthermore, to keep ahead of countermeasures, new components of the system and new tactics will have to be under development even before the first generation system is installed.[12]

JTF 728 was chartered with the unusual authority to report directly to SECDEF and could communicate directly with the Joint Chiefs, Services and field units. Finally, General Starbird was directed that "the existence and operations of the Joint Task Force (728) should be kept confidential" driving the formation of the innocuous Defense Communications Planning Group (DCPG).

DCPG Underway

General Starbird lost no time in establishing the structure necessary to carry out the SECDEF's order. Commandeering space at the Naval Observatory, DCPG organized into

several key directorates including a command section and administration with Deputy Directors for Forces, Material and Services and Evaluation.[13] Over time the organization would mature to include directorates for Operations, Test and Evaluation, Program Management and Engineering with overseas detachments and project specific working groups. Not surprisingly, a significant portion of the early effort involved placating various branches and offices of the services. Operating outside traditional channels was at once a curse and a blessing. To assuage naysayers, Starbird appointed Air Force, Army and Navy officers to essential DCPG positions. Of all services the Air Force seemed most disaffected by DCPG's formation. Taking their cue from the 'Air' in 'An Air Supported Anti-Infiltration Barrier' Pentagon officials quickly began to circle the wagons. Within days of General Starbird's appointment, the Air Staff had "…initiated a unilateral in-house study (COMBAT BEAVER) to establish Air Force capabilities for aerial blockade."[14] While it is probable Air Force investigation into barrier options pre-dates the JASON summer study, the Air Staff readily embraced the opportunities afforded by DCPG noting, "Whatever the final results of JTF-728, these should provide significant fall-out of benefit to the Air Force."[15] Dissembling would likely have continued if not for a personal message to all Air Force Commanders from General McConnell, Air Force Chief of Staff. In the message he noted "In view of the complexity of the tasks involved and the short deadline stipulated by the SECDEF, it is clear that the (DCPG) Planning Group will require assistance from time to time from all addressees." He indicated his "…desire that such assistance be provided as a matter of the highest priority."[16] McConnell concluded by institutionalizing Air Force support to DCPG, identifying a single point of contact on the Air Staff, AFXOP, for all DCPG activities.

Operating with characteristic speed and thoroughness, General Starbird responded to the SECDEF's original tasking by outlining projects and associated schedules.[17] The enormity of the task was readily apparent as various directorates within DCPG began to analyze available technology running the gamut from sonar buoy technology to munitions and high-speed computers. In rapid-fire succession, the services provided briefs to the DCPG staff on the state of technology and cost and deployment timelines.[18] Early meetings cemented the connection between the Gravel and Button Bomblet munitions suggested in the JASON study and systems that were later fielded in tremendous volume. Deployment locations for aircraft and ground systems were discussed and numerous long-lead items were initiated. Throughout October 1966, DCPG continued to expand its staff while pursuing efforts that would apply regardless of the direction the planning would take. To quell fears that DCPG was accelerating out of control, with total disregard of the study that figured prominently in its inception, two oversight functions were established. DCPG quickly added a Chief Scientist and a Scientific Advisory Committee (SAC).[19] Interestingly, the Scientific Advisory Committee included seven of the original fifteen JASONS who had worked on Study S-255.

While DCPG activities surged, Secretary McNamara traveled to Vietnam on October 10, to meet with field commanders. General Starbird, in Vietnam reviewing the situation in the field, was requested to stay an extra day to overlap with the SECDEF, as the barrier project would have priority on McNamara's agenda.[20] Returning to Washington, McNamara struggled with how best to sum up for the President the results of his trip to Saigon and meeting with General Westmoreland. Caveated by the prophetic, "I see no reasonable way to bring the war to an end soon," his Memorandum for the President laid out five recommended actions. Central among these was DCPG's Practice Nine[21] program, which called for:

> The construction and maintenance of an infiltration barrier. Such a barrier would lie near the 17th parallel – would run from the sea, across the neck of South Vietnam (choking of new infiltration routes through the DMZ) and across the trails in Laos. This interdiction system (at an approximate cost of $1 billion) would comprise to the east a ground barrier of fences, wire, sensors, artillery, aircraft and mobile troops: and to the west – mainly in Laos – an interdiction zone covered by air-laid mines and bombing attacks pin-pointed by air-laid acoustic sensors.[22]

This was the first formal communication on the subject that reached the President's desk.

The SAC met for the first time on October 20, 1966 to review the detailed planning alternatives to be presented to SECDEF.[23] This presentation was given by General Starbird on November 14, and laid out four alternatives. Option four, as selected, basically encapsulated elements of the JASON plan with some refinements.[24] Signifying his continued support for General Starbird and his willingness to treat DCPG as an entity outside traditional channels, Secretary McNamara sent a memorandum to JCS identifying the final selection of a barrier strategy.[25] With formal direction from the SECDEF, DCPG completed a Program Definition Plan.

Solidifying the priority of the barrier effort, Secretary McNamara recommended to the President that DCPG's program be accorded the "DX" industrial priority rating. On January 13, 1967 National Security Advisor Walt Rostow, signing for the President, issued National Security Action Memorandum No. 358 granting the program "…the highest national priority category."[26] This rating allowed rapid movement of the program through the procurement system. To receive this high a rating, in so short a time indicates the significance the SECDEF placed on the program. General Starbird and DCPG now enjoyed unlimited acquisition freedom, a direct line to the Secretary of Defense and the charter to carry out tasks that many believed would have a positive affect on the outcome of the war. With nine months remaining to meet initial operational capability the Defense Communications Planning Group was on its way.

Notes

[1] Maj Richard B. Clement, USAF. *Oral History Interview of Ambassador William H. Sullivan*, 15 April 1970, vol. 2, 53.
[2] Mark Clodfelter, *The Limits of Air Power, The American Bombing of North Vietnam* (New York: The Free Press, 1989), 119.
[3] "The Story Behind The McNamara Line" *Vietnam* Magazine, February 1996, 18-24.
[4] Senator Gravel Edition, *The Pentagon Papers, The Defense Department History of the United States Decisionmaking on Vietnam*, vol. 4 (Boston: Beacon Press, 1971), 113.
[5] Ibid., 114.
[6] Ibid., 115. (discussion of McNamara letter to Dr. Jerrold Zacharias of MIT (part of IDAs JASON group)
[7] Ibid., 115.
[8] Rowland Evans and Robert Novak, "Inside Report…The Vietnam Wall", *Washington Post*, August 1, 1966.
[9] Department of Defense. *United State-Vietnam Relations 1945-1967*. vol. 5, 65. (coordinated with the still classified copy of Study S-255).
[10] Gavel Edition, Pentagon Papers, Volume IV, 123 (extract of Chairman's Message 1732-66).
[11] Gravel Edition, Pentagon Papers, Volume IV, 123 (extract of CINCPAC msg. 130705Z Sep 66).
[12] Message, 271604Z Sep 66. CSAF to ALMAJCOM, 27 September 1966. Paragraph 2 of message is an declassified excerpt from Secretary of Defense memorandum to General Starbird (original memo still classified).
[13] DCPG Documentation September 1966-January 1969, I-9 (unclassified extract).
[14] Colonel Behn, AFXOPWV, memorandum to SAF-OS. Subject: Infiltration Barrier System for Vietnam, 20 September 1966. This letter outlines the Combat Beaver Program. Combat Beaver was later renamed Combat Belt [reference CSAF message 1897/66 dated 6 October 1966].
[15] Ibid
[16] Message, 271604Z Sep 66. CSAF to ALMAJCOM, 27 September 1966.
[17] DCPG Documentation September 1966-January 1969, (Discussion of letter from DCPG to SECDEF "Schedules and Requirements for the Project of JTF-728" dated 29 Sep 66).
[18] Colonel Johnson, AFRDDA, Memorandum for record. Subject: Air Force Briefing for Joint Task Force 728, 22 September 1966. This memorandum provides a good example of the type and complexity of the briefings predented to DCPG at this early stage.
[19] Ibid., I-9 (unclassified extract).
[20] Gavel Edition, Pentagon Papers, Volume IV, 124.
[21] Practice Nine was the first in a series of names for the DCPG system. Initiated on 7 October 1966 [reference DCPG message dated 7 October 1966], the code name was used to preface all message traffic and superseded the requirement to put 'This Is A Defense Communications Planning Group Matter' in the header of all traffic.
[22] Department of Defense. *United State-Vietnam Relations 1945-1967*. vol. 5, 82-83. (Discussion of McNamara memo to the President dated 14 October 1966).

Notes

[23] DCPG Documentation September 1966 – January 1969, I-31 [The listing on this page indicates 22 October 1966. Given that the 22nd is a Saturday it is more likely that the first meeting was held on the 20th as indicated in another location in the text.]

[24] With DCPG Documentation September 1966 – January 1969 still classified (previous references have been used judiciously and could be extracted from other declassified sources) it is difficult to accurately render the details of the four plans or the distinguishing factors that led to the selection of the fourth alternative.

[25] DCPG Documentation September 1966-January 1969, (Discussion of letter from SECDEF to JCS "Project of JTF-728" dated 15 Nov 66).

[26] National Security Action Memorandum No. 358, January 13, 1967.

Part 2

System Deployment

> *…I think the Igloo White was able to get a foothold in Steel Tiger because we (the Air Force) were not able to effectively interdict the Ho Chi Minh Trail. This was just a hope, that it would fill in and contribute to the interdiction.*
>
> — Colonel Harry C. Aderholt.[1]

System Concept

Early in 1967 the pieces of the system began to fall into place. Based upon SECDEF approval of the DCPG concept as outlined in the Program Definition Plan, JCS directed CINCPAC and, in-turn, Military Assistance Command Vietnam (MACV) to develop two plans. The first would focus on the Strong Point Obstacle System and the second would detail the air supported anti-infiltration operations.[2] Not surprising, the SPOS plan was completed quickly and greatly resembled past plans submitted from MACV. From its inception, the Strong Point system enjoyed little true sponsorship. Admiral Sharp repeatedly criticized the program citing "…an inefficient use of resources."[3] Various requests for manpower to support the linear barrier system were submitted with personnel requirements ranging from 10-20,000 as outlined in Secretary McNamara's Memorandum for the President[4] to about 8,000 as outlined in MACV's forwarded plan.[5] Physical barrier construction activities were initiated and continued at a low level throughout 1967.

While MACV worked on their version of the air supported anti-infiltration plan, DCPG continued development and programmatic efforts. The basic outline of the plan (see Figure 2), as envisioned by General Starbird, involved air emplacement of sensors and munitions in known infiltration areas using specially equipped aircraft. Signals generated from the sensors would be relayed to a central control node via specially equipped orbiting aircraft. The control node would then process the signals and recommend targets for strike aircraft.

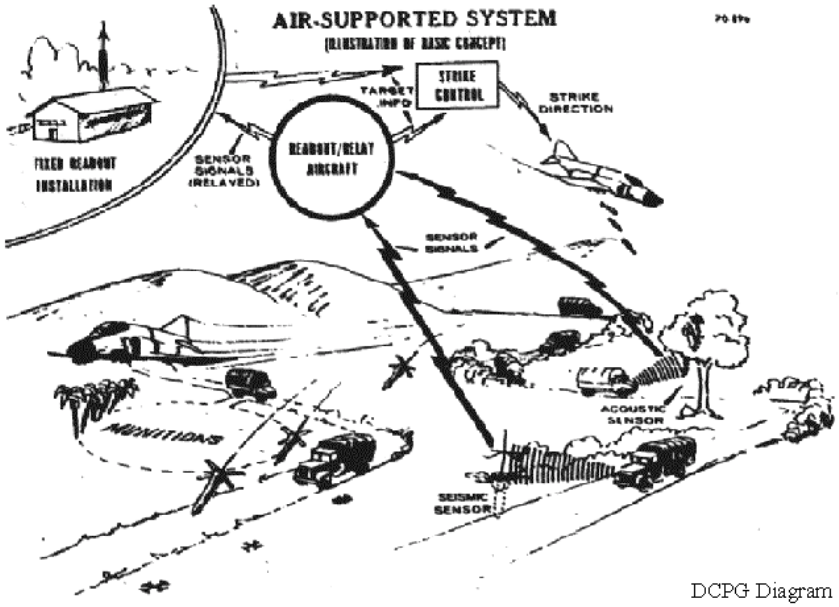

Figure 2. System Design

This simple outline focused efforts for DCPG. To meet the September 1967 deadline, DCPG needed to design develop, deploy and employ munitions, sensors, various specialty aircraft and a central processing node. Early efforts, that initially appeared disjointed and unrelated, now seemed part of a master plan. Investigation of existing munitions, first started in September 1966, led to a long-term, fruitful relationship with the Tactical Air Warfare Center (TAWC) at Eglin AFB. TAWC, supported by the Air Proving Ground Center, also at Eglin, provided ready aircraft, munitions and ranges suitable for testing the anti-infiltration system.

Early emphasis was placed on three key munitions types, the XM41/XM41E1 Gravel mines, XM45E1 Micro-Gravel mines and the CBU/28 Dragon Tooth mines (see Figure 3). The Gravel and Dragon Tooth mines could be air emplaced along known or suspected lines of communication to damage vehicle tires or injure enemy personnel. Micro-Gravel mines could similarly be air dropped and, when stepped on, would generate a significant seismic signature allowing detection by system sensors.[6]

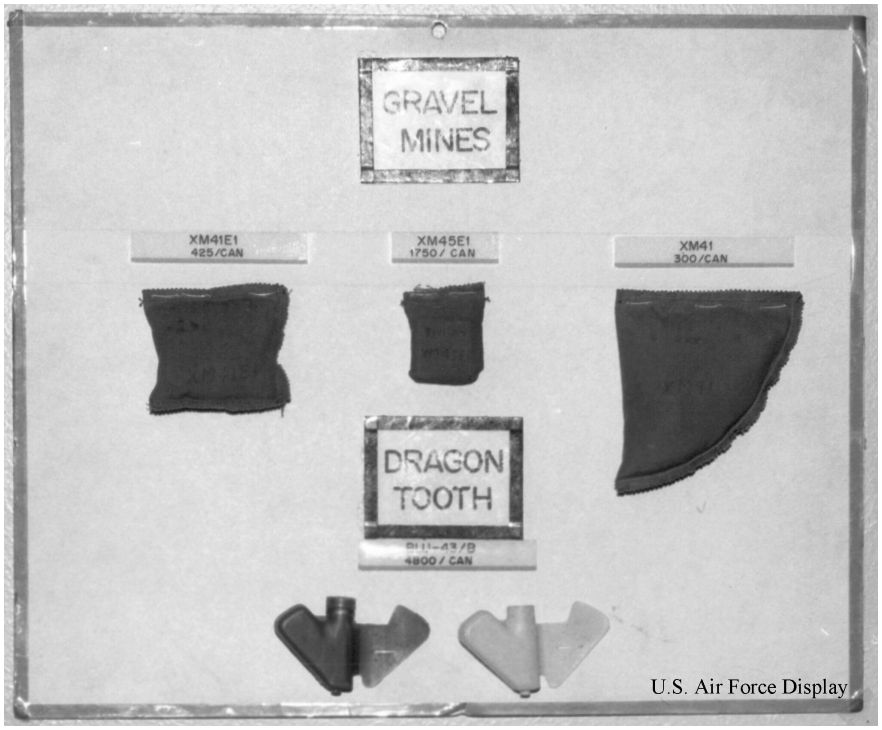

Figure 3. Program Munitions

Concurrent with munitions exploration, work continued on exploiting existing sensor technology. Two types of sensors entered simultaneous development. The first, an acoustic version would queue on audible noise above a preset threshold. DCPG, working with the U.S. Navy, modified an existing Navy sonobouy, a sound-driven submarine detection device. Essentially the hydrophone of the sonobouy was replaced with a microphone and an extended-life battery was added.[7] The early, Phase I, version of the acoustic sensor was called the

ACOUBOUY (see Figure 4) and was designed to be suspended by parachute in the upper canopy of the Southeast Asian jungle. Another Phase I acoustic sensor – the SPIKEBOUY (see Figure 5) was identical to the ACOUBOUY but was designed for ground implantation.[8]

Figure 4. ACOUBOUY Acoustic Sensor (Phase I)

Figure 5. SPIKEBOUY Acoustic Sensor (Phase I)

The second sensor type, a seismic version, would alert on ground vibration caused by the movement of large vehicles. The seismic sensor was derived from a Sandia/ARPA/U.S. Army design and called ADSID (Air-Delivered Seismic Intrusion Detector). The ADSID (see Figure 6) was air emplaced by slow or high-speed aircraft and deployed without a parachute. The sensor was designed to bury itself in the ground leaving only the camouflaged antenna showing.[9]

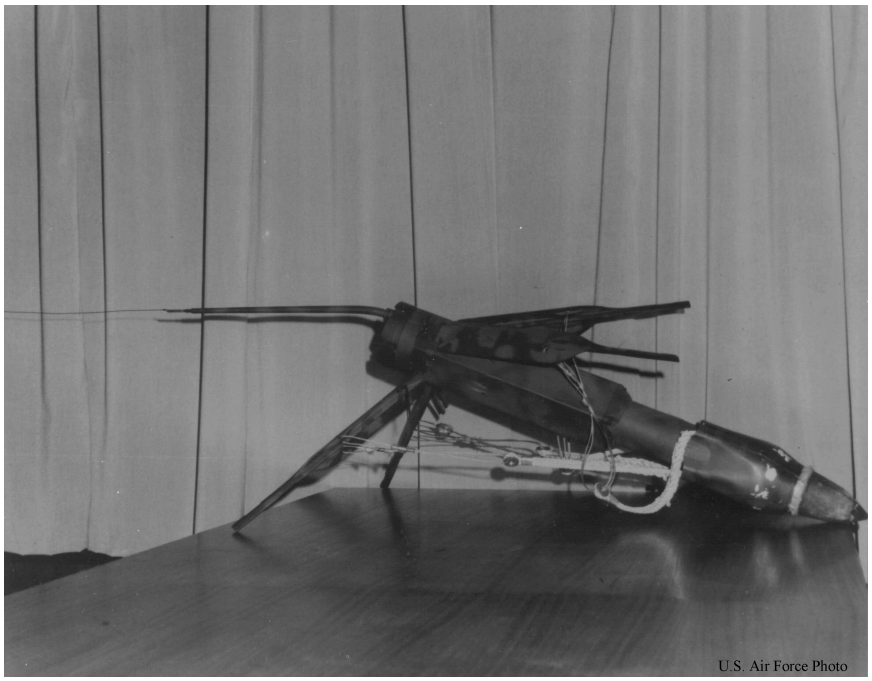

Figure 6. ADSID Seismic Sensor (F-4 version)

A hybrid of the two technologies was also explored. The ACOUSID sensor combined acoustic and seismic technology into one package. Also designed to be air emplaced, the ACOUSID (see Figure 7) buried itself in the ground like the ADSID but also had a small microphone that could be used to confirm seismic activations with attendant audio signals.[10] At an early stage, numerous other technologies were also explored. Several made there way into operational use and will be discussed later in the paper.

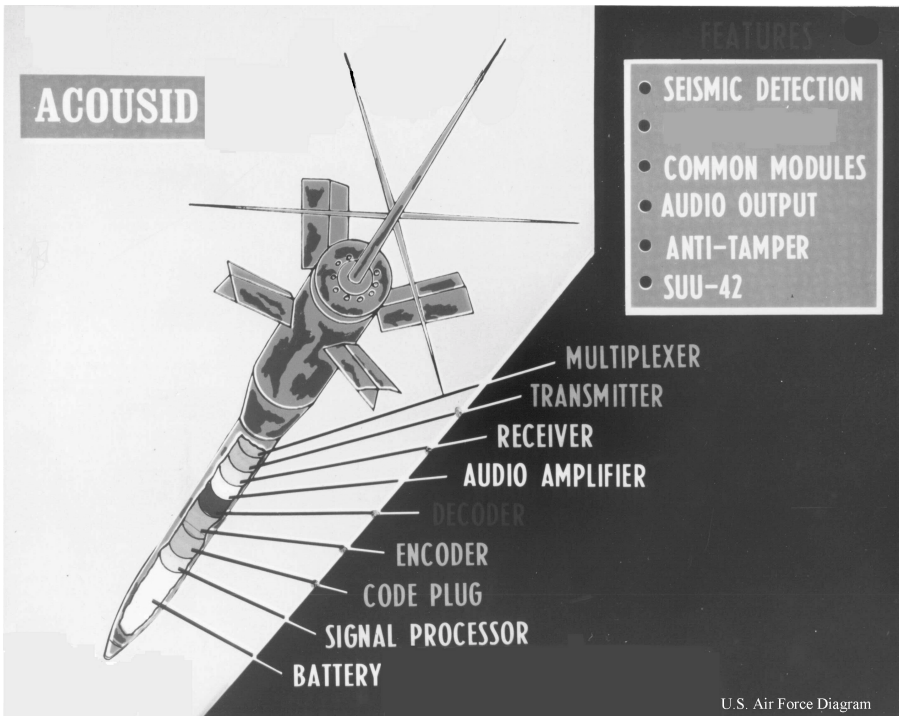

Figure 7. ACOUSID Acoustic/Seismic Sensor (Phase I)

The air portion of the system can be examined in three parts – emplacement, relay and strike. The first aspect involved sensor emplacement aircraft. On January 9, 1967, the SECDEF "…directed the Secretary of the Air Force to ready an EC-121 unit and the Secretary of the Navy to ready a special SP-2E detachment."[11] The Navy detachment would eventually grow into Observation Squadron 67 (VO 67) and would be comprised of nine OP-2E (see Figure 8) aircraft based at Nakhon Phanom (NKP) Royal Thai Air Force Base (RTAFB). Air Force CH-3 Helicopters were also being configured to support the sensor drop mission and early on long-lead actions were underway to outfit an F-4 Squadron for the sensor mission.

Figure 8. OP-2E 'NEPTUNE'

The second part of the air piece involved relaying sensor indications from the interdiction area to a central control facility. As noted above, the Air Force was directed to establish an EC-121 unit. Thirty ex-Navy Super Constellations (2 EC-121P/WV-3 and 28 EC-121K/WV-2) had their radomes and airborne early warning equipment removed and were converted to EC-121Rs.[12] The EC-121Rs (see Figure 9) of the 553rd Reconnaissance Wing at Korat RTAFB operated throughout the life of the anti-infiltration program and amassed a near perfect operational record. The final piece of the air puzzle involved strike aircraft. Ordinance delivery included not only mine seeding by A-1E Skyraiders but also offensive strike aircraft such as F-4, F-105 and later gunships. Forward Air Controllers (FAC) were integral to all phases of the anti-infiltration mission. FAC O-2 aircraft supported sensor and mine laying missions and controlled strike packages against sensor detected targets.

Figure 9. EC-121R 'BATCAT'[13]

The final segment of the anti-infiltration system was the Infiltration Surveillance Center (ISC). Initially called the barrier operations center, the ISC grew out of the "Dukes Mare" Design Plan developed by the TAWC.[14] System testing at Eglin under the project name "Dune Moon" began in March 1967 and fed an iterative process leading to system IOC.[15] MACV's final version of the "Practice Nine Air Supported Anti Infiltration Plan" reached Washington in early March 1967 and integration between field activities and DCPG began in earnest.[16] Throughout the spring and summer of 1967 various elements were tested individually and several system tests occurred. Recognizing the need for a test area that more closely resembled the jungle environment of Southeast Asia, the U.S. Navy, DCPG and TAWC established a testing location in Panama code named "Pot Lid." This also became the name for two series of system tests in April-May 1967 and August-September 1967.[17] The basic concept of air-emplaced sensors, relay aircraft and a control center would remain unchanged throughout the life of the program.

System Fielding

In a memorandum dated April 17, 1967, JCS recommended to the SECDEF the formal establishment of the EC-121R Wing at Korat RTAFB, an F-4 Squadron at Ubon RTAFB, and a CH-3 Helicopter Squadron at Nakhon Phanom RTAFB. The Infiltration Surveillance Center and an MSQ-77 radar were also to be built at NKP. The memo also discussed the OP-2E unit and reassignment of the responsibilities of an in-theater A-1E Squadron. All forces were required to be in-place to meet the system IOC date of October 1, 1967.[18] This formalized what had become a drawn out process of where to locate the ISC, where to base support aircraft, and where to base strike aircraft.

Considerations were at once technical, geographical/environmental, economic and political. Technical considerations focused on the effective radio range of various system components. Sensor data transmit range was essentially limited (although it was extended during the course of the program) driving the placement of the EC-121R orbits. This was coupled with the relay range of the sensor information from the EC-121R to the ISC. Compounding this were terrain elements and weather considerations. Careful analysis of the link equations shows that given the fixed nature of the interdiction area in Laos, the probable orbits for the EC-121R given sensor ranges and the transmit range of the aircraft, the ISC was destined to be in the extreme northeastern area of Thailand. The mountainous terrain in eastern Laos and western South Vietnam precluded basing the ISC in South Vietnam. Nakhon Phanom RTAFB became virtually the only choice. Aircraft ranges from base to sensor field particularly for rotary wing aircraft favored NKP. Weather patterns, centered on the monsoon seasons, also played a factor particularly in relation to planned interdiction campaigns. The sheer size and complexity of the overall program made economic factors a consideration. Fielding considerations emphasized

where to base aircraft/squadrons and construction of the ISC. Runways and taxiways required expansion, hangers and maintenance facilities were needed, as were unit headquarters facilities and personnel accommodations. DCPG, CINCPAC and MACV worked various budget issues -- even curtailing expansion of a South Vietnamese Air Base to support the construction requirements of the Practice Nine system.[19] Finally, as with everything in Southeast Asia, political considerations were paramount. Key in this area was the number and type of equipment to be based in Thailand as well as the number of personnel to be assigned. Thailand came on board quickly when "on May 31, 1967, the Royal Thai Air Force Commander, Air Marshal Chalasapay Dawee …informed the American Embassy in Bangkok that the Prime Minister had agreed in principle to the additional U.S. deployments and construction."[20] In 1964, President Johnson had charged incoming Ambassador William Sullivan with managing U.S. intervention in Laos and, at least overtly, maintaining Laotian neutrality as mandated by the 1962 Geneva Accords. This necessity overshadowed the entire Practice Nine[21] operation and drove the need for extreme program secrecy. All operational issues related to Laos, sensor drops, mining of interdiction areas and air strikes were tightly controlled by the American Embassy in Vientiane.[22]

Building construction began on July 6, 1967 (see Figure 10) with ground breaking for the ISC at Nakhon Phanom. The Ralph M. Parsons Company of California constructed the facility under sub-contract to IBM. The Army Corps of Engineers provided oversight and Air Force Electronic Systems Division provided a site activation manager for what became known as 'Dutch Mill' or Task Force Alpha (TFA).[23] The nucleus of Task Force Alpha would come from the already established Steel Tiger Task Force at NKP.[24] This task force was established in March 1967 to control U.S. interdiction operations in an area of South-central Laos code named Steel Tiger.

Figure 10. Infiltration Surveillance Center Construction at NKP (28 July 1967)

With construction underway in Thailand, personnel who would later man Task Force Alpha began training at the ISC mock-up, code named "Music Box" at Eglin. Dune Moon testing, now in its fifth month, began using Music Box and operational personnel in controlled tests of system equipment and operational concepts.[25] The outcome of this testing, as well as the latest round of Pot Lid tests in Panama, drove a change to the Dukes Mare Design Plan, which was reissued on July 28, 1967.

The original timetable for the Dye Marker[26] system IOC was September 15, 1967, as laid out in the SECDEF memo chartering DCPG. This was later moved to October 1, 1967 and then to November 1, 1967 for the anti-vehicular sub-system and December 1, 1967 for the anti-personnel sub-system.[27] The Tactical Evaluation Task Force, established on July 14, 1967 to 'assist the Air Force Chief of Staff in evaluating USAF capability to meet the IOC dates, reported on August 18, 1967 that a 30 day slip in IOC dates was required.[28] DCPG concurred with this recommendation which, when approved, moved the IOC date for the anti-vehicular sub-system to December 1, 1967 and for the anti-personnel sub-system to January1, 1968.[29]

On September 7, 1967, with system fielding well along, Secretary McNamara held a widely publicized news conference to discuss the barrier concept. The crux of his comments focused on the linear barrier, Strong Point Obstacle System along the DMZ. McNamara avoided specifics and would only say "equipment to be installed will range from barbed wire to highly sophisticated devices." Interestingly, he did discuss the button bomblets, the role of the Institute for Defense Analysis and the program name Dye Marker all key aspects of the still classified Laotian based anti-infiltration system.[30] SECDEF's revelations drove numerous programmatic changes for DCPG. Dye Marker was retained as a project name for the SPOS along the DMZ, but Muscle Shoals became the new code name for the air-supported anti-infiltration barrier. The sub-systems received individual names; Mud River was used for the anti-vehicular portion and Dump Truck for the anti-personnel operations.[31] ISC construction was completed on September 30, 1967 (see Figure 11) and, with the IOC date fast approaching, the operational elements of Muscle Shoals began arriving in theater.

Figure 11. Infiltration Surveillance Center at NKP (4 October 1967)

Deployment and Initial Operations

The first ISC personnel arrived at NKP on October 1, 1967 and within weeks over 400 people were in place. Cited by most of those involved as the most poorly planned of the DCPG efforts, initial personnel beddown was haphazard at best. NKP was a small and relatively unimproved base and the addition of a significant number of new troops overtaxed the few facilities available. In the first 30 days priority was given to housing, feeding and transporting Task Force personnel. A formal military unit, the 7th Air Force Task Force, was established and General McBride assumed command on October 18, 1967. On November 1, 1967, the Dutch Mill facility was officially occupied.[32] As October drew to a close the Steel Tiger Task Force deactivated and its commander became the Director of Operations for TFA.[33] Later on April 25, 1968 the organization was formally named Task Force Alpha.

Quickly, Task Force Alpha suffered from a shortage of both personnel and space. The Dukes Mare Design Plan had recommended more personnel but restrictions on end strength in Thailand had reduced the planned number by 48. Early indications from NKP indicated a need for 102 additional personnel. This was initially solved with TDY personnel. Of greater import, only 50% of those arriving at TFA had been through the Music Box training program. This shortfall necessitated an extensive on-the-job training effort.[34] As the ground portion of the system was being established air elements began arriving in Thailand.

The first EC-121Rs of the 553rd Reconnaissance Wing arrived at Korat RTAFB in September and advance teams for VO-67 arrived in October with the remainder of the Squadron's nine OP-2Es arriving at NKP on November 15. An advance team for the 1st Air Commando Squadron arrived on November 1, with A-1E aircraft and personnel trickling in throughout November and December. The first sensors arrived in late October and were readied

for VO-67's first test drop on November 25, 1967. The 21st Helicopter Squadron and their CH-3s began arriving at NKP in early December and by December 20, all 56th Air Commando Wing assets were in-place and operational. 0-2 FACs of the 23rd Tactical Air Support Squadron were already in-place and operational at NKP.[35]

With IOC literally days away, General McBride had a Gordian knot to untangle when it came to organizational structure:

> Task Force Alpha was assigned to Thirteenth Air Force for command and administration, and received logistic support from that headquarters. Command was exercised through the Deputy Commander, Seventh/Thirteenth Air Force, at Udorn RTAFB. Normal base support functions were carried out by the 56th Combat Support Group at Nakhon Phanom, where Task Force Alpha was a tenant unit. Direct liaison was maintained between TFA and DCPG to ensure prompt resolution of technical problems and rapid exploitation of technological advances in the state of the art. DCPG controlled TFA's new equipment funding and operations and maintenance resources through the Air Force System Command's Electronic Systems Division. ESD administered the contract with IBM (and, in turn, the sub-contracts with Parsons and Radiation, Inc.) to operate and maintain the ISC. Operational control of Task Force Alpha was maintained by Seventh Air Force, through that headquarters' Director of Operations.[36]

Compounding these relationships were the very real political issues with operating a secret organization, the details of which were unknown to most in the Thai government, and the complications posed by the fact that most operational activity would occur in neutral Laos.[37]

The final, full-up dress rehearsal of all aspects of the system occurred on November 25, 1967 when 18 ADSIDs and six ACOUBOUYs where dropped by OP-2E aircraft in the western Laos, Mud River, area. Seventeen sensors survived the drop and signals were successfully received by the EC-121Rs and relayed to the ISC. In spite of sensor accuracy issues (dropping the sensors in known locations), sensors not surviving drops or burying themselves too deeply, and enemy ground fire necessitating an increase in drop altitude, the first test went well.[38] One week later, OP-2Es flew a Mud River mission but weather precluded a complete drop. Two of the seismic sensors worked and, with more sensors dropped in the next few days, the units began

to generate target sequences. On December 5, 1967, Seventh Air Force authorized strikes against sensor derived targets. Both strike packages were successful in destroying enemy trucks traversing Laotian lines of communication (LOCs). The Mud River portion of the Muscle Shoals air supported anti-infiltration system was now operational.[39]

Dump Truck operations in eastern Laos and into western South Vietnam near the DMZ area were initially scheduled for a January 1, 1968 IOC but were slipped 20 days to allow for better coordination with MACV and inclusion of lessons learned from early Mud River operations. On January 17, 1968, an OP-2E dropped two strings of ADSIDS on what turned out to be the only IOC mission flown in Dump Truck. On January 18, 1968, MACV directed that all activities previously destined for Dump Truck would be reprogrammed to support the defense of the Marine outpost at Khe Sanh. These operations commenced on January 20, and continued unabated until late April 1968.[40]

Numerous lessons were learned in the process of achieving IOC. Not the least of these were the purely military issues of establishing a sizeable, technology oriented unit at a remote, environmentally challenging location. While the air units took advantage of advance teams, TFA had no dedicated advance party. Advance functions worked by the Steel Tiger Task Force, ESD or the DCPG representative were insufficient to adequately prepare for the number of personnel descending on NKP. Stateside training of arriving personnel at Eglin's Music Box facility would have greatly reduced on-the-job-training requirements and alleviated another compounding factor in the torturous IOC process.

On the technical side, numerous issues discovered during the design and procurement or field-testing phases were not adequately explained to the field. For example, problems with storage of sensors in extreme temperatures served to prematurely drain the sensor batteries.

Operational use of sensors allowed TFA to build a sensor life database based in part on sensor type and environmental conditions. Later utilization of field bulletins served as a rapid mechanism for getting valuable information to the field units. Emplacement accuracy continued to be a problem in the early life of the program. VO-67 initially used a visual drop method, which limited accuracy to no closer than 426 meters of the aim point. Accuracy was improved through the addition of the World War II era Norden Bombsight, ground radar guidance using the MSQ-77 and better tactics.[41] Helicopter drops of sensors evolved quickly to a locally developed 'hand-drop' method due to problems with auto dispensers. Sensor numbers per string and physical interval were also optimized through trial and error during early drops.

The final growing pains involved air strikes of sensor-generated targets. ROE for Laos required that all targets be visually acquired by a Forward Air Controller.[42] Analysts at the ISC had no feedback mechanism to determine if sensor activations were enemy vehicles/personnel or natural or environmental phenomenon. Initially, very few sensor-generated targets were investigated by FACs or fragged for a strike. This gave ISC operators the erroneous impression that the sensors were not providing accurate target information. Over time this was worked out as more sensor-generated targets were investigated and proved to be lucrative enemy convoys. Likewise, the whole process required overcoming an extensive learning curve, so that all participating agencies understood the capabilities and more importantly the limitations of the air supported anti-infiltration system. Many of these issues were resolved through intensive real-world application of the system in support of the Marines at Khe Sanh.

Notes

[1] Maj Samuel E. Riddlebarger,USAF and Maj Richard B. Clement, USAF. *Oral History Interview of Colonel Harry C. Aderholt*, March 5, 1970, 111.

[2] History of Task Force Alpha 1 October 1967 – 30 April 1967, iii. (Discussion of JCS message to CINCPAC dated 7 January 1967).

[3] Gavel Edition, Pentagon Papers, Volume IV, 114.

[4] Gavel Edition, Pentagon Papers, Volume IV, 126 (Discussion of McNamara memo to the President dated 14 October 1966).

[5] Jacob Van Staaveren, *Interdiction in Southern Laos 1960-1968* (Washington, D.C.: Center for Air Force History, 1993), 268. (MACV's plan was submitted on 26 January and called for 7,691 personnel. This number was upped to 8,353 within the next several weeks.

[6] Col Jesse C. Gatlin, USAF. *Igloo White (Initial Phase)*. Project CHECO. (Hickam AFB, Hawaii: Pacific Air Forces, 31 Jul 1968), 8 and figure 6.

[7] Senate, *Hearings before the Electronic Battlefield Subcommittee of the Preparedness Investigating Subcommittee of the Committee on Armed Services*, 91st Cong., 2nd sess., 1970, 112. History of Task Force Alpha 1 May 1968 – 31 December 1968, 73-74. The sonobouy was the Johnsville Naval Air Station model.

[8] Ibid.

[9] Ibid., 114 and 115 and DCPG Documentation September 1966-January 1969, III-10 (unclassified extract).

[10] Ibid., 117.

[11] History of Task Force Alpha 1 October 1967 – 30 April 1967, iii. (Discussion of Secretary of Defense memorandum to SECAF and SECNAV dated 9 January 1967).

[12] Mr. Larry Westin, "553 Reconnaissance Wing" on-line, Internet, March 2000, available from website http://www.smartlink.net/~westin/batcat0.html (These aircraft were issued new Air Force serial numbers from 67-21471 through 67-21500.).

[13] In-flight view of EC-121R (Number 67-21490). Photo is U. S. Air Force photo KE 35179, taken January 15, 1969, by Master Sergeant Roman G. Contos, USAF. Labeled as a "High angle side view of U. S. Air Force EC-121 of the 553rd Reconnaissance Squadron in flight of Thailand." Courtesy of Mr. Larry Westin at http://www.smartlink.net/~westin/batcat0.html

[14] History of Task Force Alpha 1 October 1967 – 30 April 1967, 3. (Discussion of Dukes Mare Design Plan dated 23 March 1967). Dukes Mare was the code name for the overall system while in test and development at Eglin AFB.

[15] DCPG Documentation September 1966-January 1969, III-209-216. (Details remain classified).

[16] Jacob Van Staaveren, *Interdiction in Southern Laos 1960-1968* (Washington, D.C.: Center for Air Force History, 1993), 269. (Discussion of MACV Practice Nine Air Supported Anti Infiltration Plan dated 11 March 1967).

[17] DCPG Documentation Summary September 1966 – January 1969, III-188 – 208. (Discussion indicates the Navy recommended use of the Pot Lid facilities in Panama on 4 October 1966). Specific dates for tests of 28 April 1967 – 31 May 1967 and 25 August 1967 – 2 September 1967 come from Mr. Chuck Silverstein's input to Mr. Larry Westin's 553rd website (http://www.smartlink.net/~westin/batcat0.html).

Notes

[18] History of Task Force Alpha 1 October 1967 – 30 April 1967, iii. (Discussion of JCS memorandum to SECDEF dated 17 April 1967).
[19] DCPG Documentation Summary September 1966 – January 1969, provides excellent detail (at the still classified level) on economic factors that played into fielding the anti-infiltration system.
[20] History of Task Force Alpha 1 October 1967 – 30 April 1967, 9.
[21] The overall program name Practice Nine was changed to Illinois City on 14 June 1967.
[22] Willam H. Sullivan, *Obbligato, 1939-1979 Notes on a Foreign Service Career* (New York: WW Norton&Co., 1984), 210. The Ambassador explains that "In Laos, it was decided that, rather than revert to the large military mission and arms assistance program that had characterized our pre-1962 presence there, we would borrow from the practice of the North Vietnamese and act through a clandestine, deniable system of paramilitary assistance, with any actual fighting being done by indigenous forces. This pattern called for a lead role by the Central intelligence Agency; but, in accordance with President Kennedy's limited confidence in that agency, their operations were placed *under the strict control of the ambassador* (emphasis added)."
[23] History of Task Force Alpha 1 October 1967 – 30 April 1967, 11-12.
[24] History of Steel Tiger Task Force March - November 1967, 1-2.
[25] History of Task Force Alpha 1 October 1967 – 30 April 1967, 6.
[26] The program name Illinois City was changed to Dye Marker on 15 July 1967.
[27] Ibid., iv. Note: The anti-vehicular sub-system operated in western Laos in the 'Mud River' portion of the Steel Tiger Interdiction area. The anti-personnel sub-system operated in eastern Laos and into western South Vietnam near the DMZ and was called the 'Dump Truck' region of Steel Tiger. The Mud River and Dump Truck names were first used on 8 September 1967.
[28] Ibid., 7. Interestingly the Tactical Evaluation Task Force was headed by Brig Gen William P. McBride who would later command Task Force Alpha.
[29] Ibid., 7. This change came officially from the SECDEF on 22 September 1967.
[30] George C. Wilson, "U.S. Plans Barrier Dividing Vietnams" *Washington Post*, 8 September 1967.
[31] Col Jesse C. Gatlin, USAF. *Igloo White (Initial Phase)*. Project CHECO. (Hickam AFB, Hawaii: Pacific Air Forces, 31 Jul 1968), 1-2.
[32] History of Task Force Alpha 1 October 1967 – 30 April 1967, 14. Colonel William A. Breeze is recognized as the first arrival for TFA. He essentially established the unit from the ground up. While Gen McBride assumed command of 7th Air Force Task Force it was noted on the books in DCPG as Operating Location Number 1, 6250th Support Squadron, Headquarters, Seventh Air Force, PACAF. The acknowledged date of beneficial occupancy for the ISC facility is 1 November 1967.
[33] History of Steel Tiger Task Force March - November 1967, 2. The Steel Tiger Task Force was formally deactivated on 31 October 1967.
[34] History of Task Force Alpha 1 October 1967 – 30 April 1967, 9, 14 and 18.
[35] Ibid., v and 35.

Notes

[36] Ibid., 21 and 22. These relationships were also laid out in Seventh Air Force Operations Plan 481-68 dated 10 August 1967 and the Muscle Shoals Implementation Order (7th AF OPORD 515-67 dated October 1967).

[37] Rules of engagement requiring approval from the embassy at Vientiane for each sensor and munitions drop were established early and proved to be a recurring issue. Colonel Gatlin, in the Igloo White Initial Phase CHECO Report [Col Jesse C. Gatlin, USAF. *Igloo White (Initial Phase).* Project CHECO. (Hickam AFB, Hawaii: Pacific Air Forces, 31 Jul 1968), 27-28.] noted that a more streamlined approval process could improve operations. 7AF OPORD 515-68 as ammended laid out coordination procedures for operations in the Mud River and Dump Truck [Message. 252122Z Nov 67. CINCPACAF. To CINCPAC, 25 November 1966]. Several avenues were explored to alleviate the lengthy approval process including an embassy liaison at the ISC [Message. 090555Z Dec 67. HQ 7th AF. To AIRA Vientiane Laos, 9 December 1966, Message. 161002Z Dec 67. HQ 7th AF. To American Embassy Vientiane Laos, 16 December 1966, and Message. 221355Z Dec 67. HQ 7th AF. To AMEMB Vientiane Laos, 22 December 1966]. This liaison function was not implemented during the early phases of the program but as system operations matured the approval process did become more streamlined.

[38] Ibid., 36 and 37.

[39] Ibid., 38 and 39.

[40] Ibid., 49.

[41] Ibid., 41.

[42] "Summary Air Operations Southeast Asia" Volume XLII, January 1968, 2-5. (Discussion of 7th AF message dated 21 January 67 outlining Laotian ROE "All jet strike aircraft operating in Steel Tiger areas with the exception of Dragon A-37's and Misty F-100Fs must be under positive FAC or MSQ-77 control.").

Part 3

Integrated Employment

It is a pleasure to forward the attached memorandum from the Director of Defense Research and Engineering in which he congratulates the Air Force for its part in the timely and effective implementation of Project MUSCLE SHOALS. The role of the United States Air Force in this endeavor has been important, and I am especially pleased that we have significantly contributed to its success.

P.S. And let's get on with the operational part. HB

— Secretary of the Air Force Harold Brown[1]

Summer Improvements

In the post script, Secretary Brown is referring to DDR&E's suggestion "…of increasing the kill effectiveness of the system by placing operational control at the point where timely intelligence is being developed; that is, at Task Force Alpha."[2] This suggestion would be acted upon in the upcoming Northeast monsoon campaign code named COMMANDO HUNT.

To get there, TFA needed to resolve issues raised during the first phase of operations. Analysis of system output was conducted throughout the spring and summer of 1968. What types of sensors worked best in what situation? Where should sensors be emplaced in relation to active or suspected LOCs? What was the proper mix of sensor types in a string? What should the interval between sensors in a string and between strings be? Obviously sensors could be used to detect movement of vehicles along a LOC but could sensors be used to monitor fixed logistics areas? TFA vigorously attacked these and other issues. A study was conducted that led to an

on-going “Truck Park Working Group” to assess sensor capabilities in relation to targeting fixed logistics areas. Another study led to the development of an automated CONFIRM (Coincidence Filtering, Intelligence, Reporting Medium) reporting process. This greatly relieved the manually intensive analysis process on Tactical Officers charged with making sense of the electronic data and forwarding targeting recommendations. Additionally, on-going studies developed optimal sensor emplacement guidance, providing information to planners on which sensors to use, where they should be dropped, and what their mix should be. While these activities were underway in the field, DCPG was researching and developing the Phase II sensor suite.[3]

Phase II sensors, under development since late 1967, attempted to overcome shortcomings identified through sustained combat use. The primary limitation on deployed sensors was battery life, which related directly to operational sensor life. In addition to developing and integrating long-life power sub-systems, DCPG also developed commandable sensors. These sensors could be turned on and off by radio relay to conserve battery life. Construction at the ISC to accommodate the increased radio requirements was completed on March 16, 1968. Other major construction upgrades to Dutch Mill included a build out to house unit administrative functions and additional computer space. This activity was completed by July 20, 1968. Although the ISC was upgraded to be compatible with the Phase II sensors, the sensors themselves lagged. Primary issues involved configuring sensors to be dropped by F-4 aircraft.

F-4 delivery of sensors was critical to the continued success of the program. From inception the slow flying OP-2E, operating at low altitude, was vulnerable to enemy ground fire. The first OP-2E was lost on January 11, 1968 to an unknown cause (later investigation indicated that enemy gun fire was not a factor). The second and third OP-2Es were lost to enemy ground fire within a ten-day period in February 1968. The 25th Tactical Fighter Squadron (TFS) was

initially selected for the sensor emplacement mission, with an original operational readiness date of June 1, 1968. This date was latter slipped 30 days to ensure all aircraft were LORAN D equipped. Increased OP-2E losses, however, drove 7/13AF to task the 497 TFS (an in-theater F-4 unit of the 8th Tactical Fighter Wing) to support sensor drop missions. With minor aircraft modifications in-place, the 497th made its first sensor drop on February 24, 1968. A sister squadron, the 435th TFS, also had some aircraft modified and began sensor drop missions. Working through numerous difficulties associated with high-speed deployment of sensors, these squadrons laid the groundwork for the arrival of the 25th TFS. Arriving at Ubon RTAFB with 20 Loran D equipped aircraft in June 1968, the 25th TFS assumed the full sensor mission on July 1, 1968. Completing its last mission on June 25, 1968, VO-67 redeployed to the United States. According to the TFA Operational Summary "The dedicated efforts of Observation Squadron Sixty Seven were a significant contribution to the initial implementation of Igloo White operations and in keeping the field seeded with sensors."[4]

The program, as of May 31, 1968 called Igloo White, continued throughout the late summer and fall to conduct on-going operations as well as plan for the dry season campaign.[5] The objectives of the campaign were twofold. The first objective was to interdict the flow of enemy men and material along the Ho Chi Minh Trail. The second was to evaluate the effectiveness of combining the ISC function with direct control of strike aircraft. TFA would control the original Mud River area, parts of the Dump Truck area and the approaches to the A Shau Valley. Collectively this area was termed COMMANDO HUNT.[6]

COMMANDO HUNT

During September, detailed planning for COMMANDO HUNT was accomplished. With the addition of the strike direction mission, TFA constructed a balcony above the existing control

room. This balcony allowed strike controllers and sensor analysts to conduct integrated operations. Construction was completed on October 22, and Sycamore Control (TFA's Combat Operations Center) assumed direction of two sectors in COMMANDO HUNT. On November 15, the full COMMANDO HUNT interdiction campaign officially started.[7]

Coincident with physical changes in the Dutch Mill facility, DCPG was also considering an Alternate ISC (AISC) concept in the event the primary ISC was attacked or suffered some loss in capability. Originally called CORONET COMBO the AISC was mocked up at the Music Box facility at Eglin but never deployed to Southeast Asia. The concept and technology were, however, revamped and grew into the Deployable Automatic Relay Terminal (DART) system, which was deployed in 1969.[8]

Early planning called for TFA to control about 170-225 sorties per day as part of the COMMANDO HUNT campaign. This number rapidly grew to over 300 as aircraft became available due to a bombing pause in the North. This increase in sortie count was unexpected and accordingly TFA operations were anything but smooth. In spite of training by Seventh Air Force ABCCC personnel, TFA/Sycamore Control experienced expected growing pains.[9] Proficiency increased throughout December and operations were deemed as effective as previous ABCCC controlled operations.

In addition to strike sorties, 134 sensor emplacement missions were flown through 31 December 1968. Table 1 illustrates the sensors deployed in that same time period. As indicated, some Phase II sensors were emplaced as were FADSIDs, modified ADSIDs designed to be dropped by fast moving F-4 aircraft of the 25th TFS. Another innovation was the SPIKESID, which had both seismic and acoustic capability. However, ADSIDS, ACOUBOUYs and SPIKE ACOUBOUYs continued to be the mainstay.

Table 1. Sensors Used in COMMANDO HUNT through 31 December 1968

SENSORS						
ADSID	FADSID	SPIKESID	PH II SPIKE ACOUBOUY	PH II ACOUBOUY	PH I SPIKE ACOUBOUY	PH I ACOUBOUY
283	21	9	71	48	151	5,136

Source: History of Task Force Alpha 1 May 1968 – 31 December 1968, 157.

In addition, munitions drops continued at a high level. Table 2 illustrates the munitions drops in the same 45 day period. As noted, a new munition was introduced. The Wide Area Anti-Personnel Mine (WAAPM) could be pre-set to self-detonate thereby alleviating concern that millions of mines would be dropped in Laos without any plan for demining.[10]

Table 2. Munitions Used in COMMANDO HUNT through 31 December 1968

MUNITIONS			
Mini-Gravel XM-42	WAAPM BLU 54B	Dragon Tooth	Booby HELOSID
571,200	103,680	404,480	13

Source: History of Task Force Alpha 1 May 1968 – 31 December 1968, 157.

An examination of sensor output is depicted in Table 3. These activations came from 391 operational sensors.

Table 3. Sensor Activations in COMMANDO HUNT through 31 December 1968

SENSOR ACTIVATIONS		
Acoustic	Seismic	Total
1,819,589	967,852	2,787,441

Source: History of Task Force Alpha 1 May 1968 – 31 December 1968, 157.

Of the 2.7 million activations, 4,458 Target Sequences were developed (236 day and 4047 night). Of the 4,458 sequences, 3,976 were based on moving target indications with the remaining being fixed or static. From these sequences, the estimated number of trucks moving per day equaled

about 367. Also, 138 known lines of communication (LOCs) were determined to be active and 343 truck park areas were discovered.[11]

From October 22, through campaign's end, 20,594 strike sorties were fragged to COMMANDO HUNT with 17,878 expended in the TFA area of responsibility. Table 4 shows the breakdown of strike operations for the initial period.

Table 4. Strike Operations in COMMANDO HUNT through 31 December 1968

STRIKE OPERATIONS		
	15-30 November	December
FAC Sighting of Trucks	2,420	3,791
Strikes	1,184	2,328
Trucks Destroyed	209	551
Trucks Damaged	63	114
Secondary Explosions	185	971
Fires	664	2184
AAA Sites Attacked	6 of 47 sites targeted were destroyed	24 of 205 sites targeted were destroyed

Source: History of Task Force Alpha 1 May 1968 – 31 December 1968, 158-159.

As depicted, extensive operations were conducted during the final 45 days of 1968. All aspects of the air supported anti-infiltration barrier were fine-tuned. As 1969 dawned, a focused evaluation of the system was initiated. For the COMMANDO HUNT period, 498 sensor drop missions were flown establishing 203 sensor strings of more than 1200 individual sensors. The dedicated resources available to TFA during the campaign allowed an unprecedented intelligence analysis of Laotian LOCs. This resulted in a better understanding of enemy road networks and a complete revision of supporting maps and charts.[12] Of particular note, 13 specific intelligence

'items of interest' were generated, including the discovery of new LOCs and significant bypass routes in-use by the enemy.[13]

From the Seventh Air Force perspective, "COMMANDO HUNT had two primary objectives: To reduce the enemy's logistical flow by substantially increasing the time required for him to transmit his supplies into South Vietnam and to destroy enemy trucks and caches of military supplies along routes leading into South Vietnam." At the conclusion of COMMANDO HUNT, 7th AF considered both objectives met.[14] Table 5 provides a snapshot of the campaign.

Table 5. Strike Operations in COMMANDO HUNT through April 1969

STRIKE OPERATIONS							
FAC	15-30 November	December	January	February	March	April	Total
Sighting of Trucks	2,420	3,791	7,754	8,068	9,624	3,207	34,864
Strikes Trucks	1,184	2,328	4,377	3,785	4,022	1,386	17,082
Destroyed Trucks	209	551	848	673	579	315	3175
Damaged Trucks	63	114	307	230	165	56	935
Secondary Explosions	185	971	1,220	5,017	4,340	2,012	13,715
Fires	664	2,184	1,752	2,003	1,944	888	9,435
AAA Sites Attacked	6 of 47 sites targeted were destroyed	24 of 205 sites targeted were destroyed	54 of 394 sites targeted were destroyed	21 of 274 sites targeted were destroyed	47 of 303 sites targeted were destroyed	26 of 142 sites targeted were destroyed	178 of 1365 sites targeted were destroyed

Source: Task Force Alpha Statistical Summary of COMMANDO HUNT, 8 June 1969, attach 5.

Throughout the COMMANDO HUNT campaign, FACs sighted over 34,000 trucks. TFA's Igloo White system played a very real part in the success of Command Hunt. Conservatively Igloo White was credited with "…directly assisting in the real time location of slightly more than 20% of the targets attacked."[15] These targets were generated from over 31,000 sensor activation sequences. While these two numbers are similar there is no direct correlation and what is highlighted is the lack of coordination between sensor detection, putting a FAC into the area, correlating the target, striking the target and getting viable battle damage assessment (BDA). In addition, FACs commonly called any sightings 'their own' regardless of the intelligence sources that had queued them.[16]

Gilster's methodological review of the interdiction campaign revealed a significant impact to enemy operations. Research indicates that for every five units of material input into the enemy logistics system only one eventually reached South Vietnam.[17] Careful analysis during COMMANDO HUNT indicated that 47% of the enemy material was destroyed on the ground in Laos, 29% was consumed in operating the logistics infrastructure, 6% was stored against future need and the remaining 18% got through to South Vietnam. In real terms it was estimated that 46,199 tons of material were input between January 1, and April 29, 1969. The estimated amounts reaching South Vietnam were 8,537 tons or about 18%.[18] This led 7th AF to conclude, "The COMMANDO HUNT interdiction campaign, in conjunction with combat operations in South Vietnam, successfully prevented the enemy from building stockpiles that would permit him to expand his operations in South Vietnam."[19] Specifically, relating to the air supported anti-infiltration barrier it was noted:

> Igloo White sensor information assisted in the nightly deployment of force to the most lucrative route segment. Sensor information was also used effectively to assist FACs in locating larger convoys. In real-time, IGLOO WHITE information was available to FACs, strike aircraft and gunships when they were not otherwise

> occupied with targets. When this occurred and IGLOO WHITE information was used, it was demonstrated to be an accurate means of locating enemy traffic.[20] Sensor-derived information also influenced planning for allocation of forces, especially at the higher decision levels, and provided a check on the efficiency of tactics. By adding another dimension to data gathering and battle management, sensor technology revealed more about the entire enemy logistic system and the magnitude of the enemy effort. This insight was an important ingredient in the strategic direction and success of the campaign.[21]

Clearly, COMMANDO HUNT was deemed a success and the Igloo White system played a significant role. As the campaign was winding down, it was determined that it was not essential to have strike control resident with the sensor operations at TFA. Accordingly, operational control of strike aircraft was transferred from Sycamore Control to the ABCCC on April 13, 1968.[22] The Igloo White system, building upon successes first realized during the siege of Khe Sanh, now had a successful dry season campaign under its belt. Long-term operations of this unique system-of-systems were assured.

Notes

[1] Harold Brown, Secretary of the Air Force to Chief of Staff USAF, Subject: Muscle Shoals, 22 March 1968.

[2] John S. Foster, Jr., Director Defense Research and Engineering to SECAF, Subject: Muscle Shoals Effectiveness, 19 March 1968.

[3] History of Task Force Alpha 1 October 1967 – 30 April 1967, 62-67.

[4] "Task Force Alpha Operational Summary 1 December 1967 Thru 15 July 1968", 15-17 and 30.

[5] Maj Philip D. Caine, USAF. *Igloo White July 1968 – December 1969*. Project CHECO. (Hickam AFB, Hawaii: Pacific Air Forces, 10 Jan 1970), 6. During the period 1 April 1968 –30 September 633 ACOUBOYS, 1,068 SPIKE ACOUBOUYs, and 1,696 ADSIDs were emplaced. During this time sensors were also placed in Route Package I in North Vietnam, Ibid., 8.

[6] History of Task Force Alpha 1 May 1968 – 31 December 1968, 9.

[7] Maj Philip D. Caine, USAF. *Igloo White July 1968 – December 1969*. Project CHECO. (Hickam AFB, Hawaii: Pacific Air Forces, 10 Jan 1970), 9. History of Task Force Alpha 1 May 1968 – 31 December 1968, 44-46 and 156. Although TFA initiated Sycamore Control operations on 22 October, personnel didn't begin occupying the raised, glass-enclosed balcony area until 27 December and it wasn't until early January 1969 that full communications connectivity was established.

Notes

[8] History of Task Force Alpha 1 May 1968 – 31 December 1968, 47-48. DART was used to support in-country Duel Blade operations (On 31 May 1968 when Muscle Shoals became Igloo White, Dye Marker became Duel Blade).
[9] Ibid., 151.
[10] Ibid., 88-90 and 157.
[11] Ibid., 158.
[12] "Task Force Alpha Statistical Summary of COMMANDO HUNT, 8 June 1969", 12.
[13] Ibid., 13.
[14] "COMMANDO HUNT (I) November 1968-April 1969, 20 May 1969", iv.
[15] Maj Philip D. Caine, USAF. *Igloo White July 1968 – December 1969*. Project CHECO. (Hickam AFB, Hawaii: Pacific Air Forces, 10 Jan 1970), 12.
[16] History of Task Force Alpha 1 May 1968 – 31 December 1968, 173.
[17] Herman L. Gilster, *The Air War in Southeast Asia, Case Studies of Selected Campaigns*, (Maxwell Air Force Base, Alabama: Air University Press, October 1993), 20.
[18] Ibid., xxv.
[19] "COMMANDO HUNT (I) November 1968-April 1969, 20 May 1969", vi.
[20] Ibid., xix.
[21] Ibid., xxii.
[22] "COMMANDO HUNT (I) November 1968-April 1969, 20 May 1969", iv.
[22] Maj Philip D. Caine, USAF. *Igloo White July 1968 – December 1969*. Project CHECO. (Hickam AFB, Hawaii: Pacific Air Forces, 10 Jan 1970), 12.

Part 4

Long Term Operations

> *The potential of this new and growing system still is relatively untapped. The equipment and techniques developed for, and in support of, Igloo White already have reduced significantly a long-recognized deficiency of tactical airpower – its lack of a high-confidence, all-weather interdiction capability. That's a long stride forward in our search for a more effective deterrent to conventional war.*
>
> — Brig. Gen. William J. Evans[1]

Mission Activities

Operational patterns for the USAF interdiction campaigns were often dictated by theater weather patterns. Indochina is:

> Dominated by two major seasonal phenomenon – the southwest and northeast monsoons. The southwest monsoon normally predominates from June to October and the northeast from November to May. The climatological patterns for each of these seasons are best remembered with reference to the Annam Mountains. During the southwest monsoon, or wet season, a low-pressure area draws air off the Indian Ocean, bringing thunderstorms and rains to Laos. During the northeast monsoon, or dry season, a high-pressure area blows over the Gulf of Tonkin and South China Sea, bringing low overcast clouds, fog, and drizzle to North Vietnam and dry weather to Laos.[2]

During the dry season activity along the Lao-based Ho Chi Minh Trail was high. This coincided with the odd numbered COMMANDO HUNT campaigns (see Table 6). Focused interdiction efforts were conducted to halt the flow of material entering South Vietnam. The summer wet season provided a respite in enemy activity and an opportunity to fine tune operations and plan for the fall campaigns.

Table 6. Compiled COMMANDO HUNT Statistics

COMMANDO HUNT Campaign Statistics				
Campaign	COMMANDO	COMMANDO	COMMANDO	COMMANDO
Inclusive Dates	HUNT I	HUNT III 1 Nov 69	HUNT V 10 Oct 70	HUNT VII 1 Nov 71
	1 Nov 68 –	–	–	–
	30 Apr 69	30 Apr 70	30 Apr 71	30 Mar 72
Number of Strike Sorties	423	319	304	216
Trucks Destroyed or Damaged	6,000	10,000	20,000	10,000
Enemy supply input/output ratio (In Tons)	45,000/8,500 (1/5)	54,000/19,000 (1/3)	61,000/7,000 (1/9)	31,000/5,000 (1/6)

Source: Herman L. Gilster, *The Air War in Southeast Asia, Case Studies of Selected Campaigns*, (Maxwell Air Force Base, Alabama: Air University Press, October 1993), 20. As extracted from individual COMMANDO HUNT reports produced by HQ Seventh Air Force, Directorate of Tactical Analysis.

Nominally the southwest, wet season periods utilized the even numbered COMMANDO HUNT designators. Working through issues brought out in COMMANDO HUNT I, TFA worked to expand and modify existing sensor fields, incorporate upgraded equipment and improve tactics and procedures. Activities also increased in Northern Laos BARREL ROLL area with sensors emplaced for the first time in August 1969. Activity was however disappointing and missions in that area were suspended on September 20. Activity increased as the dry season approached and enemy operations in BARREL ROLL served as a precursor to COMMANDO HUNT III.[3]

For the second season Igloo White was planned as an integral portion of the interdiction effort. Of particular importance was the system's real-time potential. To take advantage of that, the Commando Bolt operation was initiated. Commando Bolt was established in November

1969 and delineated an area in East Central Laos that would be controlled by the Sparky FAC (call sign Copperhead) operating from the now expanded TFA (see Figure 12).

Figure 12. Task Force Alpha during COMMAND HUNT III

The central capability of the Sparky FAC/Commando Bolt operation was the ability to analyze, in real-time, sensor activations and predict future target locations for LORAN equipped strike aircraft.[4] TFA computer equipment had advanced to the point that the FAC, assisted by a sensor interpreter, could visually 'see' enemy vehicles move along a LOC as represented by sequential sensor activations depicted on the screen. Targets were then passed to two in-flight teams, either fast (F-4/Navy) or slow-movers (A-1E), for strike. While this improved the direct detection to strike capability, poor weather conditions and the difficulty in having properly outfitted aircraft available to strike targets when detected hampered the overall Commando Bolt missions.[5] Notwithstanding these limitations, the Igloo White system was enjoying significant improvements in capability and producing improved results over COMMANDO HUNT I.

An innovation to improve real-time targeting involved passing sensor-derived targets from the EC-121R 'BATCAT'[6] aircraft directly to ABCCC for immediate fragging of strike aircraft. This program, termed FERRET III, operated successfully from February through May 1970.[7] COMMANDO HUNT IV, in the summer of 1970 continued the Commando Bolt strike areas in the mountainous areas of Mu Gia, Ban Karai and Ban Raving. The focus of summer activity was to improve intelligence and targeting activities and to build towards the fall dry season campaign.

COMMANDO HUNT V took the Commando Bolt strike concept to new levels, increasing the number of areas from six to twenty.[8] In spite of this increase, COMMANDO HUNT V produced uneven interdiction results. From a high of .8 trucks killed per sortie at the end of January 1971 to a low of zero in mid-March, the average was approximately one-half of a truck destroyed or damaged per sortie.[9] Poor weather, with strikes conducted under non-visual conditions, contributed to low BDA results and the resultant low statistics. Airspace crowding also impacted the success of various Commando Bolt areas. With the advent of gunships for the interdiction mission, it became apparent that it was difficult to conduct F-4 operations in the same sector. Likewise, 7th AF tended to frag the gunships against the more lucrative areas, perpetuating the confusion between derivation of targets and credit for target destruction.[10] One innovation for COMMANDO HUNT V was the Traffic Advisory Service. This was another effort to make better use of real-time sensor detection of targets. Taking over where FERRET III left off, the ability to apply Igloo White derived intelligence was essential in the success of the interdiction program. This program started on 24 October 1970 with the advisory controller call signed Headshed. Headshed results were impressive as explained in Table 7.

Table 7. HEADSHED Traffic Advisory Summary January – April 1970

SEQUENCES:	
No. of Sequences processed	69,723
No. of Sequences Passed	21,363
SEQUENCES PASSESD TO:	
COMMANDO BOLT	7,716
FACs	3,911
Gunships	4,863
Armed Recce	1,889
ABCCC	2,984
7th AF Command Post	10
BDA:	
Trucks Destroyed	2,739
Trucks Damaged	586
Explosions	1,793
Fires	1,490

Source: Capt Henry S. Shields, USAF. *Igloo White January 1970-September 1971*, Project CHECO. (Hickam AFB, Hawaii: Pacific Air Forces, 1 Nov 1971), 36.

At the conclusion of COMMANDO HUNT V, the DART I equipment was moved to NKP and operations were fused at the ISC. Other summer activities included consideration of Cambodian sensor operations. In May 1970, command interest was high and a proposed area of operations was outlined. In late June, TFA determined that 20 strings of sensors would be needed to meet MACV requirements. On September 27, 1970, 7th AF directed three strings be dropped and the missions were flown on October 3 and 4.[11] A second set of three strings were hand-emplaced on 20 December. The HANDSID or HAND Seismic Intrusion Detector (see Figure 13) dated to early in the program and was traditionally put in place by special teams inserted into an area by helicopter. Little activity, however, was detected along these LOCs. As

these two sensor fields began to expire, MACV "determined that it was unlikely that a continuing sensor capability in that area would be worth the effort needed to monitor it effectively."[12]

Figure 13. HANDSID or HAND Seismic Intrusion Detector

Technical Expansion

Sensor improvements formed the cornerstone of technical expansion as DCPG and TFA matured. In the summer of 1969, Phase II sensors were rapidly being incorporated into combat operations and early training programs were being developed for the Phase III program. The commandable feature of the Phase II sensors allowed a change in operational tactics. Essentially, dual fields of sensors could be simultaneously emplaced allowing for a primary and reserve field using the command on/off feature.[13] Another change that positively influenced sensor drop operations was the consolidation of sensor build activities with the sensor seeding squadrons at Ubon RTAFB.[14]

Three sensors were used as part of the Phase II program. The ACOUBOUY/SPIKEBOUY, FADSID and the ACOUSID. ACOUBOUYs and SPIKEBOUYs were essentially the same as their Phase I predecessors with the added ability to turn the audio pick-up on and off by command, either from the orbiting EC-121R or from the ISC. The FADSIS was destined to be the replacement for the Phase I ADSID but abnormally high failure rates on implant drove the program to return to the reliable ADSID. The addition of the ACOUSID, first tested in late 1968, allowed versatile seismic and audio capability. While the Phase II sensors brought needed improvements, the program was proceeding along an evolutionary path with Phase III ADSID, ACOUSIDs and ACOUBOUYs sensors arriving in theater.[15]

In addition to the command feature, they also incorporated increased radio channels allowing for more sensors to be emplaced and operated simultaneously.[16] The Phase III program was executed during the COMMANDO HUNT V campaign, taking advantage of upgrades to both the ISC and EC-121R fleet accomplished in December 1969.[17] Phase III capability also increased the performance of sensors (see Table 8).

Table 8. Detection Ranges of Phase III Sensors

	Trucks	Personnel
Seismic ADSID III	100-150 meters	30-50 meters
Acoustic COMMIKE III	300-1500 meters	30-100 meters
Seismic and Acoustic ACOUSID III	100-300 meters	30-50 meters
Ignition EDET III	100-200 meters	

Source: Capt Henry S. Shields, USAF. *Igloo White January 1970-September 1971*, Project CHECO. (Hickam AFB, Hawaii: Pacific Air Forces, 1 Nov 1971), 6.

As depicted in Table 8, two new sensors were added late in the program. The COMMIKE III was a commandable microphone that was exclusively suspended from the jungle canopy (see Figure 14).

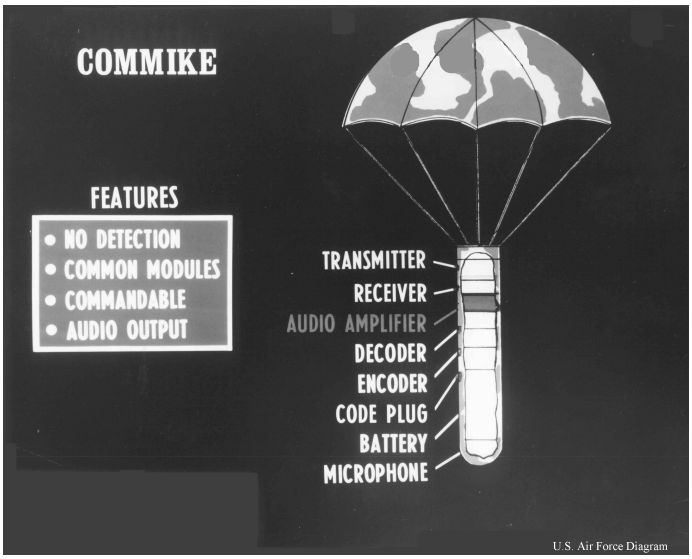

Figure 14. COMMIKE Communications Microphone (Phase III)

The EDET III was an engine detection sensor that was queued by the electromagnetic signal from a gasoline powered vehicles' ignition (see Figure 15).[18] EDET IIIs worked well to monitor truck parks and a combined COMMIKE/EDET was developed.

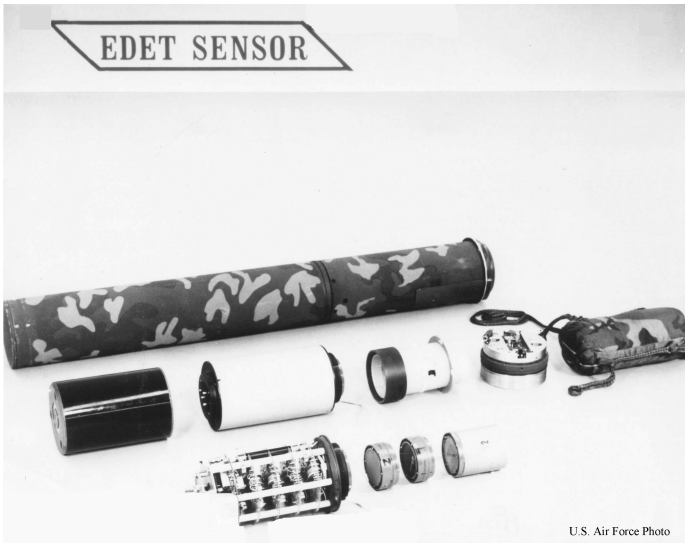

Figure 15. EDET Electronic (ignition) Detector (PHASE III)

Other sensor types were also developed and DSPG (DCPG became the Defense Special Projects Group with a slightly expanded role on 1 April 1971) continually advanced the state of the art.

As the program expanded, particularly into more heavily defended regions of Indochina, a capability was needed to supplement the EC-121R. In early 1968 a program involving a YQU-22A, Beechcraft Debonair aircraft in a drone configuration was explored. These PAVE EAGLE I aircraft were outfitted with minimal EC-121R relay gear and could transmit sensor activation information to the ISC. Designed to takeover for the BATCAT in high threat areas, it appears that the YQU-22A (version I) never flew an unmanned operational mission.[19] A second PAVE EAGLE aircraft was under development as the program wound down and palletized suites of relay equipment were developed as part of Vietnamization under project TIGHT JAW.[20]

The DART system, first deployed in 1969, was used extensively to support in-country operations and various plans called for an expansion of this capability. It was envisioned that if the ISC were more mobile, then the application of sensor technology to an increasing range of operations would be possible at a significantly reduced cost and schedule.[21] DART II, the follow-on system, was also incorporated into TIGHT JAW.

Program Conclusion

COMMANDO HUNT VII was the last active dry-season campaign conducted by the DSPG/TFA team. Running through April 30, 1972, COMMANDO HUNT VII again saw strike operations conducted from TFA. Operating using massed sensor methods called Blocking Belts to better focus sensor operations, Igloo White was instrumental in the success of the campaign and the damage or destruction of over 10,000 trucks. This reduced enemy flow of material from 31,000 tons per day to 6,000 tons.[22]

At the conclusion of COMMANDO HUNT VII, DSPG transferred active and development programs over to the various services and ceased operation on June 30, 1972. Air Force sensor operations were then shaped by the HQ USAF mandated Remote Ground Sensor Planning and Programming Objectives (REGSENSPO) program. This group would guide mid-range and long-range Air Force sensor acquisition efforts. A key mission for the Air Force sensor program was to develop applications for other theaters. Project Mystic Mission, for example, explored the use of Phase III technology in Europe.[23]

Task Force Alpha stood down on December 31, 1972 after accomplishing significant transition of technology and material to ARVN forces as part of the Vietnamization effort.[24] Air assets supporting Igloo white were gradually transitioned to other missions.

From September 1966 to December 1972 truly amazing operations were designed, developed, deployed and employed in an effort to interdict the flow of men and material from North Vietnam along the Ho Chi Minh Trail to the south. With the Igloo White sensor program now a matter of record, an examination can be made as to its successes and failures in accomplishing the air supported anti-infiltration mission.

Notes

[1] John L. Frisbee, "Igloo White" *Air Force Magazine*, June 1971, 53. Brig. Gen. Evans was a member of DCPG from June 1968 to February 1970.
[2] Herman L. Gilster, *The Air War in Southeast Asia, Case Studies of Selected Campaigns,* (Maxwell Air Force Base, Alabama: Air University Press, October 1993), 15.
[3] Maj Philip D. Caine, USAF. *Igloo White July 1968 – December 1969*. Project CHECO. (Hickam AFB, Hawaii: Pacific Air Forces, 10 Jan 1970), 15.
[4] Ibid., 17.
[5] Ibid., 19.
[6] 'BATCAT' was the call sign utilized by the 553rd Reconnaissance Wing EC-121R aircraft.
[7] Capt Henry S. Shields, USAF. *Igloo White January 1970-September 1971*, Project CHECO. (Hickam AFB, Hawaii: Pacific Air Forces, 1 Nov 1971), 26.
[8] Ibid., 31.
[9] Ibid., 32 and Figure 14.
[10] Ibid.

Notes

[11] Ibid., 46-48.
[12] Ibid., 49.
[13] Maj Philip D. Caine, USAF. *Igloo White July 1968 – December 1969*. Project CHECO. (Hickam AFB, Hawaii: Pacific Air Forces, 10 Jan 1970), 14.
[14] Ibid.
[15] Ibid., 24.
[16] Phase I sensors transmitted their information via the EC-1212R on one of 31 channels using one of 27 discrete tone codes per channel. This limited the total number of sensors to 837. Of those, 162 channels/sensors were directly allocated to MACV and an additional 54 were maintained as a backlog for planning new emplacements. Throughout 1968 TFA utilized a high of only 504 of the 621 sensor communications channels available. History of Task Force Alpha 1 Jan 1968 – 31 December 1968, 84. Phase III sensors increased the number of channels from 31 to 640 and the number of discrete tone codes from 27 to 64 per channel. This increased the theoretical number of sensors from 837 to 20,480. That number was limited by the available computing power at the ISC to about 2000. Maj Philip D. Caine, USAF. *Igloo White July 1968 – December 1969*. Project CHECO. (Hickam AFB, Hawaii: Pacific Air Forces, 10 Jan 1970), 24.
[17] Ibid., 25.
[18] Capt Henry S. Shields, USAF. *Igloo White January 1970-September 1971*, Project CHECO. (Hickam AFB, Hawaii: Pacific Air Forces, 1 Nov 1971), 53.
[19] Maj Philip D. Caine, USAF. *Igloo White July 1968 – December 1969*. Project CHECO. (Hickam AFB, Hawaii: Pacific Air Forces, 10 Jan 1970), 31.
[20] Capt Henry S. Shields, USAF. *Igloo White January 1970-September 1971*, Project CHECO. (Hickam AFB, Hawaii: Pacific Air Forces, 1 Nov 1971), 92.
[21] Maj Philip D. Caine, USAF. *Igloo White July 1968 – December 1969*. Project CHECO. (Hickam AFB, Hawaii: Pacific Air Forces, 10 Jan 1970), 36. An extensive discussion of DART operations is contained on pp. 45-49.
[22] Herman L. Gilster, *The Air War in Southeast Asia, Case Studies of Selected Campaigns*, (Maxwell Air Force Base, Alabama: Air University Press, October 1993), 20.
[23] DSPG Documentary Supplement Two August 1970-June 1972, (Defense Special Projects Group, Naval Observatory, Building 56, Washington, D.C.), this volume and the accompanying annex detail closeout activities of DSPG. Details of the Mystic Mission program can be found in the CONUS Plan for 'Demonstration of a Phase IIIE System in Europe (Mystic Mission)' (Defense Special Projects Group, Naval Observatory, Building 56, Washington, D.C.).
[24] History of Task Force Alpha 1 Oct 1972 – 31 December 1972, 8.

Part 5

Conclusions

> *The barrier would be costly, but because our bombing was ineffective, I authorized it and assigned Lt. Gen. Alfred D. Starbird to oversee its development. The Joint Chiefs reacted coolly to this idea but did not actively oppose it. Once it was put in place, the barrier was intended to increase infiltration losses. And it did.*
>
> — Secretary of Defense Robert McNamara[1]

Secretary McNamara correctly asserts that the barrier increased infiltration losses. Colonel Gilster, in his definitive study, argues that on average, for every five tons of supplies input from the North into the Trail network only one ton eventually arrived in the South.[2] At the tactical level the Communist logistics system was seriously disrupted. Gilster's estimate of an 82% reduction, taken in isolation appears impressive. A closer examination, however, reveals the fragility of this data. The war in Vietnam in general, and the Laotian interdiction campaign in specific, was often measured by raw numbers. These numbers lead many to believe that the United States was pursuing a successful bombing strategy. In fact, the U.S. interdiction campaign and the use of the Igloo White sensors did not significantly impact Hanoi's ability to wage war. A detailed examination of the logistics requirements of both the Viet Cong insurgency and the PAVN main force units; reveals a capacity to successfully operate with as little as 18% of the supplies being sent South. In sum, while the United States damaged and/or destroyed vast quantities of trucks and supplies, it is now clear that these efforts never reached the level of pain necessary to sway the North Vietnamese from their quest for reunification.

Numerous theories have been advanced on how the Vietnam war should have been prosecuted. Most agree that attacking the numerous branches of an enemy's support system is not as effective as striking at the heart of the system. Analysis of the Igloo White system shows that it did boost the interdiction effort, but the effort was misapplied from the outset. If the *raison d'être* for the mission were ever critically examined, then the policies and infrastructure supporting the mission would have waned as resources, both fiscal and political, were shifted to support other goals and strategies. Could the Igloo White system have been utilized in the war against the heart of the enemy's system? Central to these issues is the idea of an exclusively air supported anti-infiltration barrier.

History cautions those nations tempted to rely on technology. Neither the politics nor the environment of Vietnam were conducive to the barrier concept and, while building a barrier of electrons appealed to the whiz-kids, it had little influence on the decisions of the North Vietnamese leadership. From the U.S. domestic perspective, there are other critical lessons and markers for future American military involvement. Vietnam compels U.S. policymakers to make a clear and compelling case for committing American blood and treasure. Declassified figures show that DCPG spent $1.68 billion.[3] Strike aircraft costs are figured at $20 million per 1000 sorties and the associated costs are astronomical.[4]

The air supported anti-infiltration barrier was a much-anticipated program that, unfortunately, did little to affect the outcome of the war. It became just a part of the failed U.S. interdiction strategy. Failure all the more bitter for the operational successes achieved. Igloo White provides a poignant reminder that airpower alone, regardless of its advances or pairing with superior technology, cannot and should not be considered the only solution when fighting this nation's wars.

Notes

[1] Robert S. McNamara, *In Retrospect, The Tragedy and Lessons of Vietnam*, pp. 246.

[2] Herman L. Gilster, *The Air War in Southeast Asia, Case Studies of Selected Campaigns*, (Maxwell Air Force Base, Alabama: Air University Press, October 1993), 20.

[3] Senate, *Report of the Electronic Battlefield Subcommittee of the Preparedness Investigating Subcommittee of the Committee on Armed Services*, 92nd Cong., 1st sess., 1971, 71-S202-2, 12.

[4] Department of Defense. *United State-Vietnam Relations 1945-1967*. vol. 5, 84. During COMMANDO HUNT I as an example, 17,878 sorties were flown in the TFA area of responsibility. Now, consider the additional costs associated with conducting strike operations, such as escort, combat air patrol, suppression of enemy air defenses, air-borne command and control and tanker/logistics flights and the costs continue to rise. Further, examine those costs not against one six-month period but across four and one-half years (containing an additional three focused interdiction campaigns) and the total costs are indeed astronomical.

Appendix A

Khe Sanh Support

Operations in the Khe Sanh extension to Dump Truck commenced on January 20, and became the major focus of the anti-infiltration campaign. Dump Truck missions were originally intended to detect personnel moving from Laos into South Vietnam but, given the shift in mission, TFA planners coordinated directly with the III Marine Division to identify support requirements. TFA would provide advance warnings of large-scale movements of 100 or more troops and provide more accurate coordinates to improve Marine artillery fire.[1]

21st Helicopter Squadron CH-3s dropped 99 ADSIDs in the first four days of Khe Sanh support (see Figure 16).

Figure 16. 21st Helicopter Squadron Personnel Loading ADSIDs

The HELOSID sensor (see Figure 17), designed for rotary wing operations, proved unsuccessful in system tests and saw little operational use.

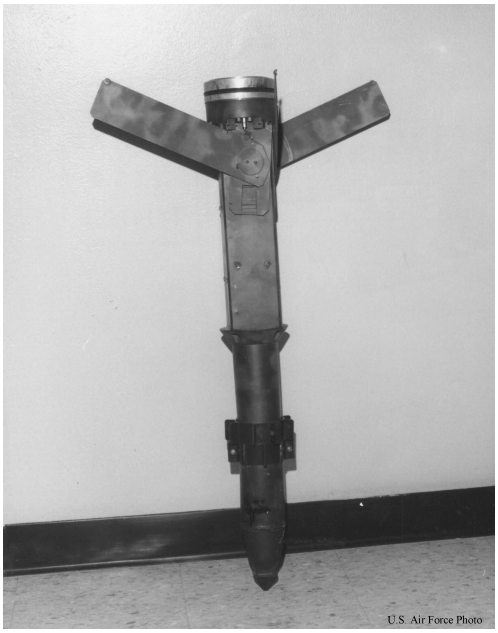

Figure 17. HELOSID Helicopter Emplaced Seismic Intrusion Detector (Phase I)

Because the Marine base area had relatively thin jungle canopy SPIKE ACOUBOUYS were also hand dropped by helicopter. The first mission was flown on January 29, 1968.[2] Within two days OP-2Es and CH-3s had flown 72 sensor-seeding missions. Initial sensor derived targets were indiscriminately fired on. Later the Marine artillery units used sensor data in conjunction with other intelligence to better strike enemy positions. Overwhelming air power was used throughout the siege of Khe Sanh, at times in excess of 400 sorties per day. In February, support to the Marines was elevated to an all-out effort and in addition to sensors, munitions were also seeded (see Table 9). 1st Air Commando Squadron A-1Es conducted the first Dump Truck micro-gravel drops on January 25, 1968 (earlier munitions drops had occurred on December 27, 1967 in Mud River). Further drops of injurious gravel mines were made on January 27, and close in to the Marine base on February 4.[3]

Table 9. Sensors and Munitions Used in Defense of Khe Sanh through 15 April 1968

SENSORS			Munitions	
ADSID	ACOUBOUY	SPIKE ACOUBOUY	Gravel	Micro-Gravel
239	91	87	1,100,000	5,700,000

Source: Headquarters United States Military Assistance Command, Vietnam, *Muscle Shoals Six Month Summary Evaluation Report*, 38.

An evaluation of overall Muscle Shoals activity in Dump Truck shows that 52% of the ADSIDs, 34% of the ACOUBOUYs and 52% of the SPIKE ACOUBOUYs were dropped in direct support of the Khe Sanh operations.[4] In the opinion of MACV and the III Marine division:

> Muscle Shoals was effective for several reasons. Large enemy troop concentrations in a limited geographical area provided ample targets for sensors. Sensors provided the only real-time intelligence during darkness, and during inclement weather so that reports were generally not in competition with other sources. Here the system was not fire power limited. All the air and artillery that could be effectively used was provided.[5]

Indicating a potential future for operations in South Vietnam, General Westmoreland stated:

> I am enthusiastic about the potential of sensors and am convinced we are on the verge of a breakthrough in acquisition of ground tactical intelligence. Therefore, I desire that vigorous command emphasis be given to the program for introduction of sensors into tactical operations.[6]

Introduction of sensor capability into South Vietnam became a formal mission on April 5, 1968 when Deputy Secretary of Defense Nitze, concurring with a DDR&E recommendation, directed DCPG and in turn TFA to:

> Assist CINCPAC/COMUSMACV/COM7AF in the introduction and use of available MUSCLE SHOALS and DYE MARKER type assets to enhance our detection and surveillance capability in South Vietnam. And to prepare, in conjunction with CINCPAC/COMUSMACV/COM7AF, a plan for application of MUSCLE SHOALS and DYE MARKER type technology and assets to a wide range of applications in operations against the enemy.[7]

Success in support of Khe Sanh ensured a future for the system and, as the summer of 1968 unfolded, numerous efforts were underway to deliver sensor capability throughout the theater.

Notes

[1] History of Task Force Alpha 1 October 1967 – 30 April 1967, 49.
[2] Ibid., 50.
[3] Ibid., 53.
[4] Ibid., appendix III. ('Sensor Emplacement Summary' compared to Table 1).
[5] "Muscle Shoals Six Month Summary Evaluation Report" Headquarters United States Military Assistance Command, Vietnam, 31 May 1968, 38-39.
[6] Ibid., 44.
[7] Senate, *Report of the Electronic Battlefield Subcommittee of the Preparedness Investigating Subcommittee of the Committee on Armed Services*, 92nd Cong., 1st sess., 1971, 71-S202-2, 6. History of Task Force Alpha 1 October 1967 – 30 April 1968, 69.

Glossary

AAA	Antiaircraft Artillery
ABCCC	Airborne Battlefield Command and Control Center in C-130 Aircraft
Acoubuoy	Acoustic sensor designed to suspend in trees or foliage
Acousid	Combined acoustic/seismic sensor
ACW	Air Commando Wing
ACS	Air Commando Squadron
ADP	Automatic Data Processing
ADSID	Air Delivered Seismic Intrusion Detector
AFHRA	Air Force Historical Research Agency
AISC	Alternate Infiltration Surveillance Center
ARPA	Advanced Research Projects Agency
ARVN	Army of the Republic of Vietnam
BARREL ROLL (BR)	Area encompassing northern Laos
BATCAT	553D RW EC-121R data relay aircraft call sign
BDA	Bomb Damage Assessment
CAS	Controlled American source
CDMS	Communications Data Management System (Unclassified name for IGLOO WHITE system)
Choke Point	Area chosen for interdiction and restriction of enemy traffic, based on the relationship between natural terrain features and vehicular movement
CINCPAC	Commander in Chief, Pacific Command
CINCPACAF	Commander in Chief, Pacific Air Forces
COC	Combat Operations Center
COMMANDO BOLT	Operating Area in East Central Laos established during COMMANDO HUNT III and later expanded to include many specific Laotian interdiction areas
COMMANDO HUNT	(CH) title of interaction plan for campaign in Laos during the northeast monsoon season, 1968-1969
COMMANDO HUNT Area	Eastern Laos, between 16.5 degrees N and 18 degrees N Latitude
COMUSMACV	Commander, U.S. Military Assistance Command, Vietnam
CONFIRM	Coincidence Filtering Intelligence Reporting Medium – computer printout containing all useful information provided by the sensor field

COPPERHEAD	Call sign for Sparky Fac working COMMANDO BOLT missions from TFA
CORONET COMBO	First AISC project, managed by TAWC, Eglin AFB
CSS	Combat Sky Spot – Ground directed bombing using MSQ77
DART	Deployable Automatic Relay Terminal
DCPG	Defense Communications Planning Group (Unclassified title of JTF-728)
DDR&E	Director, Defense Research and Engineering
DMZ	Demilitarized Zone separating North and South Vietnam
Dragon Tooth	Antipersonnel mine used to hinder troop movement
DSPG	Defense Special Projects Agency. DCPG became DSPG on 1 April 1971
DUCK BLIND	Code name for application of IGLOO WHITE technology in RVN. Superseded by DUFFEL BAG
DUEL BLADE	Superseded by DYE MARKER (DUEL BLADE II plan changed from SPOS concept to sensors only)
DUFFEL BAG	(see DUCK BLIND)
DUKES MARE	Test evaluation project for IGLOO WHITE at USAF Tactical Air Warfare Center, Eglin AFB, Florida
DUNE MOON	Full system testing of anti-infiltration program conducted throughout 1967 at Eglin AFB
DUMP TRUCK	Original TFA anti-personnel area around western DMZ
DUTCH MILL	Nickname for ISC at Nakhon Phanom RTAFB
DX	Priority rating for procurement of systems critical to the national security
DYE MARKER	Code name originally used to describe entire DCPG effort in SEA; later used to describe SPOS only. Superseded by DUEL BLADE
EDET III	Phase III sensor that detected the electronic signature from gasoline powered vehicles
ESD	Electronic Systems Division, AF Systems Command
FAC	Forward Air Controller
FADSID	Fighter Air-Delivered Seismic Intrusion Detector
Fast Movers	High-performance jet aircraft: F-4, F-105, F-100, A-7, A-4, A-6
FERRET III	Program to provide direct relay of sensor targets from EC-121R to ABCCC
FRA	Faculty Research Advisor
Frag	A Fragmentary Operations Order is the daily supplement to the standard Operations Orders governing the conduct of the air war in Southeast Asia. It contains mission number and function, type of ordnance, TOT, and other instructions
Gravel	Small antipersonnel munition

Handsid	Hand-Delivered Seismic Intrusion Detector
HEADSHED	Traffic Advisory Service program initiated during COMMANDO HUNT V
Helosid	Helicopter-Delivered Seismic Intrusion Detector
IBM	International Business Machines, Incorporated
IDA	Institute for Defense Analysis
IDP	Interdiction Point (Where a LOC can be cut effectively and by passes are nonexistent or difficult to construct)
IGLOO WHITE System	(IW) Surveillance system consisting of air delivered sensors, relay aircraft, and ISC. Previously named MUSCLE SHOALS
ILLINOIS CITY	Code name for DCPG activities, superseded by DYE MARKER
In-country	General reference to operations conducted within South Vietnam
Intervalometer	Instrument which controls timing of ordnance/sensor drops from aircraft
IOC	Initial Operational Capability
ISC	Infiltration Surveillance Center
IW	IGLOO WHITE
JASON	Division within IDA which produced initial Barrier Study
JCS	Joint Chiefs of Staff
LOC	Line of Communication
Log Areas	Truck parks, supply storage areas, and logistic areas
LORAN	Long-Range Airborne Navigation System
MACV	Military Assistance Command, Vietnam
MICRO-GRAVEL	Small munitions to activate acoustic sensors
Monsoon	Seasonal wind that prevails from the direction preceding the term
MSQ-77	Ground-based radar bombing system
MUD RIVER	Original TFA anti-vehicular area in STEEL TIGER
MUSCLE SHOALS	Code name established to differentiate air-supported anti-infiltration system operated by TFA and the DYE MARKER SPOS. Superseded by IGLOO WHITE
MUSIC BOX	ISC test and training mock-up. Part of Project DUKE'S MARE
MYSTIC MISSION	Program to migrate Phase III sensor technology to the European Theater
NKP	Nakhon Phanom RTAFB, Thailand
NVA	North Vietnamese Army
Occupational String	Composed of acoustic sensors deployed to monitor suspected logistic areas
OJT	On the job training

OPLAN	Operational Plan
PAVE EAGLE	Experimental drone data relay aircraft intended to supplement and eventually replace the EC-121R
PAVN	People's Army of Viet Nam. Communist North Vietnamese Army
Phase I	Early non-commandable sensors
Phase II	Upgraded, commandable sensors
PI	Photo Intelligence/Interpreter
POT LID	System test area in Panama and the name of tests conducted in that area
PRACTICE NINE	Original code for DCPG activities, superseded by ILLINOIS CITY
REGSENSPO	Remote Ground Sensor Planning and Programming Objectives
ROE	Rules of Engagement
Route Package One (RPI)	Area in NVN panhandle
RTAFB	Royal Thai Air Force Base
Real Time	Reporting of events as soon as they happen or control of forces while the action is taking place
Reece	Reconnaissance
RW	Reconnaissance Wing
SAC	Scientific Advisory Committee
Sandy	Call sign for A-1 aircraft participating in search and rescue
SECDEF	Secretary of Defense
Sequence	A series of sensor activations within a string or module
SL	Steel Tiger
Steel Tiger Task Force (SLTF)	Organization formed by 7AF at NKP in early 1967 to coordinate air interdiction in STEEL TIGER. SLTF closed down when TFA was formed to perform a similar role with IGLOO WHITE technology
Spikebuoy	Acoustic sensor designed to stick in the ground
Spikesid	Sensor combining seismic and acoustic capabilities
SPOS	Strong Point Obstacle System
Spotlight	Report of moving target derived from sensor information and passed to a FAC or the ABCCC
Sycamore Control	TFA Combat Operations Center established during COMMANDO HUNT I
TACAN	Navigation System
TASS	Tactical Air Support Squadron
TFA	Task Force Alpha
TFS	Tactical Fighter Squadron
TFW	Tactical Fighter Wing
TIGHT JAW	Program to migrate sensor operations to the South Vietnamese government

VC	Viet Cong
VO-67	Observation Squadron 67, U.S. Navy
WAAPM	Wide Area Antipersonnel Mine
Zulu (Time)	Greenwich Mean Time

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