

**TEABALL:
Some Personal Observations of SIGINT at War (U)**



(b) (3) - P.L. 86-36

THE BACKGROUND

~~(S-CCO)~~ The situation was grim in the air war over North Vietnam: The kill ratio of American to North Vietnamese aircraft was low, and too many American crew members' lives and aircraft were lost to MiG fighters defending North Vietnamese strategic areas from American attack. In early 1972, however, development of a weapons control facility, covername TEABALL, changed the course of the air war over North Vietnam. Designed as a SIGINT-driven weapons control center, this U.S. Air Force entity vividly demonstrated to operational commanders at all levels that SIGINT, when properly employed in an operational environment, greatly reduced aircraft losses to hostile fighters while significantly increasing the number of enemy aircraft destroyed, especially in areas where the U.S. was denied or had limited radar coverage. Lieutenant General Norman Wood, USAF, then a member of the Seventh Air Force Intelligence Directorate and currently the Director, Intelligence Community Staff, has told me on numerous occasions that he considers the TEABALL Weapons Control Center (TWCC) "the most significant SIGINT contribution to tactical U.S. air operations since the Korean War."

MY STORY

~~(S-CCO)~~ While serving as the Deputy Chief of the Special Support Group, Seventh Air Force, at Tan Son Nhut Air Base, Vietnam (a small detachment of one NSA civilian and ten military personnel under the operational control of Seventh Air Force and the technical control of NSA and responsible for providing SIGINT support to both Seventh Air Force and Seventh Fleet), I was called upon by the Seventh Air Force Vice Chief of Staff for Intelligence, Brigadier General Eugene Hudson, to help find and develop a new early warning system in support of U.S. airmen on missions over North Vietnam. This requirement stemmed from a high loss of U.S. aircraft that were being attacked and shot down by North Vietnamese fighters. During the first four months of LINEBACKER I¹ operations over North Vietnam (April-July 1972), the USAF lost a significant number of F-4 fighter-bombers to North Vietnamese Air Force (NVAF) MiG-21s in aerial combat. The main reason for the high number of F-4 losses was the lack of a U.S. radar command and control capability at low and medium altitudes over North Vietnam to the north and west of Hanoi.

1. LINEBACKER I was the covername for the second in a series of three periods of bombing raids over North Vietnam. The first was ROLLING THUNDER (2 March 1965-1 November 1968), the second LINEBACKER I (30 March 1972-22 October 1972), and the final LINEBACKER II (22 December 1972-29 December 1972).

~~SECRET SPOKE~~

CRYPTOLOGIC QUARTERLY

(b) (1)
(b) (3) - 18 USC 798
(b) (3) - 50 USC 3024(i)
(b) (3) - P.D. 86-36

~~(S-CCO)~~ In late June 1972, General John Vogt, Deputy Commander Military Assistance Command Vietnam (MACV) and Commander Seventh Air Force, requested that the National Security Agency and NSA Representative Vietnam (NRV) ~~(C)~~ produce a study outlining all possible ways to use SIGINT for vectoring USAF fighters.

~~(SC)~~ In response to General Vogt's request, I reviewed all available intercepts to determine if SIGINT support could be improved. After several days of research, I rediscovered an untapped source of COMINT that could be exploited and used to satisfy Seventh Air Force needs. This unique source of intelligence was North Vietnamese azimuth and range ground-controlled intercept (GCI) radar position reports on North Vietnamese MiGs. Although these links had been copied as early as 1965 by U.S. Army intercept operators, they were not copied regularly until two U.S. Air Force operators at the 6908th Security Squadron (SS), located at Nakhon Phanom (NKP) Royal Thai Air Force Base, recognized the significance of this intercept and began to copy it daily. The position reports were passed in voice over the North Vietnamese [redacted] and R105/109 single-channel communications network. These azimuth and range MiG position reports were originated by North Vietnamese BARLOCK and BIG BAR B radar operators. They read their position reports directly from their radar scopes for manual plotting at a central authority where the actual ground-controlled intercept vector instructions for the MiG pilots were formulated. Analysis of these reports revealed that they were extremely accurate as well as timely. The communications equipment used by the North Vietnamese to pass these data operated in the high HF and low VHF bands. These line-of-sight communications could be reliably copied only from a high-altitude airborne collection platform such as the OLYMPIC TORCH U-2, which downlinked to the 6908th SS at NKP.

~~(SC)~~ After plotting out all available transcribed azimuth and range GCI traffic, I was convinced that it could be processed in real-time and fused with already available North Vietnamese tactical air communications (ground controller to MiG pilots). This information could then be used by a USAF weapons controller for both offensive and defensive purposes. These fused data, if properly presented, could provide a U.S. weapons controller with basically the same air picture that was available to the North Vietnamese GCI controller, thus giving the U.S. controller the capability to know the enemy's intent as well as the exact location of his aircraft.

~~(SC)~~ On 8 July 1972, I briefed General Vogt on the possibility of exploiting the North Vietnamese azimuth and range GCI tracking in conjunction with tactical air communications to support LINEBACKER I operations. General Vogt approved the concept in principle and directed that personal messages outlining the concept of operations be sent to Admiral Gayler, Director, NSA; General Ryan, Chief of Staff, Air Force (CSAF); General Clay, Commander-in-Chief, Pacific Air Force (CINCPACAF); Admiral Moorer, Chairman, Joint Chiefs of Staff (CJCS); and Admiral McCain, Commander-in-Chief, Pacific (CINCPAC).

~~SECRET SPOKE~~

TEABALL

~~SECRET SPOKE~~

(b) (3)-P.L. 86-36

(b) (1)

(b) (3)-P.L. 86-36

~~(S)~~ On 15 July, at General Vogt's direction, I went to the 6908th SS, the prime collector of both North Vietnamese tactical air and azimuth and range tracking communications, to determine the feasibility of processing and correlating the tactical air and GCI tracking communications in real-time. Along the way I picked up two assistants, Major Darrel Nope, the U.S. Air Force Security Service (USAFSS) Liaison Officer, to assist with Air Force coordination, and [redacted] the [redacted] [redacted] Udorn, an expert on North Vietnamese tactical air communications. With the cooperation of Major Dick Myer, the Commander of the 6908th SS, and Major Kosmor, the Operations Officer of Detachment 5 of the 621st Tactical Control Squadron, and with the assistance of 6908th SS linguists, we reenacted the previous day's MiG attack on our strike force (using tapes of the NVAF voice air-ground-air communications and the azimuth and range information, integrating them in real time and plotting out the activity for a USAF weapons controller.) The object of this simulation was to see if a controller could use the displayed information for offensive and defensive purposes. The controllers who participated in the simulation felt the displayed information could be effectively used.

~~(S)~~ On 16 July, a joint NSA/CSAF team sponsored by Admiral Gayler and General Ryan arrived in Saigon to assist General Vogt with the development of a plan of action based on the locally developed concept. The NSA team members were [redacted] [redacted] (the intelligence planner for the ill-fated Son Tay raid), and Delmar C. Lang, of Korean War fame. The Air Staff contingent that provided Air Force operational expertise and coordination consisted of Colonel (now retired as Brigadier General) Bill Kirk, a two-time MiG killer, and Major Ernie Short. The Navy sent Rear Admiral "OBe" Oberg from Seventh Fleet as its coordinator. Last but not least, Pacific Air Force sent Captain (now Brigadier General) Grover Jackson to assist. Later that day, after flying in from NKP, I briefed General Vogt and the Washington team on the results of the simulation and provided a proposed design for a weapons control center at NKP. General Vogt approved the basic plans and sent the entire team to Nakhon Phanom to build it.

~~(S)~~ Brigadier General "Bones" Marshall lent the team his gleaming silver VIP C-47, built by "Rosie the Riveter" in August 1944, for the trip to NKP. Immediately upon my arrival at NKP, I drew up detailed plans for the 56th Special Operations Group construction engineers who were tasked with building the control facility. While the other members of the team toured Southeast Asia fighter wings, briefing pilots on how the weapons control center would support them, I stayed at NKP to supervise the construction of the facility.

~~(S)~~ The weapons control facility was built in a 11' x 17' expandable M-292 van mounted on a 2 1/2-ton military truck located adjacent to the 6908th SS intercept area. The truck, complete with van, was obtained for us by [redacted] (the [redacted] from the [redacted] When turned over to Harry's troops, it was located in the Laotian jungle and had to be driven to NKP. Upon arrival at NKP, after an exciting trip without brakes, the truck was perched atop a three-foot-high platform built by the base engineers. Within the van, a 4' x 9' edge-lighted plexiglass reverse plotting board was constructed to display the azimuth and range GCI tracking. Three

(b) (3)-P.L. 86-36

93

~~SECRET SPOKE~~

(b) (1)

(b) (3)-P.L. 86-36

communications links, built from modified EE-8 field phones, were installed between the M-292 van and the 6908th SS intercept areas. The three lines, encased in electrical conduit, were used to carry the azimuth and range tracking data, tactical air communications and early warning tracking data to the van. Concurrent with the fabrication and installation of the plotting board and intercom lines, the local Air Force Communications Service unit constructed a communications console connecting the weapons control center with the Task Force Alpha² radio room. This console was designed to give the weapons controller the capability to communicate with USAF aircraft active over North Vietnam via the Strategic Air Command (SAC)-operated COMBAT LIGHTNING radio-relay platform. This communications lash-up was plagued with problems from the outset. The problems ranged from an omnipresent 400-cycle hum, through antenna misalignments, to a C-135 radio-relay platform that SAC refused to fly at higher altitudes. The communication problems were so severe that General Vogt gave Brigadier General Floyd Trogdon, the Seventh Air Force Vice Chief of Staff for Communications, the full-time job of making the system work. Much to our amazement, General Trogdon moved in with us at NKP for several weeks and worked with us and the communications technicians, using his rank and prestige to force cooperation as required with Air Force elements not under the operational control of Seventh Air Force, until the problems were solved.

~~(S)~~ On 29 July, the TEABALL Weapons Control Center became operational and supported its first LINEBACKER mission. By the time we supported the second LINEBACKER mission, the NVAF realized what we were doing and stood-down all air operations. For the next seven days U.S. air forces had free reign over North Vietnam. After the NVAF had a chance to regroup, they attempted to employ deception (i.e., ground controllers pretended to be pilots reacting to U.S. aircraft). Our intercept operators were able to detect this ruse within thirty seconds because of the differences in sound between ground and airborne transmitters, and thus prevented us from vectoring our aircraft against ghost NVAF MiGs. Next in their efforts to foil us, the NVAF began launching their MiGs under radio silence (they probably used red/green lights from the control tower). However, the NVAF had to tell their surface-to-air missile (SAM) units when MiGs were launched and where they would be flying to prevent accidental shootdowns of their own planes. To this end the NVAF began passing alert messages over the SAM [] network, which contained the number, type, airfield and passover point for the MiGs when they were launched against our aircraft. One of the operators at NKP realized what they were doing and started passing this information to the controllers, which once again gave U.S. forces the edge by allowing them to vector fighters to a point where they knew the MiGs would be and where the SAM forces would be standing down. Additionally, controllers began using the NVAF controllers' voice vectors to locate the MiGs for the pilots. If an NVAF controller told his MiG pilots that there were four F-4s to their right rear at forty

2. Task Force Alpha (TFA), located at NKP, was the downlink and processing site for remote sensor operations in Vietnam and Laos.

(b) (1)
 (b) (3)-18 USC 798
 (b) (3)-50 USC 3024(i)
 (b) (3)-P.L. 86-36

kilometers, the controller would reverse these data and tell the pilots that there were MiGs to their left front at twenty-five miles.

~~(G)~~ Shortly after the TWCC became operational, the combined NSA/CSAF team returned to Washington via Saigon and Hawaii, briefing theater commanders on the way. I remained at NKP at the direction of Major General Slay, Director of Operations, Seventh Air Force, as the principal assistant to the senior weapons controller at the weapons control center. I remained there until late September, when the weapons control center became fully manned by USAF weapons controllers and technicians. As a result of the critical manning shortage at the weapons control center, I served as a member of the weapons control team, working seven days a week between July and September. As a member of the team, and in rotation with the Air Force controllers, I attended the daily post-LINEBACKER debriefings chaired by Major General Searles and later by Major General Hughs at Udorn, Thailand, representing the TWCC as an operational Air Force entity. These post-LINEBACKER debriefings were attended by the principals of the previous day's mission for the purpose of identifying and resolving problem areas.

~~(G)~~ Lieutenant General Wade, Vice CSAF, visited the control center shortly after it became operational. He decided that the control center should be relocated to a permanent facility within the Task Force Alpha compound at NKP. After the new TWCC location was designated, I designed the new weapons control center, including the protected wire distribution system, plotting boards, weapons controller stations, and the radio transmitter consoles. The new facility was completed on 23 October and supported LINEBACKER II strikes against North Vietnam during December 1972. TEABALL operations were terminated on 29 December 1972 with the signing of the peace accords in Paris.

CONCLUSION

~~(G)~~ The establishment of the TWCC as an integral part of the Southeast Asia command and control system increased the USAF/North Vietnamese MiG kill ratio from 1.16 to 1 to 3.80 to 1, accounting in part for the destruction of nineteen enemy aircraft. Referring to the TEABALL operation in unclassified terms, the book *Aces and Aerial Victories - The U.S. Air Force in Southeast Asia, 1965-1973*³ stated "late in July (1972) the U.S. put a more sophisticated MiG warning system in operation, and the kill ratio again turned in favor of the Americans. For the remainder of LINEBACKER operations, U.S. pilots destroyed four MiGs for every lost Phantom or Thunderchief." Based on the loss rate of USAF F-4 fighters to North Vietnamese MiG fighters during aerial combat prior to 29 July, it has been estimated that the changes to the U.S. command and control system brought about by the establishment of the TWCC saved the lives of at least twenty USAF crew members and over 40 million (1972) dollars in aircraft.

~~(S-CCO)~~ The Chief of Staff, USAF, considered the TWCC so significant that on 27 November 1972, he directed the documentation of the organization, tactics and procedures

3. R. Frank Futrell, et. al., Headquarters, USAF: Albert F. Simpson Historical Research Center, Air University, and Office of Air Force History, 1976, p. 101.

used by the TWCC during LINEBACKER operations "to preclude the loss of valuable experience gained in counter air operations." In their response to the CSAF requirement to document the TWCC, the Thirteenth Air Force, Technical Research Detachment, Udorn, Thailand, made the following recommendations:

"The TEABALL concept [should] be integrated into the Airborne Warning and Control System (AWACS). The concept of an air mobile weapons control center which could be collocated with a ground COMINT source, in any theater, should be developed. The AWACS aircraft would receive COMINT plots, via secure satellite data link, either as computer generated track or voice tells. If space and payloads permit, COMINT collection stations should be incorporated into AWACS. The improved air picture that will be available with the advent of AWACS, when integrated with the information available in COMINT, will provide a degree of command and control never before achieved."

~~(C)~~ Further, the lessons learned during the TEABALL experience were used by Brigadier General William Kirk and his tactical doctrine development team at Air Staff for the development of new aerial combat tactics, as well as a concept of operations for the AWACS and the USAF command and control facility at Boerfink, Germany.

~~(C-CCC)~~ The TWCC was also documented by the USAF Security Service (now Electronic Security Command) in December 1972 when their historical office prepared a monograph entitled "A Historical Resume of the TEABALL System." As a result of continued high interest in the TWCC, the USAFSS Historical Office in April 1974 prepared an expanded "Historical Study of the USAFSS SIGINT Support to the TEABALL Weapons Control Center."

~~(SC)~~ The direct SIGINT support concept as employed by TEABALL in Vietnam wasn't new; it was just forgotten. When there is a time gap of ten or fifteen years between armed conflicts, lessons learned tend to fade into obscurity along with the old soldiers who developed them. A TEABALL-type operation can work only when all of the needed ingredients (fine-grain tracking data and air-ground-air tactical voice communications) are in place and command authorities have the will to try something different. We probably wouldn't have had the opportunity to test the TEABALL concept in Vietnam if the loss of USAF fighters had not been so high. The high-loss, low-kill rates put General Vogt's command in jeopardy, and he was willing to grab at any straw that showed any prospect for reversing this loss rate. I doubt that all of the elements that contributed to TEABALL's success will ever be available again to support a specific air operation. However, parts of the concept can always be integrated into current plans if today's planners are made aware of past lessons learned.

(b) (3) - P.L. 86-36
(b) (6)

