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PROJECT CHECO SOUTHEAST ASIA REPORT

LINEBACKER OPERATIONS

SEPTEMBER - DECEMBER 1972 (U)

31 DECEMBER 1978

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14. ABSTRACT

Project CHECO was established in 1962 to document and analyze air operations in Southeast Asia. Over the years the meaning of the acronym changed several times to reflect the escalation of operations: Current Historical Evaluation of Counterinsurgency Operations, Contemporary Historical Evaluation of Combat Operations and Contemporary Historical Examination of Current Operations. Project CHECO and other U. S. Air Force Historical study programs provided the Air Force with timely and lasting corporate insights into operational, conceptual and doctrinal lessons from the war in SEA.

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PROJECT CHECO
Contemporary
Historical
Examination of
Current
Operations
REPORT

LINEBACKER OPERATIONS

SEPTEMBER - DECEMBER 1972 (U)

31 DECEMBER 1978

PROJECT CHECO
OFFICE OF HISTORY
HQ PACAF

Prepared by:
MAJOR CALVIN R. JOHNSON

[redacted]

[redacted]

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FOREWORD

The counterinsurgency and unconventional warfare environment of Southeast Asia resulted in the employment of USAF airpower to meet a multitude of requirements. The varied applications of airpower involved nearly the full spectrum of USAF aerospace weapons, support equipment, and manpower. As a result, there has been an accumulation of operational data and experiences that has been collected and documented which must be analyzed for its current and future impact upon USAF policies, concepts, and doctrine.

Fortunately, the value of collecting and documenting our SEA experiences was recognized at an early date. In 1962, Hq USAF directed CINCPACAF to establish an activity that would be primarily responsive to Air Staff requirements and direction, and would provide timely, analytical studies of USAF combat operations in SEA.

Project CHECO, an acronym for Contemporary Historical Examination of Current Operations, was established to meet this Air Staff requirement. Managed by Hq PACAF, with elements formerly at Hq 7AF, 7/13AF, and 13ADVON, Project CHECO provides a scholarly, "on-going" historical examination, documentation, and reporting of USAF policies, concepts, and doctrine in PACOM. Since the drawdown in SEA, the Project CHECO functions have been centralized in the Office of PACAF History.

This CHECO report is part of the overall documentation and examination which has been accomplished. It is an authentic source for the assessment of the effectiveness of USAF airpower in PACOM when used in proper context. The reader must view the study in relation to the events and circumstances at the time of its preparation--recognizing that it was prepared on a contemporary basis which restricted perspective and that the author's research effort was limited to records available within his local headquarters area.

CHARLES C. PATTILLO, Major General, USAF
Vice Commander in Chief

ABOUT THE AUTHOR

Major Calvin R. Johnson spent the summer months of 1973 and 1974 in a career broadening assignment with the Project CHECO staff in Southeast Asia, while serving as an instructor in the Department of Civil Engineering, Engineering Mechanics and Materials at the United States Air Force Academy.

Major Johnson has eight years of experience as a Strategic Air Command navigator-bombardier in B-47 and B-58 aircraft. He also accumulated over 150 combat sorties in the EB-66C/E while serving a tour in Southeast Asia during 1970-71.

He is a graduate of the United States Military Academy (1960), Undergraduate Navigator Training (1961), Air Force Squadron Officers School (1965), Air Command and Staff College (1968), Air Force Institute of Technology (1970), Armed Forces Staff College (1972), and Industrial College of the Armed Forces (1974).

* * *

The author's draft was reviewed by competent authorities; it was edited by Tony Koura, Hq PACAF/HO/CHECO.

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INTRODUCTION

(U) This report continues the chronology of events from the termination date of a previous CHECO report, Linebacker: Overview of the First 120 Days, which covered the period from 10 May to 10 September 1972.[1] This study also shows the evolution of bombing tactics and technologies from 11 September 1972 until the final cease-fire announcement on 14 January 1973. Other topics highlighted in this report are discussions of significant historical events, expansion of command and control systems, effectiveness of penetration aids, force composition and selection, impact of guided bombs, and significance of weather on decision-making.

(U) Although the focus, geographically, will be on air activities within North Vietnam, the operational area must be viewed in broader terms. Forces engaged in air operations over NVN originated from staging bases in Thailand, South Vietnam, and Guam, and from Navy carriers off the coast. Activities against enemy units outside North Vietnam--the Linebacker area--however, will not be addressed except when requirements in these areas had an adverse impact upon completion of the Linebacker mission.

(U) Politically, the situation was deteriorating rapidly at the Paris peace talks because of the continued North Vietnamese invasion across the demilitarized zone (DMZ), which began in March 1972. Militarily, the situation had stabilized in the fall of 1972, with a continuing interdiction effort over NVN, SVN, and Laos. Although significant bomb damage had been inflicted by Allied air power, the enemy supply effort was not stopped. The Allied team was being pushed into a corner. One could almost predict the dealing of the ultimate blow, the 11-day air campaign in December of 1972.[2] A similar political-military dilemma had confronted America nearly 20 years before in Korea. At that time, General Douglas MacArthur's forces neatly slipped into the port of Inchon to slice the North Korean supply line in two. A parallel, historically, would soon be attempted with a devastatingly decisive series of air strikes against the North Vietnamese nerve centers of Hanoi and Haiphong during 11 days of bombing. This single intensive air operation would be known as Linebacker II. From it would evolve a cease-fire and hope for a possible peace settlement in Southeast Asia. (See Appendix 1, Chronology of Major Events.)

I. LINEBACKER BUILD-UP

(S) Throughout the first 120 days of Linebacker operations, the North Vietnamese had responded predictably, launching MIGs and surface-to-air missiles (SAMs) in record numbers. On 10 May 1972, the first day of the campaign, for example, 41 MIGs rose to challenge the U.S. strike force. Eleven of the 41 were shot down, and six U.S. aircraft were lost.[3] The ensuing months brought sporadic fluctuations in U.S. losses to MIGs and SAMs. The various kill ratios were watched closely by commanders at all levels. Factors influencing fluctuations in these numbers varied from improvement in communications to changes in tactics of the adversaries. In order to bring the linebacker interdiction into focus, the more prominent weapon systems, tactics of employment, and significant historical events will be discussed as individual topics in Chapter III. Chapters I and II will show the evolution of Linebacker from the first series of plans and rules of engagement (ROE) to the impact of the various support structures of command and control, communications, and the support forces themselves.

EVOLUTION OF PLANS AND RULES OF ENGAGEMENT

(U) Linebacker operations officially commenced with an execution order by the U.S. Joint Chiefs of Staff (JCS) on 9 May 1972. Initial strikes were conducted the following day near Hanoi by PACAF (Pacific Air Forces) units and near Haiphong by PACFLT (Pacific Fleet) forces, both under the operational command and control of CINCPAC (Commander in Chief, Pacific Command).[4]

(S) A Linebacker standing operations order clearly stated the mission and concept of operations for the Air Force contingent. The order authorized a coordinated campaign against enemy transportation and supply distribution systems in NVN from the DMZ to the Chinese Buffer Zone.[5] Attacks were forbidden in a zone along the People's Republic of China (PRC) border, 30 nautical miles wide from the Laotian border to 106°E, and 25 NM wide from there to the Gulf of Tonkin.[6]

(C) Although extensive examinations of the aerial ROE have been made in previous CHECO reports, a brief summary is in order at this time. Linebacker operations differed in many respects from previous interdiction efforts, and relaxation of the ROE reflected that difference. The overall goal of Linebacker, like the old Rolling Thunder bombing and interdiction campaign over NVN between 1965 and 1968, was to bring sufficient pressure on the NVN government so that it would stop its open aggression and support of insurgent operations in South Vietnam, Laos, and Cambodia. Relaxation of the ROE occurred in the following general categories:[7]

- Armed reconnaissance
- JCS validated targets
- Military airfields
- NVN mineclearing vessels
- Numbers of new targets struck per day
- Level of U.S. effort in NVN
- Strikes on the ports of Cam Pha and Hon Gai

(S) The initiation of Linebacker operations involved little more than a name change, since air operations against NVN had been adequately developed in April under Freedom Train [USAF strikes up to 20°N between 6 April and 7 May 1972].[8] The JCS authorized destruction and disruption of POL (petroleum, oil, and lubricants) storage areas, transportation resources, and LOC (lines of communication) in NVN. Such lucrative targets as pumping stations, bridges, railroad yards, heavy repair equipment, railroad rolling stock, and trucks would soon become easy prey for both guided and unguided bombs. The JCS further authorized CINCPAC to include AAA (anti-aircraft artillery), SAM defenses, and their supporting command and control systems in his targeting plan. Two provisos revealed the extent of the political undercurrent still present, however, as late as May 1972:[9]

- B-52 strikes required approval of the target by the Secretary of Defense 24 hours in advance of proposed time over target (TOT), except for those targets in Route Package (RP) 1 (the southernmost part of NVN; see Fig 1).

- Fixed transportation/interdiction targets could be added to the validated TACAIR/NGFS (tactical air/naval gunfire support) list at CINCPAC's discretion, but the JCS had to be advised. One exception existed: targets within a 10-nm radius of Hanoi or Haiphong, or in the PRC Buffer Zone had to be validated by the JCS prior to inclusion in the target list.

(S) Numerous additional relaxations occurred throughout the months of May and June as the JCS attempted to stem the flow of war materiel southward. Subsequent to the mining of Haiphong harbor in early May, there was a concerted effort to influence the peace negotiations in Paris by applying military pressure on North Vietnam. On 2 June, the JCS authorized attacks against rail lines, bridges, and tunnels to within 10 NM of the PRC border.[10] At the same time, a temporary political restraint was felt. On 15 June, a USAF spokesman reported that bombing in the area of Hanoi was temporarily halted, owing to the USSR president's visit to Hanoi.[11] More guidance, this time for NGFS targets in NVN, arrived in Saigon from Admiral John S. McCain, Jr., CINCPAC, indicating that these targets were subject to the same constraints imposed upon the USAF/USN TACAIR and B-52 forces. Additionally, all possible precautions would be taken to avoid known or suspected prisoner-of-war camps, shrines, hospitals, and third-country shipping, and to minimize civilian casualties.[12]

(S-NF) Along coastal areas a similar denial program would be enforced and remain in being for at least the following five months. Waterway targets would be struck (if positively identified as NVN mine-clearing vessels located within the NVN-claimed territorial waters) and denial munitions would be seeded in NVN inland waterways and coastal waters. Air attacks against merchant ships and third-country vessels were prohibited, except in self defense or with approval of the JCS.[13]

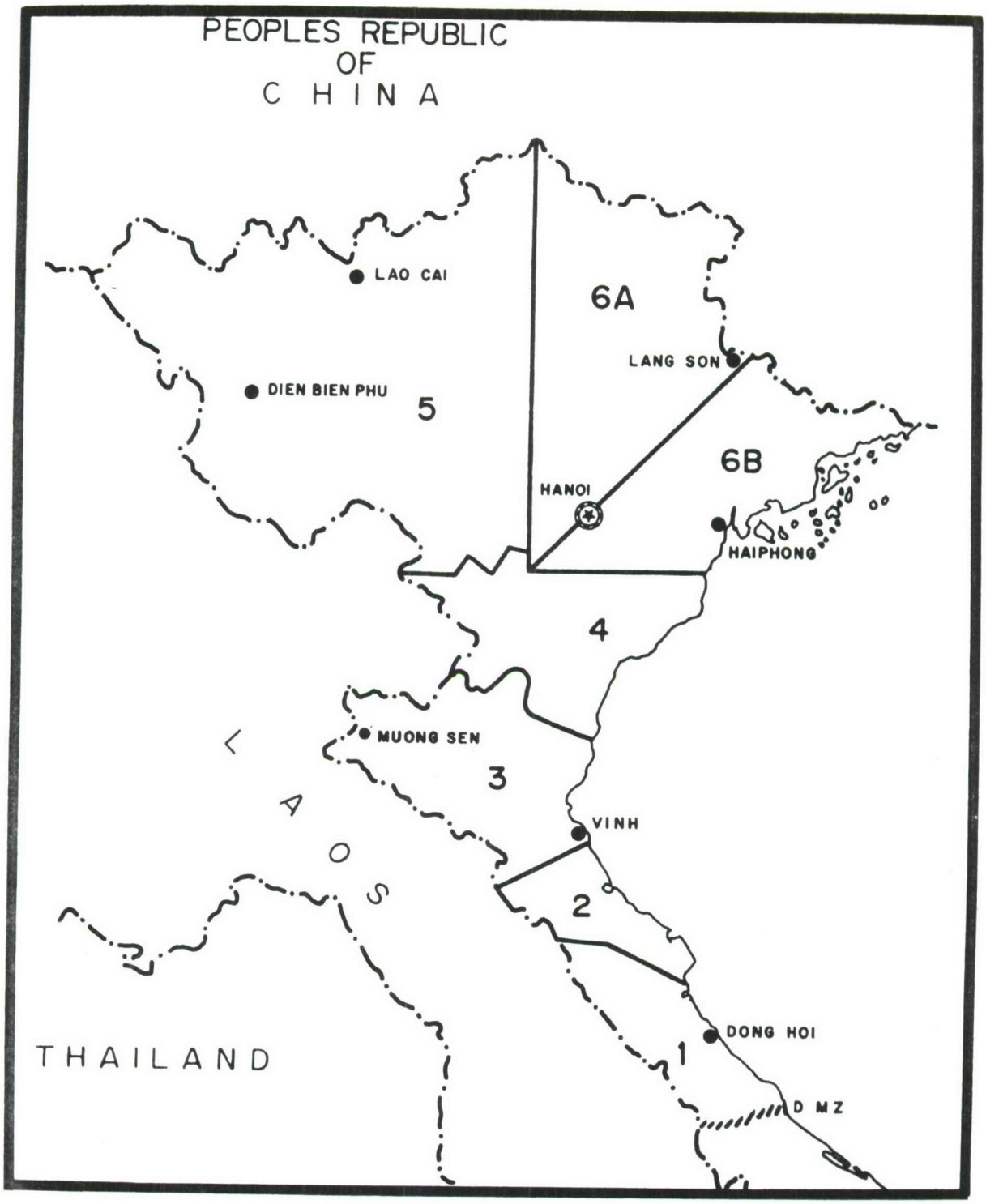
(U) The Linebacker interdiction operation within Seventh Air Force (7th AF) was under the command of General John W. Vogt, Jr. The effort was fast gaining momentum in the May to September period. Gains had been made in relaxing the air operating authorities (AOAs) since the Rolling Thunder campaign.[14]

(S-NF) Considerable expansion in the AOAs occurred in a very sudden shift in policy on 9 May 1972 with the mining of Haiphong harbor and secondary ports along the NVN coastline. As early as January 1967, retired USAF General Curtis E. LeMay, in an interview in Washington, D.C., had gone on record as favoring the closing of Haiphong and other ports in order to start the progressive destruction of NVN support and supply bases. The joint CINCPACFLT/CINCPACAF concept of operations, published in April 1967 for RP 4, echoed General Le May's beliefs in even stronger words:[15]

> *The primary objective in denying external assistance to NVN is the closure of the Haiphong port and, in conjunction with this, the objective of preventing the enemy from diverting his resupply effort to the NE and NW rail line and/or the Hon Gai and Cam Pha ports. Until authority is received which will allow the closing of the ports, no meaningful military campaign can be launched which will achieve the objective of denying external assistance.*

(S-NF) Former Secretary of Defense Robert S. McNamara earlier had seen things in a different light. He expressed the very firm opinion that the limited bombing approach was successful when weighed against its stated objectives. He viewed an intensive interdiction campaign as dangerous; it might have resulted in a direct confrontation with the Soviet Union.[16] Nearly five years later, in May 1972, a significant reversal in U.S. policy took place--an intensive interdiction campaign was begun and the three ports in question had been sealed off with sophisticated U.S. mines in a matter of hours.

(U) While commanders continued to strengthen their military positions, the negotiators in Paris wrestled with the administrative decisions that had to be made for each side to sign an agreement. These political maneuvers caused certain AOAs to be susceptible to the political winds.



(U)

Figure 1

NORTH VIETNAM ROUTE PACKAGE AREAS

(S) Not all standdowns had political implications. The temporary halt on 3 September 1972 was the result of adverse weather in the northern regions of NVN. Specifically, it began when the JCS wanted special authority for F-4 units to strike most railroad bridges within the PRC buffer zone with laser guided bombs (LGBs). The code word for this operation was an appropriate one--Prime Choke. On 3 September, all bombing north of 20°N was halted for 24 hours. The next day, bombing was permitted to resume under Prime Choke. The JCS decided that all lucrative targets within the buffer zone would be hit until 16 September. The standdown was used to good advantage, providing essential crew rest and peaking aircraft weapon systems for a maximum effort. One particular target complex consisted of three to six railroad bridges known as the Lang Giai railroad bridges. The condition of this complex was closely monitored at the direction of CINCPAC. Strict monitoring of aircraft positions by radar was also essential, cautioned CINCPAC:[17]

> *It is imperative that aircrew briefings for all strike and support aircrews continue to underscore the extreme sensitivity to PRC airspace violations and that every feasible effort be made to preclude navigational errors in the border area through use of the best available aids to navigation such as LORAN and maximum control from airborne and ship radars.*

There was high-level interest in destroying the NVN LOC. Prime Choke was specifically approved by the JCS for restrike during the period of 26 September to 19 October 1972.

(S) With NVN appearing to be responding favorably towards a cease-fire agreement, the JCS issued new directives that decreased or totally restricted air activity over North Vietnam. On 11 October 1972, CINCPAC relayed the following instructions: "There will be no, repeat, no air-strikes conducted within a 10-NM radius of Hanoi until further notice."[19] The maximum effort strikes were immediately redirected to bridges and rail targets outside the restricted zone around Hanoi. A gradual reduction of attack sorties over North Vietnam continued from 16 through 22 October. Even under this reduction, however, large numbers of aircraft, especially F-4s and F-111s, were flown into the northern two route packages (RPs 5 and 6). Specifically, there were 380 F-4 and 270 F-111 strikes into these two areas in only 22 days of operations. The date of 22 October was a key one. On that day the JCS, at the direction of the President, released the following message: "Cease air operations of all types . . . [including] leaflet and psychological operations and naval gunfire operations north of 20°N commencing 23 October 1972 at 0700H [South Vietnam time].[20]

(U) At long last the evasive peace settlement seemed close at hand. Substantial strikes would continue in NVN territory south of 20°N, but it was obvious that a "show of good faith" had been made by both sides.

However, the passing of only a few weeks would reveal the overoptimism of the negotiating teams, and a massive air bombardment of Hanoi and Haiphong would follow on 18 December. The extreme difficulty of bringing North Vietnam to the bargaining table was reflected in the CINCPAC's assessment of the August through September operations:[21]

> *In summary, we more than doubled the weight of effort in the upper route packages over the last reporting period. Our efforts have slowed the movement of supplies to the battlefields, caused the enemy to use extensive transshipment and short haul shuttling, reduced his flexibility and options, disrupted his economy, and strained his resources. Nevertheless, we have yet to attain fully our objective to apply pressure on Hanoi to produce a more favorable environment for negotiations.*

TYPICAL FORCE COMMITMENT

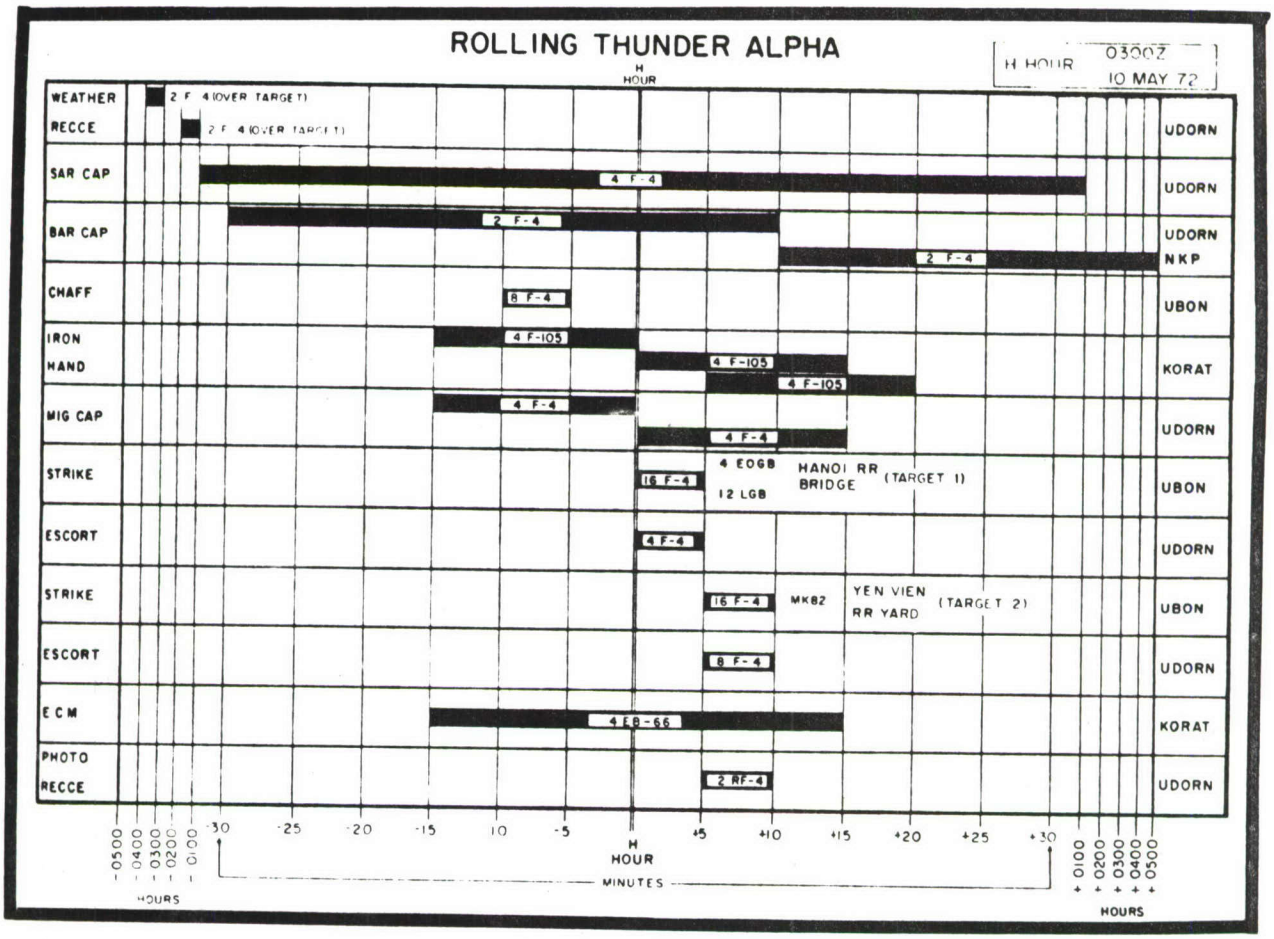
(U) The conduct of operations during the initial 120 days of Linebacker was documented in the first CHECO report. An examination of typical missions during Linebacker I (10 May - 17 December 1972) would illustrate the emphasis placed on force security, changes in tactics, and establishment of improved command and control concepts.

(U) The initial Linebacker mission on 10 May 1972 was flown under the code word Rolling Thunder Alpha because the new code word had not yet reached the field. The primary targets were the Paul Doumer railroad/highway bridge and the Yen Vien railroad yard. Both targets were located in high threat zones, so a heavy support force accompanied the strike aircraft.*

(U) The heavy commitment of support aircraft to Linebacker missions was to come under considerable study in later months. In September, Seventh Air Force revealed the burdensome support/strike ratio maintained for its one or two missions daily above 20°N (weather permitting):[22]

Support Force (93-101)	Strike Force (20-28)
4 weather reconnaissance; 3 ECM EB-66s; 8 chaff bombers; 8 chaff escorts; 8 MIGCAPS, 16-20 strike escorts; ingress CAP; 4 egress CAP; 2 photo recon; 2 recon.	8-12 strike F-4s with LGB ordnance; 12-16 strike F-4s with conventional ordnance.

**(S-REVW 15 Jul 93) The ratio for the first mission was 88 support aircraft of all kinds to 32 F-4 strike aircraft, or 2.75 to 1. Fig 2 shows the planned force composition and size, time over the target area (or on station), and base of origin for this mission. Tanker aircraft and airborne command and control centers are not shown. Fig 3 shows the geographic scope of this typical operation.*



(S-REVW 15 Jul 93)

Figure 2

PLANNED FORCE COMPOSITION, TIME OVER TARGET AREA (OR ON STATION), AND BASE OF ORIGIN FOR FIRST LINEBACKER STRIKE

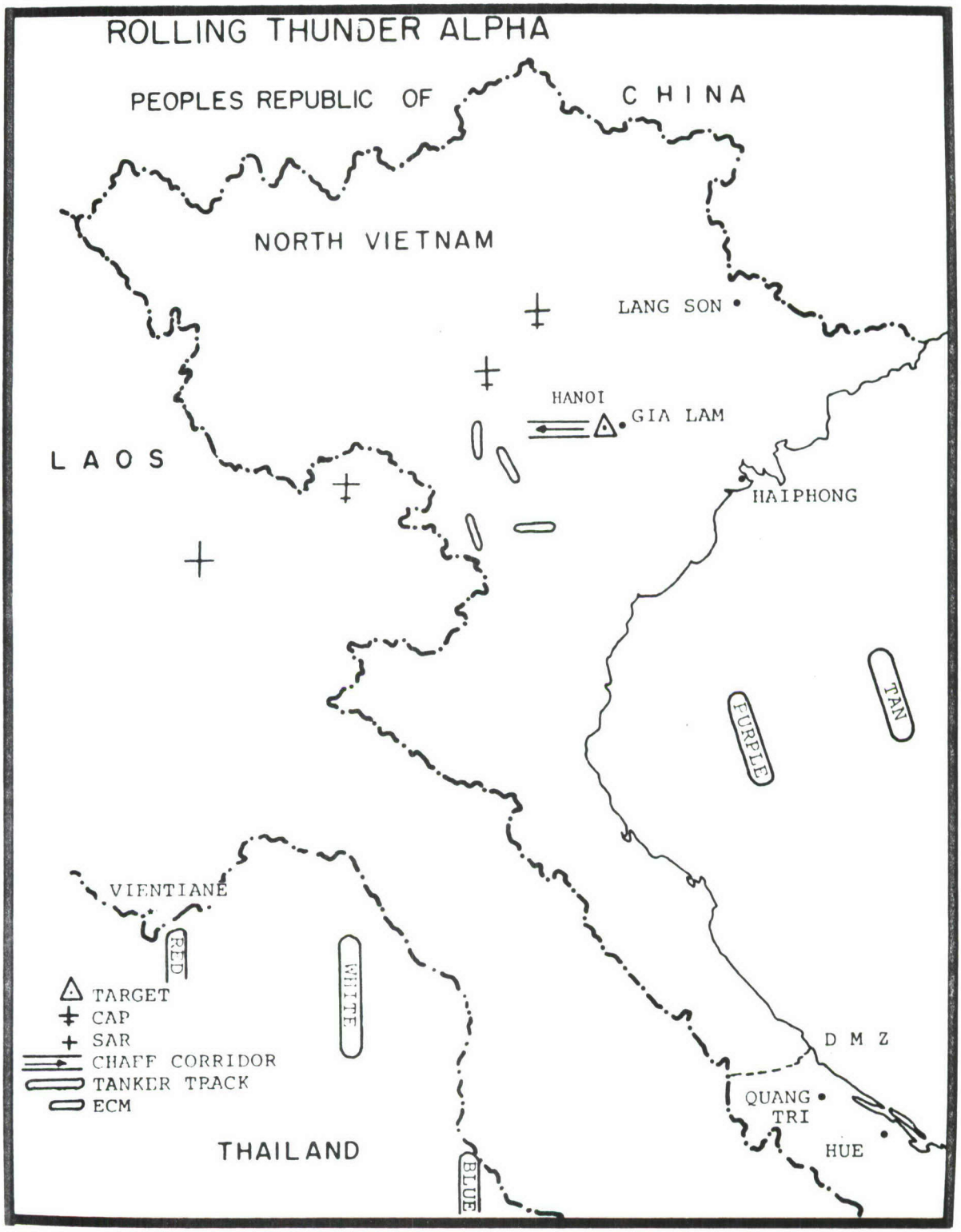


Figure 3 (S-REVW 15 Jul 93)

POSITIONING OF SUPPORT ELEMENTS
FOR FIRST LINEBACKER STRIKE

The support-to-strike ratio for this force in September, therefore, ranged from 4.6-3.6 to 1. In addition, each mission had the usual SAR (search and rescue), airborne surveillance radar, and tanker support.

(U) The exact number of aircraft varied with each mission, depending on the targets, the extent of the threat in the target area, and the number of missions per day (closely scheduled mission TOTs could use common support aircraft in many instances). Linebacker mission size did not vary whether launched through Laos or the Gulf of Tonkin. This feature allowed flexibility for weather diversions.[23]

(U) The overall mission of the strike forces during September was consistent with that of previous Linebacker months. The forces were to:[24]

- Interdict land and water communications, including rail and highway bridges.
- Interdict choke and transshipment points.
- Destroy POL systems and storage areas.
- Destroy war-supporting systems; e.g., military supplies, vehicle/equipment repair facilities, military installations, industrial plants, command and control centers, and electrical power systems.
- Attack air defense systems as necessary to provide maximum freedom of action and safety for friendly strike and reconnaissance forces.

(U) The overall figures comparing sortie rates from May 1972 through January 1973 are shown in Appendix 2. The reader should keep the support/strike ratio in mind when analyzing these data. Certain modifications to the definition of a strike sortie as an armed reconnaissance sortie had to be made during the Linebacker period. The mission was ultimately defined by the nature of the effort for the majority of the strike aircraft on that particular mission.[25]

TARGET SELECTION - LINEBACKER I

(S) The original interdiction program, the CINCPAC master target list submitted to the Chairman, Joint Chiefs of Staff (CJCS) for approval, was aimed at achieving maximum interdiction of supplies to the battlefield, "consistent with the availability of airpower over and above that required to support the SVN battle area on any specific day." Geographical and functional target groups highlighted CINCPAC's desire to isolate Haiphong and Hanoi from their road and rail links (both north and south), neutralize the offensive and defensive weapon systems around these two population centers, and then destroy all war materiel stored at or in transit to these areas. Finally, with the caveat "should existing restrictions be removed," CINCPAC recommended adding a

category of targets located within the previously restricted areas of Hanoi, Haiphong, and the PRC buffer zone.[26]

(U) The original master target list was continuously updated by the JCS, subordinate commanders, and the specific units themselves. Targets tailored for special mission aircraft, such as the B-52 and F-111, were logged on individual unit lists as Linebacker authorities evolved in late 1972. Roving F-4s, on armed reconnaissance flights south of 20°N, were authorized to hit targets of opportunity--a fighter pilot's dream.[27]

(S) October and November saw definite changes, even outright restrictions, in the type, priority, and location of targets authorized by the JCS to be struck. Between 8 May and 30 September 1972, restrictions imposed by higher authority for a total of 59 days limited access to targets for only 60 percent of the period.[28] The initial Linebacker targets for U.S. Navy TACAIR consisted predominantly of railroad and highway bridges, railroad sidings, and petroleum storage areas. A general armed reconnaissance mission was assigned to destroy waterborne craft, LOCs, railroad equipment, and trucks.[29]

(S) The actual Linebacker target selection cycle began with a nomination of certain targets to CINCPAC or the JCS. Nominated targets required validation by the JCS whenever there was a question of the target being within a restricted zone, or was of a politically sensitive nature. Admiral Noel Gayler, who succeeded McCain as CINCPAC on 1 September 1972, established the CINCPAC joint targeting committee to validate nominated targets from PACAF. The committee kept a sharp eye on target location versus the threat to populated areas. Additionally, targets in proximity to water control facilities such as irrigation dams and dikes required special justification by the nominating authority.[30]

(S) At the Seventh Air Force level, the selection process commenced three days prior to the mission, with a mating by the Deputy Chiefs of Staff for Intelligence and Operations of recommended (and validated) targets with the available force. Conflicts were resolved and the consolidated mission package was presented to the 7th AF commander for approval. Once approval was obtained, the Linebacker fragmentary operations order (frag) was developed and distributed at least 48 hours before mission execution.[31] During Linebacker II, B-52 strike coordinations through CINCSAC were made approximately 36 hours prior to the TOT, insuring timely publication of the frag.[32]

(S) Admiral Gayler provided guidance for general target priorities early in Linebacker I. Four major categories emerged:[33]

- Shipbuilding facilities
- Industrial plants
- Command and control centers
- Electric power facilities

(S) While defense installations were not placed in a specific target priority, certain defensive targets were to be attacked to provide maximum freedom of action and safety for friendly strike and reconnaissance forces. These defense installations included the following familiar threats:[34]

- Air defense systems (airfields, MIG aircraft, SAM sites, ground-controlled intercept (GCI), early warning (EW), and AAA radars, associated SAM and AAA equipment, coastal defense systems, and associated fire control facilities).
- Command and control facilities associated with air defense systems.
- Communications facilities associated with air defense systems.

(S) The naval gunfire list for NVN, derived from the PACOM contingency planning facilities list, was the source of NGFS targets throughout Vietnam. These targets were subject to the same constraints imposed upon validated targets from the CINCPAC master target list.[35]

(U) The first step toward a new point in emphasis began at CINCPAC on 29 September 1972, when the fifth Linebacker/Pocket Money operations assessment was conducted. After carefully studying the figures, the committee's conclusions led to the reshuffling of target priorities for the month of October; namely, to emphasize destruction of targets in RPs 5 and 6 that "support resupply from the People's Republic of China." The change in priorities was not intended to force maximum scheduling against priority targets in spite of forecasts of poor weather, but rather to give the field commanders flexibility to react with maximum force when weather windows permitted. Pre- and post-strike standdowns were authorized to meet a surge capability as necessary. Additionally, for planners at all levels, current reviews were conducted to identify and quantify any surge capability.[36]

(U) Another revealing fact emerged from the 29 September assessment of operations in NVN between 22 August and 26 September. Throughout NVN, 78 POL storage facilities had been struck, and although an estimated 25 percent of NVN's original storage capability was destroyed, the near-term effect on the POL transportation systems appeared minimal. This fact generated a study to determine the desired balance between pipeline system interdictions and storage facility destruction. Electric power plants and transformer stations attacked in August netted little gain (owing to rapid NVN repairs and calls upon the secondary plants in the system), but the September raids were believed accurate enough to place the targets in a "minimally productive" category.[37] Eventually, in December, the onslaught would virtually destroy the Hanoi Thermal Power Plant, thus reducing the capacity even further. Linebacker II target selection processes and bombing successes will be discussed in Chapter IV.

(U) Another surprise was the inability to close major highway routes by TACAIR strikes. Admiral Gayler admitted: "Due to the magnitude of the

effort required to interdict highway traffic, it is doubtful if we can close these routes." From 22 August to 26 September, approximately 240 highway bridges and 600 vehicles had been damaged or destroyed on major road nets. A corollary problem was that effective rail interdiction was difficult to achieve for more than a few days at a time. Repairs began within hours after interdiction.[38]

(U) In late October, the CINCPAC had analysts focusing their attention on a more optimal use of resources. He had to prescribe priorities for isolating the "triangle" (NVN heartland of Hanoi, Haiphong, and Ninh Binh) and still maintain interdiction along the LOCs south of 20°N. It appeared that greater concentration on fewer targets would result in more effective interdiction.[39]

II. LINEBACKER I OPERATIONS

STRIKE AND SUPPORT FORCES

(U) Because of the obvious dependence upon tanker aircraft to complete strikes anywhere in North Vietnam, the B-52/TACAIR team planned sorties on a daily basis. The Strategic Air Command's KC-135 tanker force was spread very thinly during the latter days of Linebacker I. In November, the CINCSAC stated that additional KC-135s could be relocated, within 72 hours if required, from CONUS bases to support any increase in SEA operations. In an economy move to meet higher headquarters planning (for Linebacker II, presumably), the CINCPAC suggested a reduction of from 90 to only 70 KC-135 sorties per day in support of fixed TACAIR sorties. SAC quickly concurred with this suggestion.[40] Only two months previously, CINCSAC, CINCPAC, and MACV had examined the feasibility of meeting a Seventh Air Force commitment of 99 sorties per day (86 tankers) and redeploying all Clark-based tankers to the United States.[41]

(U) The difficulty of scheduling SAC tankers against a fluctuating demand in SEA was discussed by Brig Gen Richard G. Cross, Assistant Director of Air Operations, MACV, on 18 December 1972--the very day Linebacker II operations commenced. General Cross said the allocation of tanker sorties to the effort in both North and South Vietnam was a full-time job:[42]

> *Because of our position within the geography of Thailand and South Vietnam, we had to have tankers in order to be able to get the proper range for our fighter aircraft to give them enough maneuverable fuel that they would be able to safely ingress and egress to the area. . . . The tankers have not only done a tremendous job in the support of our Linebacker missions into North Vietnam, but they've also done a tremendous job in the support of our TACAIR that is used in-country and in Laos, and in southern portions of North Vietnam.*

Tanker aircraft operated out of three bases in early October: Takhli and U-Tapao, Thailand, and Ching Chuan Kang (CCK), Taiwan. North-south orbits were used when supporting Linebacker strikes. East-west orbits were used for refueling those missions going into the Republic of Vietnam.[43]

USAF/USN TACAIR

(U) Tactical aircraft available for use in Linebacker operations came from USAF and USN assets located in South Vietnam, Thailand, and on aircraft carriers stationed offshore. Limited Marine Corps assets became

available in the latter part of Linebacker I. The actual numbers of Navy aircraft available varied because of the rotation of aircraft carriers with different capabilities (interdiction, ground support, and air defense aircraft) on board. U.S. Navy forces included A-4s, A-6s, A-7s, F-4s, and F-8s in varying numbers.[44] Prior to the start of the offensive, the Navy, operating from two aircraft carriers, was launching 120 sorties per day. After the buildup in September, four carriers were constantly on station (see Command, Control, and Communications, this chapter) in the Gulf of Tonkin, providing as many as 240 sorties per day.[45]

(U) Air Force TACAIR assets were more definable. As of 1 November 1972, the following relative figures were used for planning strike and support forces in North Vietnam, South Vietnam, and Laos:[46]

Type USAF Aircraft	Number Available
F-4D/E	306
F-105G	27
F-111A	48
A-7D	72
A-1E	20
RF-4C	18
EB-66	17

(U) These figures represented a portion of the more than 600 fixed and rotary wing aircraft then in-country, en route, or alerted for deployment under a series of CINCPAC plans designed to meet the planned withdrawal from South Vietnam and subsequent beddown in Thailand. Scheduled deployments, redeployments, and relocations occurred under the nickname Constant Guard. All movements were to be simultaneously completed so as to "minimize loss of SEA sortie capability."[47]

(S) By 2 November 1972, three additional PACAF fighter wings had been alerted for possible deployment to selected SEA bases. The 405th Fighter Wing at Clark AB in the Philippines, 18th Tactical Fighter Wing (TFW) at Kadena AB in Japan (Okinawa), and the 3d TFW at Kunsan AB in Korea assembled their personnel and equipment under CINCPAC OPlans Commando Flash, Commando Hawk, and Commando Fly. Since air refueling assets and base support facilities were austere, these units planned to stage through currently operating support bases, with tactical fighter maintenance personnel in place. These plans called for deployment to begin within 12 hours of execution notice, with movements to be completed within 72 to 96 hours. The stage was being set to counter any unpredictable actions by communist forces.[48]

(U) As messages were sent to prepare fighter squadrons for deployment and redeployment, additional correspondence opposing any substantial drawback was also taking place. In the event of a cease-fire, recommended

General Vogt, the Seventh Air Force commander, a strong USAF structure should remain in Thailand under a contingency plan. General Vogt felt that this should be a joint command under CINCPAC. CINCPAC would have the responsibility for targeting and tasking all participating forces. The commander was to be a USAF general (O-10) with his deputy being a U.S. Army lieutenant general (O-9). If such a plan were not acceptable, an alternate proposal placed 7th AF headquarters at Nakhon Phanon (NKP), Thailand, in lieu of a joint command at the same location.[49] Eventually, a joint command with a U.S. Army major general as deputy commander was chosen as the most workable organization. The new headquarters was named the U.S. Support Activities Group (USSAG). Coordinating elements included a SAC ADVON (advanced echelon) and a Navy team called the Fleet Coordinating Group, commanded by a rear admiral.*

MARINE TACAIR

(U) The rapid deployment and buildup of air power during Linebacker I proved the Air Force was capable of calling up forces based in the continental United States (CONUS), rapidly deploying specific units into the combat zone, employing these units within hours, and delivering ordnance at a sustained rate with minimum support facilities. Weapon systems demonstrating this unprecedented capability ranged from F-4s of the 49th TFW to F-111s of the 474th TFW. Marine air had an equivalent mobility at various overseas locations.*

(U) When a heavy demand hit USAF TACAIR allocations in April, May, and June, three Marine units deployed to take up the slack. Marine and Navy units participated as BARCAP (barrier combat air patrol) at times.[50] Twenty-seven U.S. Marine Corps F-4s from Iwakuni Air Station, Japan, moved to Da Nang AB, South Vietnam, on 10 April 1972. By 16 May, 32 Marine A-4s had also been moved to Bien Hoa, Vietnam. Finally, by 18 June, 12 Marine A-6s from Iwakuni had been relocated to Nam Phong, Thailand. This last move was in agreement with the policy to reduce the U.S. military presence in Vietnam.[51]

SEARCH AND RESCUE FORCES

(C) The location of SAR orbits was part of the planning in any long-range strike. The rescue team orbited in one of several tracks which were located outside high threat areas, yet close enough to reach

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For more information, see Project CHECO Report, USSAG/7AF in Thailand (1973-75): Policy Changes and the Military Role.

**Refer to SEA Air Augmentation, 1972, a Hq PACAF Office of History monograph, for details of the USAF buildup in response to the Communist Easter Offensive.*

downed aircrews. On Linebacker I missions into NVN, the SAR orbits were usually located in eastern Laos. When SAR missions entered high threat areas, they were given combat air patrol (SARCAP) coverage to protect them for the MIG threat.[52]

(C) The SAR force varied in size and complexity. Both ground and air alerts were used to meet specific requirements. A typical SAR team consisted of two armor-plated, armed HH-53s ("Super Jolly Green Giant" helicopters), an airborne coordination center to direct the rescue effort (usually an HC-130 "King" aircraft), and accompanying tactical fighters (SARCAP, later called RESCAP) to protect the helicopters by suppressing hostile fire and to recommend safe ingress and egress routes for other rescue aircraft.[53]

REDEPLOYMENT PROBLEMS

(C) When General Vogt was asked to comment on the complex air movements to and from SEA in support of the Linebacker effort, he pointed out the difficulties of responding to the unpredictable politico-military situation:[54]

> *For the first time in our SEA involvement, April 1972 found us involved in a major air war in the north [as well as] with a major invasion in the south. Now, at the same time we were trying to handle all of this, we were told to reduce our forces in South Vietnam! Nobody, after the invasion, had turned off the prior planning which called for the withdrawal of U.S. forces from South Vietnam. These increments, even while the attacks were going on, were being met. More people were going home. [The 7th AF commander cut his own headquarters, originally 1,200 under his predecessor, to 500 to make up his share of the U.S. cutback.]*

TACTICS EMPLOYED

(U) Despite the instabilities caused by aircraft deployments, redeployments, and rebasing within the theater of operations, General Vogt succeeded in maintaining order on the various bases. Between 1 April and 5 September, the force swelled from the 343 aircraft supporting the interdiction campaign in Laos to a total of 618 aircraft. In addition, there were 152 B-52s operating out of Guam and not appearing in theater totals.[55]

(U) In looking at the capability of the combined B-52 force based at U-Tapao and Guam, General Vogt envisioned a sustained sortie level of 105 per day in late September and early October. A portion of the B-52 force had the necessary electronic countermeasure (ECM) equipment to permit them to operate in the higher threat areas of NVN. Except for "press-on"

missions, the Arc Light cells would divert to preplanned alternate targets whenever weather, equipment, or the SA-2 threat so dictated. In early October, a line across NVN at 17°30'N determined whether the full MIGCAP, F-105 Wild Weasel/Iron Hand, and EB-66 ECM aircraft would be required for B-52 escort.[56]

(U) The electronic countermeasures and collection team was impressive. The nature of the NVN air defense system made ECM and ELINT (electronic intelligence) extremely important in USAF operations. The AAA/SAM threat reached down into the northern portion of South Vietnam during Linebacker I. All aircraft used in Linebacker operations were equipped with a defense/warning pod containing radar homing and warning (RHAW) gear. The EB-66s were used in a standoff orbit to gain acquisition radars for NVN missions. For chaff, F-4s were used to dispense the ALE-38 for Linebacker ingress and egress corridors as well as chaff bombs for both corridor and terminal areas. Electronic intelligence came from many sources: EC-47 airborne radio direction finders; EB-66Cs recording and analyzing radar transmissions; RC-135 collectors ("Combat Apple" and "Burning Pipe"), monitoring enemy communications and radar emissions; and orbiting U-2 relay aircraft ("Olympic Torch") over the Gulf of Tonkin. The U.S. Navy's EC-121 "Big Look" communications collector, operating over the Gulf, provided MIG and SAM warnings. A U.S. Navy A-3 called "Sea Wing" performed the same function in both the Gulf and over Laos.[57] (See Fig 3 for orbits.)

(U) A representative time phasing and force composition schedule for an early Linebacker mission was previously discussed. The plan for all Linebacker force composition centered around the type and degree of threat. As a rule of thumb, high SAM threat areas called for chaff, ECM support, and Iron Hand aircraft. The support package grew larger when the required combat air patrol flights and escorts for MIG protection were added. Whenever the SAM threat was not considered great enough for chaff, the support package dropped considerably (no chaff, chaff escort, or ECM). The actual strike/support aircraft ratios in Linebacker operations will be discussed later in Chapter IV under Lessons Learned.

(C) One of the most impressive but least known aspects of the air war was the tremendous teamwork involved in sending a TACAIR mission deep into North Vietnam. This teamwork required for the whole effort was commented upon by General Vogt:[58]

> *There is no way to put TAC fighters into North Vietnam and into the . . . defense environment that the North Vietnamese now have in the northern areas and be able to expect any survivability as a force. No force of TAC fighters alone could go into North Vietnam and expect to come out with even half of their forces without the proper . . . support package that goes with them.*

COMMAND, CONTROL, AND COMMUNICATIONS

(U) The Air Force portion of the command and control function in Southeast Asia was complex, but workable. The Seventh Air Force commander was the single manager for all U.S. air operations in Laos, South Vietnam, Khmer Republic, and specified areas of North Vietnam. He also maintained operational control over assigned Thirteenth Air Force resources in Thailand and was the coordinating authority for COMUSMACV with the Navy CTF 77 and SAC forces supporting air operations. In this regard, he was delegated the planning, scheduling, coordination, and execution of air operations in COMUSMACV areas of responsibility. He had a special responsibility to the CINCSAC in that he coordinated all B-52 air strike support sorties. For example, CINCSAC provided KC-135 tankers in support of the SEA campaign, and the 7th AF commander coordinated these assets for B-52s as well as for TACAIR as the situation dictated. Understandably, certain operational aspects in Laos and the Khmer Republic were coordinated through civilian channels at the appropriate American embassies.[59] The command communications supporting this structure was makeshift, and subject to improvements (see Teaball, Chapter III), but accomplished the mission quite well.

(U) With aircraft from the four services, plus a number of Allied air forces engaged in operations in a given airspace, many problems arose with respect to the concept of command and control. The net used to control aircraft expanded and assumed a sophisticated form early in the war. Inputs laterally from civilian, as well as military, bodies were made on a regular basis. The USAF criticized itself for not correcting an in-grown "parallel system," one in which U.S. forces were off on their own conducting the war and another in which the VNAF was doing essentially the same thing on its own. The parallel system continued to the end of Linebacker II.[60] However, there were numerous operational examples of cooperation between USAF and USN tactical commanders.

(U) Limited instances of failure in command and control were immediately noted and promptly treated. On 20 September 1972, for example, Maj Gen Carlos M. Talbott, 7th AF DCS/Operations, sent a strongly worded message to all wing commanders on the lack of air discipline and communications control in 7th AF units. He cited four specific violations involving Linebacker aircraft. The violations concerned the improper expenditure of ordnance (wrong target, or improper attack under the current rules of engagement) and neglect of the special instructions (SPINS) in the daily frag. All crews were immediately briefed on specific restrictions under the ROE.[61]

(S) When Linebacker II operations commenced, Air Force planners realized they could not meet all TACAIR strike requirements without Navy assistance. With the heavy demand on Air Force assets for both SAM site pre-strike and escort for B-52 strikes deep into NVN, Navy TACAIR was requested to fulfill the pre-strike role in many instances. Extensive

support was provided for exceptionally heavy B-52 raids. On 27 December 1972, aircraft from the carriers Ranger and Enterprise provided support in terms of ECM, Iron Hand, MIGCAP, BARCAP, and SAR for SAC B-52 strikes. Additionally, six SAM sites were targeted for pre-strike by Navy TACAIR 20 to 40 minutes prior to the B-52 TOTs. The final coordination for this was accomplished between Seventh Air Force and the Seventh Fleet commander.[62] Within 24 hours, CINCSAC requested additional pre-strikes of 14 SAM sites in the Hanoi/Haiphong area in support of the next day's B-52 missions.[63] Approval was promptly given by all parties.

(S) In previous months similar close liaisons were maintained between 7th AF and CINCPACFLT planning and targeting staffs in monitoring the operational status of Bai Thuong, Vinh, Dong Hoi, and Khe Phat airfields (a restriction of 20°N was in effect during August). The latter two airfields were struck on a regular basis by USAF armed reconnaissance sorties. When the former two became operational, they were also struck through coordination with CTF 77 or by using available Linebacker forces. The 10 August Vinh strike was a continuation of 7th AF efforts to suppress the NVN use of that airfield.[64]

(S) Mutual cooperation of Air Force and Navy forces worked to the advantage of the Navy as well. As of 3 November 1972, there were still four aircraft carriers (CVAs) operating off the coast of NVN. Two of these CVAs were beginning to show the strain of sustained operations and needed a respite for repairs. Linebacker sortie requirements, however, delayed the first Navy request for withdrawal of one CVA from the line. In fact, owing to new intelligence information revealing an increase in NVN's logistic activity in preparation for a new offensive into Military Region I (MR I) of SVN, the JCS removed a temporary restriction of 150 daily sorties into NVN effective 6 November 1972. Navy TACAIR met the sortie requirements until reduced ceilings were imposed at the end of November (100 daily TACAIR sorties from the DMZ to 20°N plus 30 B-52 strikes). At that time, CINCPAC received a concurrence from COMUSMACV to permit a temporary reduction of from 4 to 3 CVAs in the Gulf of Tonkin. Further delays would have adversely affected future readiness. The U.S. Navy met its sortie requirements with 3 CVAs, and maintained a surge capability of 225 daily sorties.[65]

(U) The transmission of combat information from radars was accomplished through the SEA Tactical Air Control System (TACS). The TACS consisted of an extensive network of land-, air-, and sea-based radars. Radar sites located at bases or stations in Thailand and the Republic of Vietnam (RVN) gave adequate coverage within those countries. Airborne EC-121s called "Disco" provided coverage in Laos and the Gulf of Tonkin for all Linebacker refueling and strike missions. U.S. Navy coordination was used to incorporate information from the ocean radar vessel, "Red Crown."[66]

(U) The communications network operated on real-time information from various sources: Combat Apple, Olympic Torch, and Deep Sea aircraft through Udorn, NKP, and Red Crown, respectively. The link from Combat Apple and Brigham at Udorn was transmitted through microwave relay to Da Nang ("Motel"). Strikes outside SVN, other than Linebacker, were controlled through ABCCC (airborne battlefield command and control center) aircraft. The ABCCC directed strike aircraft to forward air controllers (FACs) with lucrative targets. Linebacker sorties, because of their remoteness and the nature of enemy defenses, demanded a specialized control capability called Teaball.[67] (See Chapter III.)

(U) Difficulties surfaced with respect to the communications element of the command and control function when an Iron Hand support aircraft was shot down by an SA-2 on 29 September 1972 during Linebacker Whiskey VI. The aircraft was in its operating area north of Hanoi at the time of the incident. At the ensuing Linebacker conference, it was determined that a contributing factor was the large number of SAM and Arc Light warning calls on Guard frequency (2430 MHz) which caused considerable distraction during the mission. Accordingly, the 7th AF commander outlined corrective action as follows:[68]

- All units concerned were to reemphasize the importance of good radio discipline during Linebacker operations.

- All units were reminded that current procedures dictated SAM warnings would be issued only to Air Force weather reconnaissance flights. No SAM warnings were to be issued during the remainder of the Linebacker mission except to warn Navy aircraft operating in the southern route packages.

- All units were reminded that when SAM warnings were issued to aircraft other than those involved in Linebacker, care should be taken to insure the radio relay net was not used because of the distracting effect on Linebacker aircraft (nor was the net to be used for Arc Light warning calls).

(S) Another form of communications difficulty occurred during Linebacker II on at least seven different occasions. Various MIGCAP aircraft, in addition to the weapons control center (WCC), reported interference or electronic jamming on the 322.2 MHz frequency which was used for a large portion of WCC transmissions. Although neither China nor NVN were credited with a jamming capability, both 322.2 and occasionally its backup, 253.3, had measurable interference. The problem was still being investigated at the close of Linebacker operations.[69]

(U) Still another form of difficulty arose when a failure to communicate a MIGCAP orbit point change from Motel/Blue Chip to Red Crown caused MIGCAP aircraft to fly unnecessarily through SAM threat areas. Delays

in transmitting changes to Arc Light ingress routes were thought to have caused the misunderstanding. It was swiftly corrected.[70]

(U) Improvements in the command and control function went from ideas to swift implementation. Obvious problems and limitations surfaced during an evaluation of communications at one of the regularly scheduled Linebacker critiques (or conferences). It was determined that pre-strike refueling, the strike mission itself, and post-strike refueling had frequent communications discipline lapses or "chatter." The problem seemed to be a physical limitation rather than a lack of command and control; i.e., on one "College Eye Task Force" (CETF) EC-121 aircraft, there were five radios, eight frequencies, and two controllers to handle as many as 125 aircraft.[71]

(U) The problem was identical when talking to the GCI sites. After several debriefings of Linebacker aircrews, however, a solution was found to eliminate much of the chatter. Only the lead aircraft commander for the entire package from one base (20 to 24 aircraft) checked in with the GCI site after his mission had formed up. The air refueling rendezvous was thus greatly simplified. It should also be noted that a completely workable communications net (Teaball, Luzon, Disco) simplified the operation even further. Finally, increasing the length of TDY for College Eye Disco personnel improved the quality of control. Reorientation training time was reduced to take better advantage of the length of TDY stay.[72]

(C) Although various elements of the command, control, and communications functions were rightfully criticized, corrected, and reorganized into more effective elements, the system did have its merits. New concepts (specifically, Teaball and the USSAG organization) were developed and tested as a result of continual self-criticism during Linebacker operations. Another idea, an airborne warning and control system (AWACS), still undergoing evaluation in the United States, was proven to be a necessity for the future.[73] This requirement grew out of the 7th AF network of ABCCCs (in combat areas outside NVN), coupled with subordinate direct air support centers (DASCs), generally collocated with ground command operations centers. In turn, the DASC was in immmediate contact with the ground commander or his point of contact (liaison) and knew the general situation on the ground. The ABCCC allocated FACs into a combat area (such as a province in Laos or Cambodia) and then allocated TACAIR to the same area and FAC. The FAC put TACAIR onto the target. Requests for air support went directly from the DASC to ABCCC. The ABCCC determined the flow and where it would go, depending on the general situation at the time.[74]

(U) Seventh Air Force planners went back to the use of EC-121 CETF to enhance the warning system after a B-52 was nearly shot down by a MIG in December 1971. The system which evolved yielded both warning and

control in the enemy environment, well beyond the range of ground-based friendly radars (NKP radars were over 200 NM from Hanoi).[75] The element of "control" in the hostile environment was a new strategem for an AWACS-type system, but it was that element which made the action decisive for the USAF/USN TACAIR over Hanoi and Haiphong.

(U) Brig Gen Cross, MACV's Assistant Director of Air Operations, in December of 1972 observed that some of the systems in use during Linebacker were "makeshift," as the programmed withdrawal from the RVN began and the war continued:[76]

> *When you look at our rather backward command and control center with the back-plotting and just the very austere communications . . . we were able to effectively do the job with minimum cost. Time and money permitting, we could have done much more. . . . AWACS is definitely a must in the future for the tactical situation.*

WEATHER SIGNIFICANCE

(U) From the outset, the NVN Army offensive was apparently timed to take advantage of weather phenomena associated with the spring transition from the northeast to the southwest monsoon. Typically, during this changeover period, cloud cover extended over NVN and the northern regions of the RVN. Heavy cloud cover, low visibility, fog, and drizzle were typical and existed in April 1972 when the offensive began.[77]

(U) Inclement weather again had a pronounced effect upon later Linebacker operations, especially during the fall transition period of 1972. Earlier, even though five all-weather bombing techniques* were used to maintain effectiveness during poor visibility, weather continued to limit operations during August and September. One Linebacker/Pocket Money assessment stated that weather limited operations an average of 50 percent of the time. In spite of poor weather conditions, 7,800 tactical strike sorties were conducted in a 5-week period (22 August to 26 September), during which 2,000 Linebacker sorties were flown in RPs 5 and 6. The field commanders continued to use their surge capability to strike during forecast "weather windows."[78]

(C) General Vogt underscored the importance of an all-weather capability when he later stated:[79]

**B-52 synchronous radar bombing, F-111 beacon bombing in Laos and synchronous capability in NVN, ground radar-directed bombing using the MSQ-77 radar equipment, F-4 all-weather bombing equipment, and LORAN-controlled releases.*

We were also concentrating in September and October on the development of all-weather bombing techniques, because we knew . . . that the daylight, clear weather bombing . . . would be severely restricted. . . . We had been able to optimize the use of guided weapons. . . . Our greatest problem would be trying to sustain the same type of damage with the severe limitation of all-weather bombing. . . . That, incidentally, was the determining factor when the decision was finally made to go back in and resume bombing in Linebacker II, and one of the key factors in going to the B-52, with its all-weather capability.

(U) Some difficulty existed in obtaining the forecast weather windows, so Navy aircraft in the Gulf on BARCAP were requested to supply timely data for the Hanoi/Haiphong area during late November and early December. By 19 December, CINCPAC was obtaining weather windows for laser guided bomb (LGB) sorties on a daily basis to strike priority targets in NVN.[80]

(U) Weather criteria itself came under discussion during October at a 7th AF commanders' conference, and some recommended changes for LORAN weather minimums were investigated. Many contributing factors such as type of ECM equipment, chaff usage, and aircraft maneuverability affected LORAN weather criteria. Eventually, a standard of 8,000 feet clearance above an undercast or 3,000 feet below an overcast was recommended by Major General Talbott. An absolute minimum of 3,000 feet above an undercast was retained "if operational necessity dictated." The 3,000-ft distance allowed an aircrew to acquire and react to an inflight SA-2 while bombing by LORAN techniques.[81]

(C) While the laser guided bomb revolutionized certain aspects of the air war in SEA, it was not as effective as it might have been owing to less than optimum weather conditions during Linebacker I and II. Adverse meteorological conditions such as cloud, haze, vertical wind sheer, and high wind velocities affected the LGB's performance. Equally bad was a complete lack of wind over the target because multiple strikes were not possible if the smoke and dust produced by initial impacts were not blown away. Finally, aircraft flying through rain clouds could suffer precipitation damage to the face of the bombs' seeker heads. The concern for substandard laser strikes in June 1972 was frequently the topic of messages from General Vogt to General John D. Ryan, USAF Chief of Staff (CSAF). Since only a few clouds in the local target area could disrupt the entire mission, weather forecasting had to be supplemented by reconnaissance flights. A 10-June strike was typical, as described by General Vogt:[82]

Weather caused many anxious moments today. . . . Weather reconnaissance flights indicated unworkable weather until just before noon, and marginal weather at that point.

Trusting the weatherman's forecoast, we launched the force with a 1515 TOT. . . . The first flight found the target clear and rolled in with a successful run.

(U) By late October, the probability that a particular target would be workable by laser strike forces depended on its location relative to the Annam Mountain Range paralleling the coast of Vietnam and whether the northeast or southwest monsoon was the dominant weather regime.

LESSONS LEARNED - LINEBACKER I

(C) Many of the lessons learned from Linebacker operations stemmed from a series of Linebacker critiques or conferences suggested by General Ryan during his visit to Saigon in June 1972. Concerned with problems of coordination of the Linebacker force, the CSAF believed that the various wings were neither talking to one another nor expressing their problems to each other and trying to reach a mutual solution. General Vogt tasked the 7/13th AF headquarters at Udorn with the conduct of continuous Linebacker critiques. The selection of Udorn as a meeting ground was a natural one. Most of the units involved were located in Thailand, although the critiques did have representation from Seventh Air Force in Saigon and, initially, from Da Nang. Element leaders and representative crews from each wing involved in Linebacker missions attended the critiques.[83]

(C) One might well imagine a certain reluctance on the part of persons involved in the planning and execution of Linebacker operations to having any "dirty laundry" aired before a conference chaired by a member of the 7/13th AF headquarters staff. Any such expected reluctance disappeared as the critiques proved to be extremely beneficial to all parties concerned. The series of meetings started in mid-August. Each mission was reviewed the day after it was flown, with each critique involving some 6 hours of discussion. This was done on a daily basis for 6 weeks. Initially, the 7/13th AF commander conducted the critiques, but after a week of sessions, his deputy commander, Col Joseph F. Olshefski, assumed sole responsibility.[84]

(C) Many of the tactical fighter wings started writing new tactics manuals in the fall of 1972, and the 432d TRW at Udorn was no exception. Some of the revisions were attributed to the results of these Linebacker critiques. Colonel Olshefski summarized the events of August and September:[85]

We found a tremendous change in the tactics that were employed in combat operations in North Vietnam prior to Linebacker. I'm talking about 66, 67, 68--that time period. They [the fighter wings] were initially trying to use the same tactics they used at that time, the old Rolling Thunder operation. The operations

differed. The SAM threat was different, and some of the lessons we learned were different. The MIG threat was quite high, for example.

(U) Another lesson learned was that of attaining air superiority. Contrary to the method of airfield bombardment used during Rolling Thunder, air superiority was gained in a different way during Linebacker I. Heavy CAP escort forces met the MIGs far out from the target area in order to prevent the MIGs from engaging the chaff/strike force. This tactic, coupled with more effective command and control, did much to hold the strike aircraft losses to a minimum (only three strike aircraft were lost to MIGs during Linebacker I). Another development from the critiques was the tactic of escort aircraft vectoring in a spoiling attack against MIGs at 20-NM range. Many Linebacker observers felt that success in these engagements was a product of three things: good flight discipline, good look-out procedures, and perfect radio communications.[86]

(U) At an earlier critique on 20 August 1972, the respective wing representatives agreed that the classic flight of four escort aircraft covering a flight of four chaff/strike aircraft could include some variations of element tactics, assuming they were under positive radar control by Red Crown or Disco. Another plan, which was considered more desirable, was to include a MIGCAP flight ingressing within several minutes of the chaff/strike force. The MIGCAP could be diverted to engage the enemy, thus allowing the escort force to remain as a back-up capability should the MIGCAP's engagement prove unsuccessful. This tactic offered several advantages:[87]

- The MIGCAP had unique equipment (such as Combat Tree) to more accurately determine the location of the MIG aircraft.

- The MIGCAP could remain on their separate radio frequency without hindering the chaff/strike force communications, while the escort aircraft could remain on the chaff/strike frequency.

(C) With the high MIG threat that existed during Linebacker operations, the Rolling Thunder tactic of stationing MIGCAP forces high (30-35,000 feet) caused them to be hit frequently by MIGs making a "pop-up" maneuver from low level to the higher altitudes at tremendous speeds. Changing these tactics by dropping the MIGCAP into lower altitudes during ingress accomplished two things favorable to the Americans. First, the MIGs were denied the silhouetting of U.S. aircraft against the blue sky, and, secondly, at low altitude (below 20,000 feet), the MIGCAP was in an environment where it could engage a MIG on equal terms and keep its high speed (F-4 and MIG-21 maneuverability curves were thought to be similar below 20,000 feet). The extra fuel burned at low altitude was thought to be worth the safeguards gained. Additionally, Linebacker operations were typically "in-and-out" type operations; the time actually spent over North Vietnam was short.[88]

(U) One final lesson learned relating to MIG engagements was the mutual USAF/USN interest developed in improving their aerial combat maneuvers (ACM). In August and September, three crews from the USS Hancock flying F-8s spent several weeks in a training program with the F-4 crews of the 432d TRW at Udorn. The experience of flying dissimilar ACM was beneficial to everyone in the five squadrons who participated. In a Navy report sent to PACAF, it appeared that "certain deficiencies in USAF ACM tactics and training" might have been uncovered by the training. Recognizing that the report may have been flavored by inter-service rivalry and was therefore somewhat biased, PACAF requested 432d TRW comments on any new training objectives, mission scenarios, and lessons learned (tactics changes, if any) associated with the F-4/F-8 ACM training program. General Ryan's desired cross-talk was finally being achieved. The ultimate testimony of the program's value was the following message from Capt John A. Madden of the 432d TRW to the CTF 77: "The experience I personally gained from this training helped me shoot down two MIG-19s on 9 Sep 72."[89] Captain Madden downed his third, a MIG-21, on 12 October 1972 without even firing a shot. In the ensuing dogfight, he maneuvered the MIG-21 into a high speed dive from which it did not recover.[90]

(U) Besides making improvements in tactics, commanders also changed the composition of the strike force to achieve a more favorable escort/strike ratio. One method of adding more firepower to the strike team involved loading the support aircraft (whether MIGCAP, BARCAP, or chaff escort) with unguided ordnance for a pre-strike role in the target area. Another method was to schedule several strike teams with approximately the same TOTs, thus enabling one flight of MIGCAPs to cover two strikes, one immediately following the other.[91] Such innovations as these enabled 7th AF to count many of the escort aircraft in the strike column, or not count them twice, thereby conserving aircraft and lowering the support/strike aircraft ratio appreciably. By late October this ratio had settled down to a value somewhere between the high of 4.65 in July and the low of 1.4 in September (southern route packages with little MIG/chaff escort).

(U) Compressing the strike teams' TOTs did create unexpected scheduling problems for the escorting fighters. The ground-controlled intercept sites were unable to assist in the rendezvous because of fighter saturation, thus degrading the rendezvous capability in bad weather. In initial attempts to have escort flight leaders effect an independent rendezvous using alternate procedures, insufficient information existed to enable the correct escorts to be paired with their scheduled tankers. The final result yielded two improvements to the air refueling procedures: first, specific remarks in the frags listed drop-off points for the receivers further north along the optimum air refueling track for each target area, thereby increasing the loiter time over the target. Second, special instructions in the frags assured that tankers would not proceed south during the post-strike refueling until the last scheduled receiver flight was in tow.[92]

(U) In weighing the overall threat, one would list MIGs, then SAMs, and last AAA, according to losses incurred by Linebacker I forces. Throughout the operations, heavy support was retained for the chaff and Pave Knife flights, because it was felt that MIGs represented the greatest threat to these two forces. The countering U.S. tactics included a combination of CAP and escort aircraft, as previously discussed, aided by Teaball, Red Crown, and Disco.[93]

(U) Chaff was used heavily, in conjunction with ECM, in an effort to degrade the Fan Song B radar performance, thereby affecting the fuzing of SA-2 missiles. Major General Talbott stated that chaff was "essential for survival of the strike force in a SA-2 and radar-directed AAA environment." He pointed out that of seven losses to SAMs during Linebacker, "only one may have occurred in a chaff corridor."[94] The first combat loss of a B-52 (see Chapter III) reveals the vulnerability of not being in a chaff corridor.

(U) Linebacker highlighted the requirement for specializing the F-4 assets. The primary reasons for specialization by F-4 squadrons were limited availability of resources and efficiency of weapon systems operation. The LGB illuminators were in critically short supply. They were located at only one base, Ubon RTAFB. Chaff dispensers were a limited resource and were also all located at Ubon. The combat air patrol and escort missions required "peaking" and considerable cross-talk to become effective. It was undesirable to alternate between bombing and dogfighting, from the viewpoint of combat effectiveness.

(U) Further improvements were forthcoming in such areas as force timing, search and rescue, and air intercept missile (AIM) reliability as a result of in-depth analyses by every staff agency in the 7th AF command structure. SAR criticism came to light when unsuccessful rescue attempts occurred on 29 September and 6 October 1972 because of a lack of MIGCAP in a high threat area. Within a few days a tentative solution was found at the Linebacker conference on 13 October:[95]

> *Tack a SAR package on the end of Linebacker frags to include one flight lead and two MIGCAP flights that would be tanked and ready to go at the last Linebacker TOT. Also, frag one wing a day to have soft ordnance on QRF [quick reaction force].*

(U) AIM-7E-2 and AIM-9E missiles had guidance failure indications of 25 to 30 percent when downloaded by missile personnel at Korat for periodic inspection after 10 to 15 flights on an aircraft. Prompt correction was anticipated as a field assistance team was scheduled to arrive on 28 September to look at another recurring missile problem, the air-to-ground missile AGM-78 used by Iron Hand/Wild Weasel teams. Crews also complained of damper failures on the AGM-45 Shrike missile, so it

was being scrutinized.[96] Studies by various staffs had also indicated that many missile failures in-flight were the result of incorrect switch positions by crew members just prior to launch. This situation was especially likely to occur whenever the pilot changed his mode of delivery following extensive ACM; e.g., changing from a radar to a manual mode of delivery in a stern chase.

(C) In the final analysis, the lessons from Linebacker were the result of hard work and considerable attention to detail once thought unimportant or unnecessary. The overall force timing was addressed flight-by-flight in an effort to remove such problem areas as undefended zones during ingress, strike, and egress. Colonel Olshefski summed up the tactical operation as follows:[97]

> *We evaluated where all our aircraft were coming in from and where it might be best to protect them and where the enemy was coming from, etc. . . . The control agencies [Red Crown, Disco, ABCCC] had good information as to what the enemy was doing. We tied this to what the friendlies were doing and then adjusted to insure that we had a better tactic, or an improved tactic.*

The net result during the fall of 1972 was a distinct change in U.S. tactics within the MIG/SAM threat envelope.

(U) The MACV Assistant Director of Air Operations, Brigadier General Cross, stated his viewpoint on the support/strike aircraft ratio during Linebacker I when he made the following concluding remarks during an interview on 18 December 1972:[98]

> *At times our support was even larger than the number of TAC fighters dropping bombs, and this was in the early part of the war when our commander, General Vogt, elected we would do surgical bombing with laser-guided bombs, and we achieved in a period of three months what it took other forces two years to do, and we did this by making that force survivable with the proper ingredients of MIGCAP, Iron Hand, and ECM. . . . It just depends on how survivable you want your forces to be and I think our concepts, the concepts of General Vogt, and his efforts, speak for themselves.*

III. SPECIAL TOPICS

FIRST B-52 COMBAT LOSS

(S) The first combat loss of a B-52 in Southeast Asia is of special interest for two reasons. That loss had historical significance, and it typifies the subsequent losses of 15 additional B-52s in bombing raids over Hanoi during Linebacker II in December 1972. The first event occurred on 22 November when a B-52D, flown by DYE E-05 (a lead crew from Dyess AFB, Texas), was downed as the result of an SA-2 missile explosion over North Vietnam. The B-52 and its crew of six limped successfully back from the target area west of Vinh to the Laos-Thailand border before crashing to earth near Nakhon Phanom.[99]

(S) Of historical note is the fact that before this, B-52s had flown more than 112,000 combat sorties since June 1965 without sustaining a single combat loss. There had been 81 separate incidents of SAM firings at B-52 cells, with a total of 286 SAMs sighted by the crews. Only five of these SAMs caused battle damage to B-52 aircraft. Two were struck in April 1972 during Freedom Train operations, and recovered safely. Three were struck in November 1972 during Linebacker I. The last of these became SAC's first combat loss in SEA.[100]

(S) DYE E-05 was number five in Olive cell during a strike of 18 B-52s against a target area located 24 miles northeast of Vinh. The strike force consisted of two 9-ship waves. Each wave was further subdivided into three 3-ship cells. There was a 2-minute spacing between cells and a 15-second interval (2 NM distance using B-52 station-keeping procedures) between individual aircraft. These tactics were typical of all Linebacker I missions. This was a "press-on" mission--one in which the B-52s did not divert prior to bomb release regardless of the SAM or MIG activity encountered--being directed by ground radars with the B-52 synchronous radar available as a backup. The mission's purpose was to interdict storage areas being used to resupply NVN units in SVN.[101]

(S) Following standard practice, the B-52 cells used bombing altitudes staggered at 34,000 and 37,000 feet and identical airspeeds (470 KTAS). Similar bombing parameters simplified the release procedures of the MSQ radar, Bromo, located at NKP. Take-off, climb-out, and routing through the navigation and timing legs were routine for Capt Norbert J. Ostrozny, the aircraft commander, and his crew of five. Each member of the crew had at least 86 combat missions and over 800 hours of B-52 flying time behind him. Captain Ostrozny was uniquely qualified to handle the emergency situation which would arise in a matter of hours. He possessed 2,200 hours of B-52 experience in only four and one-half years of SAC service.[102]

(S) Olive cell's target was within the SAM threat area. The route would take the crew through five overlapping confirmed operating areas (COAs)--prepared but unoccupied SAM site--and one confirmed operating site (COS)--confirmed SAM in place. The two missiles that were ultimately launched against Olive 2 came from the COS.[103]

(S) The support package which preceded and accompanied this strike was extensive. Four F-4s laid a chaff corridor across the target area prior to the first TOT. Three EB-66 aircraft provided stand-off jamming and electronic surveillance. Five additional F-4s were operating in two separate MIGCAP orbits while a pair of F-105 Iron Hand aircraft roamed the COS, providing SAM suppression support. Other support aircraft included tanker aircraft and SAR teams. Internal ECM jamming was conducted by all B-52 cells; however, the MSQ site at NKP requested that Olive 1 and Snow 1 (the two wave lead aircraft) turn off several systems owing to beacon interference.[104]

(S) Excerpts of Olive 2 (DYE E-05) crew debriefings trace the night's experience:[105]

Capt Norbert J. Ostrozny, pilot: To the best of my knowledge, somewhere between 60 and 30 TG [seconds to go before release] someone called out visual SAM, and we acknowledged. We proceeded on our bomb run using no maneuvers so close to release. We heard the countdown, released our weapons.

Capt Philip A. Foley, copilot: Just prior to the first target I saw two visual SAMs coming up at 1 o'clock. One must have gone off below us because it disappeared from view. The other one kept coming at 1 o'clock and went under the aircraft and the next thing I knew it detonated and impacted the aircraft.

SSgt Ronald W. Sellers, gunner (in tail section): I saw the explosive force come by and then I started watching fuel. . . . The number 2 engine was burning. . . . The first thing I noticed was a large amount of fuel coming out of the wings, all along the wings. . . . I would estimate 2 1/2 feet of the left tip tank gone; also noticed a 2-ft hole in the horizontal stabilizer. . . . I did not really see anything that was notable until the right wing caught fire. . . . The whole inter-surface of the [right] wing was burning. We had many, many explosions. . . . I would venture they were fuel explosions.

Capt Robert L. Estes, navigator: We continued our turn heading out 205. . . back towards Thailand. . . . We began to lose our electrical power and reduced rapidly . . . to a basic DR [dead reckoning] type navigation. . . . By this time I realized my left leg was hit. . . . I had gotten a small piece of shrapnel in my leg.

Maj Adam Rech, radar navigator: After flying on partial power in a gradual descent of approximately 500 feet per minute, the crew crossed the Mekong River into Thailand just south of NKP. At that time the engines appeared to have quit from fuel starvation (extensive fuselage and wing damage contributed to an unknown fuel state early in the mishap). Captain Ostrozny planned to have the crew bail out at 15,000 feet over Thailand, but the aircraft became uncontrollable as it passed through 20,000 feet. All crewmembers successfully abandoned the aircraft at 19,000 feet just as the right wing folded up over the fuselage, and the aircraft began a gradual roll to the right with full left rudder trim, left rudder, and left aileron input to the control system.

(S) After bailout of the crew, the aircraft broke up into three major sections from excessive positive G forces. The right wing, main fuselage and left wing, and the tail section including the aft wheel well, all landed with a 4-mile circle. Examination of the lower right wing surface revealed SAM damage. The tail section and aft wheel showed moderate SAM damage. The holes were directly through the horizontal stabilizer, indicating the SAM exploded directly under the aircraft. On radar the SAM explosion appeared to entirely engulf Olive 2.[106]

(S) In analyzing the causative factors in the loss of the B-52, one must consider the combination of several unfortunate occurrences. Numerous malfunctions in Olive 2's ECM equipment prevented the electronic warfare officer, Maj Larry T. Stephens, from ascertaining the exact position of his jamming transmitters. When he received the call of a SAM sighting by the crew, he made the most appropriate response, selecting the pre-set modes on his jamming transmitters and jamming the track-while-scan and downlink signals in the blind. A second factor was the location of the chaff corridor with respect to the cell and the location of the SAM threat, the COS. Chaff corridors were laid so that the strike force would be able to fly through or along it for protection. It was well known that aircraft close to, but outside, the chaff corridor would be highlighted (see Linebacker tactics, discussed in this chapter). In the case of Olive cell, severe winds at altitude or one of several possible miscalculations by strike or support aircraft caused the chaff cloud to be of little protection that day.[107]

(C) This first B-52 combat loss was typical of many which occurred the following month during Linebacker II. The sudden loss of relatively large numbers of B-52s provoked curt comments on mission summaries of that period. Extracts from one such summary outlines the fate of some B-52 crews and their aircraft:[108]

- *Hit near target, gas leaks. When flaps lowered for landing at Udorn, aircraft exploded. . . . 7 recovered, 18 Dec.*

- *Direct hit, fireball reported. . . . 6 missing, 20 Dec.*

- *Two hits, one direct hit reported. . . . Fireball. . . . 1 captured, 5 missing, 20 Dec.*

- *SAM hit SW Hanoi. Crashed on landing attempt at U-Tapao. 2 rescued, with injuries. . . . 2 rescued, 4 killed, 26 Dec.*

The successful recovery of all six crewmembers in the first loss was fortunate. The 15 other B-52s lost in December represented far more than a loss-ratio statistic (approximately 2 percent of the 729 B-52 sorties flown against NVN during Linebacker II); of the 91 crewmembers involved, four were killed when their aircraft crashed at U-Tapao, 26 were rescued by SAR forces (some under hostile fire deep in NVN), 33 bailed out over NVN and were captured, and 28 were officially listed as missing on Air Force rolls.[109]

F-111 OPERATIONS

(S) The introduction of F-111s into SEA for the second time (the first, a test deployment, was in 1967) was sudden and dramatic. Within four hours of deploying to Takhli RTAFB, the aircraft flew combat missions against the North Vietnamese. The targets were carefully selected to avoid high threat areas but still provide an estimate of the system's combat capability.[110] F-111 operations, nicknamed Linebacker Sherry, added a new dimension to the Linebacker interdiction campaign. The initial tactic was to use the F-111 as a low level, night, all-weather, single-ship penetrator. The aircraft was ideally suited for low altitude strike/attack (200-1,000 ft above ground level, depending on the enemy defenses and terrain). The flight profile was designed to maximize the element of surprise and to insure survivability. Support aircraft were not normally required. Pre-staging of jamming aircraft or pre-TOT overflights of the target area would only negate the element of surprise.[111]

(U) The F-111 employment underwent early and careful scrutiny by PACAF, as well as careful theater indoctrination training. The loss of two aircraft in 3 weeks of bombing over NVN severely dampened any idea of its invulnerability to NVN defenses. When asked about the F-111 losses, Brigadier General Cross stated:[112]

> *There must be some suitable or acceptable loss rate for the F-111 and we must adjust our thinking to this; otherwise, we should not employ the weapon system in this sort of a combat environment.*

(S) The initial F-111 loss, on 28 September 1972, was determined to be the result of a phenomenon unique to its terrain following radar (TFR) system and associated weather/terrain effects upon the TFR, which caused the aircraft to fly into the ground. Extensive testing and revision of crew procedures circumvented the problem until equipment modifications could be undertaken. After a 5-day standdown for evaluation, the 474th TFW resumed combat sorties on 4 October.[113] With the loss of a second F-111 on 17 October, the 474th reappraised its tactics in the target area.[114] The aircraft was believed to have gone down in the target area on the typical high-low-high profile, but with a bomb load of four MK-84s (low drag weapons). The exact cause of this loss was never conclusively determined. These weapons, although included in the employment concept, required a stabilized climb to 1,000 ft AGL and a 20-second bomb run at that altitude. High drag weapons, on the other hand, could be delivered at or below 500 ft AGL. Thereafter, only high drag ordnance was used with standard TFR altitude of 200-500 ft unless MK-84s were specifically fragged by 7th AF. Targeting was affected by this restriction, as the MK-82 high drag was not effective against hard point targets such as bridges and storage facilities.[115]

(S) The high-low-high profile--high level penetration, low level TFR bomb run, high level withdrawal from the threat area--had great advantages for most NVN bombing targets. Tanker support was not normally required. Computations showed that non-refueled F-111s could strike the most northeastern of targets, carrying standard conventional loads of 12 MK-82s or 4 MK-84s, with 400 NM of TFR navigation. Aircraft would recover at the departure point, Takhli, with 10 percent of their takeoff fuel remaining.[116] Emergency refueling was available from two sources if the necessity arose. An emergency tanker orbited at the northern end of Orange refueling track, and the radio relay aircraft (Luzon) in the Gulf of Tonkin had a limited refueling capability as a last resort.[117]

(U) Flying the standard F-111 profile into NVN during Linebacker I caused some unique problems. Planners observed that stereotyped routes had caused the NVN to move defenses into the general areas over which 80 percent of the F-111 night missions were flown. Allowing flight crews to plan their own individual missions removed the stereotyping tendency.[118] Additionally, the requirement to strike designated airfields within a 20-minute period prior to B-52 missions caused great concern at 7th AF. This concern was voiced by CINCPACAF after five continuous nights of F-111 attacks against NVN airfields:[119]

> *The necessary similarity of daily F-111 operations in NVN give rise to the question of whether the F-111 will be able to survive nightly low level attacks on the same few air bases.*
>
> *I realize timing, approach headings, and altitudes for attack are difficult to vary and are [determined] by the main striking force, escape routes, and aircraft capability and survivability.*

It might be appropriate to pick some entirely new targets for variety or diversion or even stand down for a night or two to break the trend. . . to counter the repetitive tactics of the F-111.

(S) Despite this apprehension, the NVN reactions were ineffective in every regard. During the limited Linebacker I exposure (until 22 October), there were 70 incidents of the F-111 being illuminated and tracked by SAM batteries. Although 16 SAMs were launched in about eight encounters, only one aircraft was damaged. The low level anti-SAM tactic employed by the F-111 involved active ECM at missile launch, chaff--accompanied by turning into the missile, and rapidly climbing 1,000 to 1,500 feet (vertical "jink" maneuver) followed by a TFR descent to the lowest practical clearance above the terrain. Repeated vertical jinking and dispening of chaff was required for successive SAM launches.[120] The NVN used the high-low SAM launch tactic against F-111s. The AAA reactions revealed that almost all firings were made without benefit of radar, since most detonations occurred behind the aircraft. Aircrews believed that AAA gunners fired at the sound of the aircraft. Although MIGs were airborne at the time of the strikes, there were no engagements reported. The extremely low altitudes minimized the risk of encountering enemy airborne interceptors.[121] F-111 strikes were then shifted to interdiction in RP 1 and support of friendly forces in Northern Laos. During November, the vast majority of strikes by the F-111s in NVN were directed against truck parks, supply areas, and storage area targets.[122]

(S) Two F-111 losses occurred during Linebacker II, the first on 18 December and the second on 20 December. In both cases, there had been radio contact with the F-111s as they egressed the target area. The first aircraft was targeted against the Hanoi radio communications facility, and the second had struck the Hanoi port facility when it lost one engine. Both crewmembers of the 20 December loss were among the prisoners of war returned from Hanoi following the Vietnam cease-fire. Considerable North Vietnamese AAA reactions were reported by F-111 aircrews during Linebacker II. Typical enemy activity consisted of moderate AAA fire from 20 seconds prior to reaching the target until one minute after release. SAM activity was successfully countered by ECM, chaff, and descents to lower TFR altitudes. While many SAMs were observed after the first two nights of Linebacker II, apparently none were fired at the F-111s.[123]

(S) F-111 targets were pruned from the 7th AF high-value/priority targets. Selection criteria for F-111 operations included compatible ordnance (MK-82 Snakeye 500-lb bombs) and area-type targets. The area targets selected ranged from railroad sidings and troop concentrations during Linebacker I to airfields, SAM sites, radio communications facilities, and LOCs during Linebacker II. In order to strike some of these targets, the crews remained at medium altitudes well past the NVN border, passed closer than desired to SAM-defended areas, and climbed back to

medium altitude while still over NVN, thus insuring an adequate supply of fuel for recovery at Takhli.[124]

(S) In just 11 nights of bombing during Linebacker II, the F-111s completed 154 sorties in high threat areas. The effectiveness of the F-111 was based on three principles: destruction, harassment, and presence. The harassment aspect was of equal importance, since it hindered the enemy from sunset to sunrise in reconstructing military installations.[125]

(S) Command and control aspects assumed the normal pattern. The deployed F-111s were under the operational command of CINCPAC through CINCPACAF and COM7AF. Because of the changing tactical situation in North Vietnam and Laos, the final decision of employment was vested in the 7th AF commander. It was agreed that the F-111 was not to be used for missions other than as an independent penetrator unless an immediate need existed and no other fighter resources were available. Ultimately, the use of the F-111 bombing system in a pathfinder role with A-7 aircraft was an exercise of its flexibility.[126]

(S) From a communications standpoint, the command and control function underwent considerable modification as a result of the several unexplained losses over enemy territory. Flight plans showing estimated arrival time over specified turning points were filed with GCI sites and controlling agencies. At each specified turn, the aircrew broadcast a brief report over UHF/HF radio. This procedure, while it did not enhance the safety of a particular mission, did provide a means of positive flight monitoring should any further catastrophic losses have occurred.[127]

(S) From its initial day of combat operations, the F-111 was in a learning situation. Between its first mission on 28 September until the conclusion of Linebacker II, the F-111 was employed a total of 33 days--22 of which were in RPs 5 and 6A.[128] Achievements in weaponeering and TFR system modification headed the list of equipment improvements. New dimensions in tactical employment included pathfinder missions for A-7s and radar beacon bombing from medium altitudes in support of friendly forces in Laos. The achievements will influence further studies of F-111 employment concepts. Development of effective high speed, low altitude deliverable munitions for area targets will broaden its existing role as a night all-weather penetrator at low altitudes.

IMPACT OF GUIDED BOMBS

(S) Laser guided and electro-optical guided bombs (LGBs and EOGBs) had been part of the Air Force weapons inventory since 1968. The bombing halts and restrictions in air operating authorities (AOAs) had reduced targets suitable for guided bomb strikes by 95 percent prior to the commencement of Linebacker operations on 10 May 1972. On that date, guided weapons began a new chapter in aerial weapons delivery despite

continued targeting constraints such as the Chinese buffer zone and the 10-NM radius buffer around Hanoi. The guided bomb returned to combat primarily because of its extreme accuracy and reliability when properly employed and because of a change in military strategy in bombing NVN targets.[129]

(C) In its evaluation phase, completed in August 1968, the LGB produced some exceptionally fine results. Its circular error average (CEA) was 8 feet, and its circular error probable (CEP)--the radial area in which 50 percent or more of the ordnance impacts--was zero feet. Owing to its operational design, however, smoke, dust, and haze degraded these figures under combat conditions.[130] Indeed, considerable operator skill and knowledge was required to achieve such pinpoint accuracy. Three measures of LGB operational effectiveness were used to analyze Linebacker operations:[131]

- The number of destroyed or damaged (D/D) targets per sortie.
- The number D/D per bomb released.
- The percentage of targets attacked which were D/D.

Appendix 3 shows the effects of threat by examining bridge targets struck in five operating areas of differing threat levels. In general, as expected, the higher the threat, the lower the LGB effectiveness. There was good reason for the low of 10 percent in RP 6, using the indicator of targets D/D per bomb. Tactics in high threat areas called for delivery of the total LGB ordnance on a single pass to maximize target kill probability and minimize aircraft exposure. Thus, for example, if all four aircraft in an LGB attack on one bridge were to drop their total load of eight bombs on one pass, this indicator would only compute to 12.5 percent, or one bridge destroyed per eight LGBs dropped. This figure is low when compared to MR II, III, and IV (SVN), but eight individual passes on a comparable bridge in RP 5, 6A, and 6B would not have been an allowable tactic. The effectiveness indicator would have been as high as 100 percent if the first LGB had destroyed the bridge in MR II.

(C) In the final analysis, LGB operational data collected in SEA from 1 February 1972 to 28 February 1973 compared favorably with the data from evaluations in August 1968. If the standard CEP calculations were applied to LGBs, it would nearly be zero because of the large percentage of direct hits.* With approximately a 50 percent accuracy during Linebacker, smaller strike forces were used, thereby reducing exposure to aircraft and crews. This accuracy further permitted LGBs to be used against strategic targets within populated areas, with far less danger to noncombatants.[133] The LGB

**(C) The USAF dropped over 10,500 LGBs between Feb 72 and Feb 73. Of the number expended, over 5,100 were direct hits, with an additional 4,000 having a CEP of 25 feet based on pilot estimates. An average of two LGBs were required to destroy or damage the intended target.*[132]

yielded unlimited advantages during Linebacker I. It gave USAF the opportunity to interdict railroad bridges in the buffer zone such as the 11-span Lang Giai bridge on the northeast rail line. A 20-aircraft force using LGBs dropped six spans of the bridge, 20 NM from the Chinese border, without the loss of a single plane. The bridge was a crucial target owing to the difficulties of repair. It stood on concrete piers up to 100 feet high.[134]

(C) During Linebacker II operations, weather played a significant role in LGB employment. To take advantage of all potential weather windows, LGB sorties were scheduled daily as an option. Also, all A-7 and non-LGB F-4 sorties had the option of using either visual or LORAN modes depending on target weather. Figure 8 clearly shows the limited number of hours available for LGB operations and the fact that USAF TACAIR took full advantage of each of the three weather windows on 21, 27, and 28 December.[135]

(U) The other guided weapon, the MK-84 EOGB, was used against high-contrast targets, such as large bridges. The weapon was composed of the MK-84 2,000-lb general purpose bomb with a guidance kit making it gyro-stabilized. An optical-contrast seeker attached to the nose used a television display for identification and acquisition of targets. The system had a launch-and-leave capability, which under ideal conditions yielded a 13-NM standoff range. Although a cost analysis might not be appropriate because of mission effectiveness factors, an EOGB cost approximately $17,000 as compared to about $4,000 for an LGB. Single unguided MK-84 bombs were priced at approximately $700 each. Additional expenses in modifying aircraft to accommodate guided bombs, as well as periodic maintenance checks are not included in these figures.[136]

(U) Combat data collected from 1 February to 31 October 1972 on 264 EOGB releases against approximately 200 high contrast targets showed an accuracy (direct hits) of 58 percent. This is a representative estimate of the combat effectiveness of the EOGB system in use at that time. While 25 percent of the EOGBs suffered gross errors upon release, the CEP for near misses was only 20 feet, by pilot estimates. No correlation with the level of enemy threat was possible during the combat evaluation, since all targets were located in RP 1, a moderate to high threat area, having several types of AAA and SAM defenses. As was true in the LGB evaluation during Linebacker I, a target kill could be expected if two bombs were assigned against any one of the typical targets--bridges, tunnels, warehouses, caves, roads, or trucks.[137]

(S) All available indicators of EOGB effectiveness during the evaluation showed an increase as crews gained experience with the weapon system. Additionally, the statistics must be tempered with the knowledge that the EOGB was extremely weather sensitive. Once the seeker head lost its lock-on (caused by a cloud drifting between it and the target, for

example), the bomb would assume a ballistic trajectory for the remainder of its flight. The smoke and haze weakness was known to the enemy, as they used smoke generation in an attempt to obliterate the target and defeat the guided bomb. The 7th AF commander advised CINCPACAF as early as July 1972 of his preference for the LGB over the EOGB because of the former's accuracy:[139]

> *We will continue to make every effort to optimize the use of the EOGB. Nonetheless, it is apparent that in the current state of the art, the LGB is a far superior weapon system and the one we must rely upon to assure best possible accuracy and highest probabilities of destruction.*

(S) LGBs and EOGBs enabled USAF strike teams to bomb the Haiphong port facilities without endangering third-country shipping in the harbor. Additionally, this technological breakthrough allowed U.S. forces to maintain crucial interdictions in the northeast and northwest rail lines, cutting off practically 100 percent of the sea- and rail-borne supplies to NVN (supplies were usually rerouted through Chinese ports and down the northeast rail line). North Vietnam's supplies were reduced by an estimated 80 percent; the major portion of the remaining 20 percent had been pre-positioned. NVN forces were short of many critical items such as POL, ammunition, and food in the forward areas.[140]

(S) Although the use of guided ordnance during Linebacker II was severely restricted by weather, three days had weather windows permitting their use. High-priority targets in Hanoi were destroyed, leading to the silencing of a deeply revetted main radio transmitter building and destruction of the main power plant.[141]

(C) As the state of the art progressed, new LGB systems continued to be developed. The trend was toward self-contained systems to eliminate the need for an extra illuminator aircraft in high threat areas. Other developments were in stressing the need for a greater variety of evasive maneuvers during delivery and the time of fall of the LGB. The advantages of higher and safer altitudes and longer slant range for accurate weapon release would give the commander a new tool in his arsenal of weapons.[142] Comparable developments in the EOGB system would undoubtedly include some form of stabilized telescope slaved to the bomb seeker head. It was believed that this improvement would increase the lock-on range (standoff capability) and enable attackers to engage smaller and lower-contrast targets.[143]

(C) A final testimonial of the LFB's effectiveness was voiced by General Vogt on 12 November 1972, when he studied the results of recent strikes against five of the northeast rail line bridges. The LGB effectiveness there, he said, was approximately 100 times that of conventional bombs. Vogt felt that there had been a "tremendous breakthrough" in technology and tactics.[144]

LORAN BOMBING CAPABILITY

(S-NF) The groundwork for LORAN* assisted bomb deliveries was laid during the Proud Deep Alpha planning period in November 1971. It was generally believed by target experts and planners that targets south of 18°N could be struck using Sentinel Lock/LORAN bombing coordinates with a reasonable degree of accuracy. The location of the Proud Deep Alpha targets (close to populated areas) militated against releases under instrument meteorological conditions (IMC).[145]

(S) LORAN strikes were conducted against area-type targets during the 29 December 1971 raids, notably against barracks areas and truck park/storage areas. One barracks area, in particular, received considerable damage under an IMC release using LORAN.[146]

(S) At the conclusion of Proud Deep Alpha operations, Gen John D. Lavelle, 7th AF commander, recognized the need for accurate Sentinel Lock or LT GAP (LORAN targeting, grid annotated photography) coordinates of high priority targets north of the currently annotated areas. A program was instituted to accomplish this. In a 7th AF paper, General Lavelle emphasized the point:[147]

> *As long as the possibility remains that we may be directed to go north again and forced to strike IFR, we must develop and maintain the best possible capability to perform the task. In order to obtain more accurate LORAN time delays [TDs], I have directed that Combat Thunder RF-4 photography be obtained on key targets in the north. This program is presently being conducted.*

(S) The program initiated by General Lavelle proved to be a formidable one when the technical details were examined by target experts and planners. Every conceivable obstacle from limited air assets to poor weather conditions interceded during the 1972 program of Combat Thunder photography. Eventually, a priority system was established by 7th AF to enable the responsible agency, the 14th TRS at Udorn RTAFB, to complete as many of its primary tasks as conditions would allow. Alternate photo coverage for updating LORAN TDs was not available, so the high priority bomb damage assessment (BDA) mission was covered by other means, specifically, the Buffalo Hunter drone (AQM-34) and the SR-71 (Giant Scale) reconnaissance aircraft. The drone proved especially valuable in late 1972, since it could operate under the low ceilings which frequently precluded successful photography by RF-4Cs and SR-71s (between 27 August and 19 October, weather prevented acceptable RF-4 photography 11 out of 21 times). Specific problems in obtaining LORAN TD/BDA photography included the following:[148]

**LORAN was a precision navigational system which measured signal time differences from three ground stations to determine aircraft position.*

- In order to minimize pitch and roll corrections and allow the LORAN computer to zero itself out, the aircraft had to be straight and level and in unaccelerated flight, approximately one minute prior to target and until one minute past the target.

- Human computation/measurement errors could be introduced by the photo interpreter while applying the various pitch and roll corrections and making the actual TD computation.

- Due to the lack of accurate LORAN gradients for NVN and certain technical correction factors for the same area, there was no way to validate the LORAN TDs except by comparing them with geographical coordinates obtained from photographs. Typical errors for the Thanh Hoa target area in April, for example, showed the LORAN TDs to be off by more than 1/2 mile. (If the LORAN TDs were shown to be within 500 meters, the TDs were considered valid.)

- Obtaining LORAN TDs with LORAN-equipped RF-4Cs in the northern route packages was shown to be difficult. Historically, on the northwest railroad, LORAN broke lock (became ineffective) approximately 30 miles south of the Red River. On the northeast railroad it normally broke lock at the coast ingress point. Once LORAN broke lock in those RPs, the aircraft had to return south of 20°N to reestablish lock-on.

- Weather played an important part in maintaining LORAN lock-on. Any thunderstorm between the aircraft and the station affected the low frequency LORAN, and it broke lock. Additionally, static electricity and/or heavy precipitation had the same result. It was also believed the ECM and/or chaff severely affected LORAN lock-on capability.

- Aircraft maneuvers in excess of two Gs produced a loss of LORAN lock-on in southern RPs. The further north (away from the M-X-Y transmitter chain at 16°N/104°E) the aircraft went, the less maneuverability it was permitted.

(S) Overall, the success rate for Combat Thunder photography was disappointing. By 8 September 1972, five of the last nine attempts had produced no usable LORAN annotated photography, owing to lost LORAN lock-on or equipment malfunction. Chances for improved success were dependent upon improved maintenance and increased attempts. Because of limited assets and other priority missions, several variations of a reduced reconnaissance were proposed and attempted. The choice of a mixed formation containing one RF-4 and an accompanying pair of F-4Ds seemed the best. It also freed another RF-4 for additional missions.[149]

(S) An alternate means of updating LORAN TDs in RP 5 and 6A involved fragging a 4-ship flight with special ordnance, MK-83 LDGP 1,000-lb bombs. Utilizing delayed fuze settings and dropping by LORAN only, regardless of how clear the weather might be, it enabled photo interpreters of the 12th RITS to measure LORAN TDs directly from BDA photography (because of the difference in crater sizes between flights).[150]

(S) The net result of a year's efforts to improve the LORAN all-weather bombing capability must be measured by three different events: the Linebacker I results, the Linebacker II analysis in a PACAF bombing survey, and the scope of a LORAN bombing test by Ubon F-4s in January 1973. LORAN bombing accuracy must be considered extremely poor. The computed CEP was 572 meters in a total of 42 drops made during Linebacker I. The approximate overall CEP during Linebacker II was 1,000 meters, where a total of 70 drops were made. Many factors, however, including acute differences in modes of delivery, would color any comparison of the two campaigns. The following factors were possible reasons for the inaccuracies:[151]

- Time Delay (TD) Determination

LB I: TDs were adjusted by BDA photo coverage.
LB II: Targets were struck for the first time without benefit, in most cases, of Combat Thunder photography.

- Turns

LB I: Targets were generally on the outer periphery of the high threat area, so turns were seldom required. LORAN signal strength loss is 50 percent for a 30° bank angle and up to 70 percent for a 45° bank.
LB II: Targets were all in high threat areas. Frequent turns were required to stay in chaff corridors. Evasive action against SAM and MIG threats was often required. Pilots modified their releases 72 percent of the time and released manually, owing to broken LORAN lock-on.

- Passes

LB I: Multiple passes were authorized.
LB II: Single passes only were made because of the high threat enrivonment.

- Other (Chaff, ECM, Lines of Position)

LB I: Minimum chaff and pod activation were used because of the low threat. More favorable intersecting LORAN lines of position (LOPs) were available.
LB II: Maximum chaff and ECM pod activity existed in high threat areas. Poor weather existed with a preponderance of moisture in the target area. LORAN LOPs intersected at 45°, a less favorable angle for accuracy. A "delta effect" occurred when crossing the mountains and karst into the delta area of NVN.

(C) Assessments pertaining to the effectiveness of LORAN bombing on individual targets during Linebacker II brought such uncomplimentary remarks as the following:[152]

- Airfields - Very low level of damage by a weapons system (9 percent overall average), with LORAN yielding the lowest damage level for the highest percentage of strikes.

- Power Facilities - There were indications of some damage to the Haiphong and Hanoi transformer stations with radar and LORAN bomb deliveries, but LGBs were the most effective.

- Radio Communications Facilities - Overall damage by any type delivery was an average of 32 percent. No bomb impacts from LORAN strikes could be found in the target areas.

- Storage Facilities - LORAN path finder results were "disappointing."

- Railroad Yards - LORAN was used on only two of 13 targets; one had 6 percent damage attributable to LORAN, the other had about 10 percent. Radar and visual deliveries surpassed LORAN.

- Bridges, SAM Sites - Not struck with LORAN.

(C) It appears, statistically, that LORAN bombing made no significant contribution to the overall damage level during Linebacker II. The LORAN strikes deep into North Vietnam were made at the fringe of reliable reception in an area where there had been only limited prior reconnaissance to update target coordinates or TDs. In addition, analysis of LORAN strikes during Linebacker II indicated that even area-type targets were missed by a considerable margin.[153]

(C) In summary, LORAN all-weather bombing of NVN was not effective. As a result, one study recommended that "extensive research should be devoted to developing and refining an all-weather strike capability for use on the outer fringes of LORAN or in areas where no LORAN capability exists."[154] LORAN bombing effectiveness should be carefully weighed in programming future bombing campaigns.

A TYPICAL LINEBACKER MISSION

(S) Combining each of the elements into a cohesive Linebacker force to support both day and night, all-weather missions required extensive coordination between units and services. A typical day mission against a North Vietnamese high threat target would best illustrate the intricacies of planning, force employment, and proper command and control of its elements. Specific Linebacker elements such as the B-52 strike force, TACAIR guided bomb teams, F-111 night strike teams, and the LORAN strike teams have been discussed individually. A single employment of these elements with their supporting teams of MIG/BARCAP, chaff and ECM, hunter-killer (Iron Hand), and reconnaissance will show the importance of timing

in negating the threat, minimizing friendly losses and destroying the target complex. Initial photography having been completed days or weeks prior to the strike, the standard Linebacker weather reconnaissance flights of pairs of F-4s visually reconnoitered each target area 4 1/2 and 2 1/2 hours before the TOT. From June to August, the poor F-4 UHF radio reception (caused by antenna location) required that an RF-4 be added to the weather reconnaissance flight to extend the communications range. The HF radio in the RF-4 provided this capability, but it was eliminated during September owing to an urgent need for BDA/LORAN photography.[155]

(U) The CAP (usually one flight of four aircraft per strike team) had three related missions: SAR protection, tanker protection, and strike force protection. Limits on USAF assets caused Marine F-4s from a deployment base at Nam Phong and Navy CTF 77 TACAIR to assume portions of the CAP early in Linebacker operations. The Marine F-4s assumed BARCAP and tanker protection missions ingressing from the west. For missions ingressing from the Gulf of Tonkin, the USN provided BARCAP/tanker CAP. This was a normal outgrowth of the Navy's 24-hour CAP over the Gulf. Normal coordination between services provided time and altitude separation to enhance safety. The Linebacker MIGCAP tactics called for specific orbit locations selected by qualified tacticians who were aware of the strike force routes and current threat areas. Study of MIG attacks showed that, historically, MIGs attacked the first third of any given strike package. Attempts were made by the 432d TRW at Udorn to reinforce the CAP coverage during that period.[156]

(S) MIGCAP had to be in place a minimum of 5 minutes ahead of the strike force (15 minutes early would adversely affect the enemy's timing, but presented fuel shortage problems to the MIGCAP). It was the CAP leader's responsibility to decide when and how to negate any MIG attack. He had to exercise good judgment when in hot pursuit to insure that his flight was not drawn out of position to counter alternate attacks. When MIG engagements did occur, the most frequently reported difficulty facing USAF pilots was one of maintaining proper communications with each other, the strike force, and various controlling agencies. Despite limited loiter time in the target area, USAF MIGCAP had numerous MIG engagements during Linebacker operations. There were 54 reported MIG engagements during the period covered by this report (of which 11 occurred during Linebacker II). MIG tactics were generally characterized by multiple-ship attacks, multiple-flight deceptive maneuvers, and high speed fly-through maneuvers such as a single supersonic pass at a formation of aircraft. (See Appendix 4 for USAF aircraft losses to MIGs during Linebacker I).[157]

(U) The next member of the Linebacker force over the target area went by many names, depending on its precise mission and armament. In general, this team fulfilled a hunter-killer role and was so described in the 388th TFW portion of the 7/13th AF Linebacker tactics review

conference of September 1972. Equally appropriate during Linebacker operations were the familiar names of Wild Weasel and Iron Hand. In the early phases of Linebacker I, pairs of F-105G Wild Weasels equipped with AGM-45 Shrike and AGM-78 Standard Arm anti-radiation missiles sought out operating NVN Fan Song SA-2 SAM radars and launched their ordnance at the emitters. This suppression role in the hunter-killer concept was called Iron Hand. A newer development used the F-4E with the F-105G. The F-4s carried CBU-52 ordnance to silence suspected SAM sites preemptively. It had been found difficult to kill a SAM site with the AGMs alone. Active SAM sites deceived the AGMs immediately after launch of successive AGMs* and then operated without fear of subsequent attacks. The inclusion of CBU-equipped F-4s reduced this probability. This suppression/attack role was the hunter-killer concept.[159]

(U) During Linebacker II, the teams were composed of two F-105Gs and two F-4Cs. Numerous changes in NVN ECM/SAM tactics challenged this team even further. Some F-105 pilots deliberately orbited active SAM sites in attempts to "draw up" guidance signals from the SAM radar. The NVN maintained minimum electronic transmission by practicing good emission discipline. Maneuvering around the SAM threat, the Wild Weasels played a key role in keeping the Fan Song off the air. B-52 TOTs were spaced and/or compressed as required to provide the necessary hunter-killer protection. Normal operating altitudes were between 13,000 and 18,000 feet for the F-105s and up to 22,000 feet for the F-4Cs (both at about 400 knots calibrated air speed (KCAS) minimum.[160]

(U) During Linebacker I, this mixed team was not considered a pure hunter-killer team in that it was fragged primarily to support the chaff or strike force. The team would expend CBU-52 only after the strike/chaff force had egressed the area. In other words, it was an Iron Hand or SAM suppression team. Alternate tasks were also integrated into the hunter-killer mission. The F-4s played a role as MIGCAP (and jettisoned ordnance when MIGs threatened) while the F-105s covered the electronic threat. Alternate SAM sites, whether occupied or not, were frequently attacked with CBU-52 during flight egress. The hunter-killer tactic was initially successful, as acknowledged by frequent SAM site relocations, improved camouflage, and strict emission discipline. A side effect was the degrading of SAM associated equipment caused by the frequent moves.[161]

(U) A final analysis of Linebacker II Wild Weasel tactics places a big question mark in the ECM/SAM category. While effectively denying full use of the Fan Song radar to the NVN, the Wild Weasel could do little (as it was configured in December 1972) to prevent an engagement if the

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**The AGM-45 was subject to confusion in isolating a single radiating source, and, therefore, could be drawn off target by two or more simultaneous signals.*[158]

SAM site intended to engage using a degraded passive tracking capability.* SAM accuracy was considered adequate against the non-maneuvering B-52.[162] All the launch parameters were available to the SA-2 operator--azimuth, range, and elevation angle. The loss of 15 B-52s to SAMs during Linebacker II gives this rationale some credit.

(U) Difficulties experienced in bringing the hunter-killer concept into full bloom were discussed in early September:[163]

- The hunter-killer team, thoroughly briefed and in radio contact with the strike force, was able to determine the strike's egress time, but it was usually unaware of the reconnaissance flight's location.

- In dense SAM areas such as Hanoi, one hunter-killer team of four aircraft could not provide adequate continuous suppression. Two teams, either both hunter-killer or one hunter-killer accompanied by one Iron Hand (with ARM only) could provide suppression and reduce team vulnerability significantly.

- In target areas with low-altitude non-visual missions, an Iron Hand team was preferable. Ordnance loads for such a team could be mixed.

(U) Numerous changes in the NVN ECM/SAM tactics also challenged the final members of the Linebacker force, the chaff and ECM aircraft. Active electronic countermeasures were conducted by EB-66 aircraft orbiting close to the threat area during Linebacker I. During Linebacker II, the EB-66 maintained positions outside the NVN SAM/MIG threat environment and performed a stand-off jamming role covering the ingress/egress routes of the strike force. It had become necessary to pull the EB-66 back because of its high vulnerability to MIGs. Escort flights of four F-4s, equipped with ECM pods, provided countermeasure protection in the high threat areas over NVN as Linebacker operations increased in scope. The F-4s were typically employed in a modified "fluid four" pod formation, with elements of the flight being spaced 1,500 - 1,600 feet apart and with the wingman at 1,000 - 1,500 feet. Vertical separation ranged from 250 to 700 feet between aircraft. Formations and tactics varied slightly among the 8th TFW, 355th TFW, and 388th TFW. Other tactics included a fighter "weave" about a slower strike force and a tactical pod formation. Single-pod configured aircraft were used in the lower threat areas only.[164]

(S) Chaff and chaff escort tactics took many forms as the NVN moved to counter their effectiveness. Chaff corridors were provided

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*(S) *It was generally believed that B-52 jamming of the "Banlock" still allowed the SA-2 to passively track the azimuth and elevation of the B-52. Range was easily determined by using the known B-52 operating altitude of 35,000 feet.*

to protect strike aircraft from SAM systems. Aircrews made every effort to fly within the chaff as they could not then be tracked effectively by Fan Song radars. Aircraft flying below, above, or alongside chaff corridors tended to be highlighted. Initially, chaff was dispensed by 8 to 12 F-4s carrying nine M-129 chaff bombs each. At times, however, as many as 16 aircraft were necessary to produce a wide-enough chaff corridor. The length of this corridor, however, was still not sufficient, so on 13 June 1972, the ALE-38 chaff dispenser was introduced giving eight aircraft the capability to produce a continuous chaff corridor 5 miles wide by 105 miles long. This proved sufficient to protect the entire ingress and egress routes within the North Vietnamese heartland.[165]

(S) To avoid stereotyping, actual chaff dispensing tactics took many forms, including varying the time of delivery, dividing the chaff formation to dispense inbound and outbound simultaneously, and using MIGCAP aircraft call signs for deception.* Each of these tactics proved effective. Initially, the chaff flight was not protected by an escort because the MIGs did not pose a threat. In June, however, MIG attacks were directed toward the vulnerable chaff flights, and an escort package became a permanent part of each Linebacker chaff force. The escort element was the inner perimeter for MIG defense. Standard configuration for air defense aircraft was three external fuel tanks, two or four AIM-7E2 missiles, four AIM-9E/J missiles, and two ECM pods.[167]

(U) Since one flight of four escort aircraft might break into two elements (depending on the strike technique agreed upon by the units), the number one and number three aircraft commanders in each flight were required to be lead qualified. Figure 4 illustrates some of the possible chaff dispensing tactics where one or both of the chaff flights spread chaff outbound from the target (P-1). Each of the options had its respective advantages and disadvantages. In analyzing each set, one should realize that the loose "fluid four" formation sowed a less dense chaff corridor which had to be filled in by the other chaff element. Additional tactical considerations included the ability of opposing flights to protect one another's 6 o'clock position and the difficulty in chaffing multiple targets with several directions of travel for each formation of chaff/escort aircraft.[168]

(U) The presence of a MIGCAP orbit generally indicated that a MIG threat existed in the target area or beyond the target. As implied earlier, the MIGCAP was used throughout Linebacker as a blocking force. The heavy loss rate in May, June, and July was a result of the NVN GCI-directed supersonic stern attacks against the chaff/strike elements. This tactic took a heavy toll of USAF TACAIR with 18 F-4s and one F-105G being lost between 10 May and 11 September. Chaff corridor protection

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*(S) *Usually the escort and strike flights coordinated their intentions by secure voice telephone before each mission.*[166]

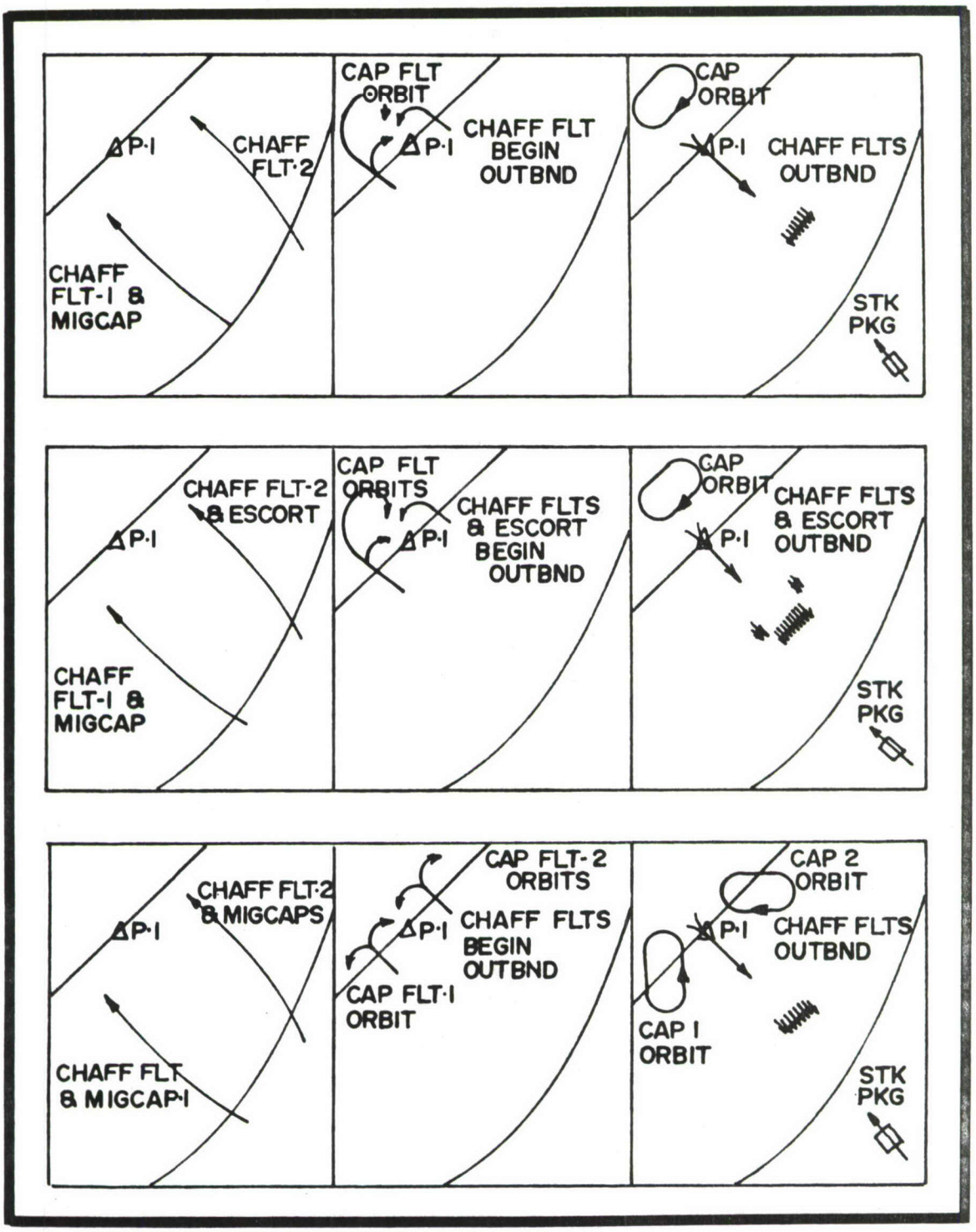


Figure 4 (U)

FLIGHT VARIATIONS FOR CHAFF DISPENSING MISSIONS
(Target: P-1)

costs were high, as seven chaff aircraft were lost to MIG-21s or ground defenses. (See Appendix 4 for a breakdown of USAF losses by mission function.) The unfavorable loss rate to MIGs was finally countered with Project Teaball, a weapons control center (WCC) located at Nakhon Phanom RTAFB.[169]

TEABALL WEAPONS CONTROL CENTER

(S) Although Teaball was an extension of the communications technology for command and control, it must be evaluated as an outstanding example of cooperation and coordination between two staff functions, operations and intelligence. Teaball produced a ground-based, sophisticated warning system using very sensitive intelligence sources. The resulting information was used to plot both friendly and enemy positions, make tactical control decisions based on these plots, and advise all strike, chaff, or escort elements (as applicable) of the impending MIG threat. Teaball's supporting agencies (such as Combat Apple, Olympic Torch, Luzon, Red Crown, and Disco) were tasked to provide one geographical position per minute on both USAF TACAIR and MIG targets, thus enabling real-time information to be given to U.S. pilots flying deep into North Vietnam.[170]

(S) Teaball was born as a result of an extremely high U.S. fighter loss rate during May 1972. The U.S. losses were twice those of the North Vietnamese. Officially, the loss rate was quoted by 7th AF headquarters as 1 to .47 in May. The NVN strategy was analyzed and one factor emerged: the enemy attacked "only when the pilot and GCI controller perceived a clear-cut advantage." The NVN advantage was created over Hanoi and targets west of Hanoi because of limited U.S. radar coverage and GCI control capability. The problem became one of providing sufficient warning to U.S. pilots that they were about to be attacked by MIGs. The latest NVN tactic involved a single high-speed, usually supersonic, pass by one or two MIG aircraft.[171]

(S) The ideal solution would have been an AWACS (airborne warning and control system) aircraft with downward looking radar capable of spotting the low-flying MIGs as they were vectored to an attack position. The available line-of-sight radar capability of Red Crown did not cover altitudes below 10,000 feet over Hanoi.[172] The MIG flights maneuvered below this altitude with relative impunity. The actual solution involved those agencies previously mentioned. The orbit or flight path flown by each is shown in Fig 5. The air elements of Teaball consisted of Olympic Torch in the Gulf of Tonkin orbit, Burning Pipe, Disco, and Big Look flying optimum flight paths for relay, and the Luzon radio relay aircraft. During Linebacker strikes, much support was located in the Gulf. Combat Apple and Olympic Torch inputs were fed back into Teaball at NKP, along with security squadron inputs. Control output information was relayed through Luzon to the airborne elements of Linebacker (see

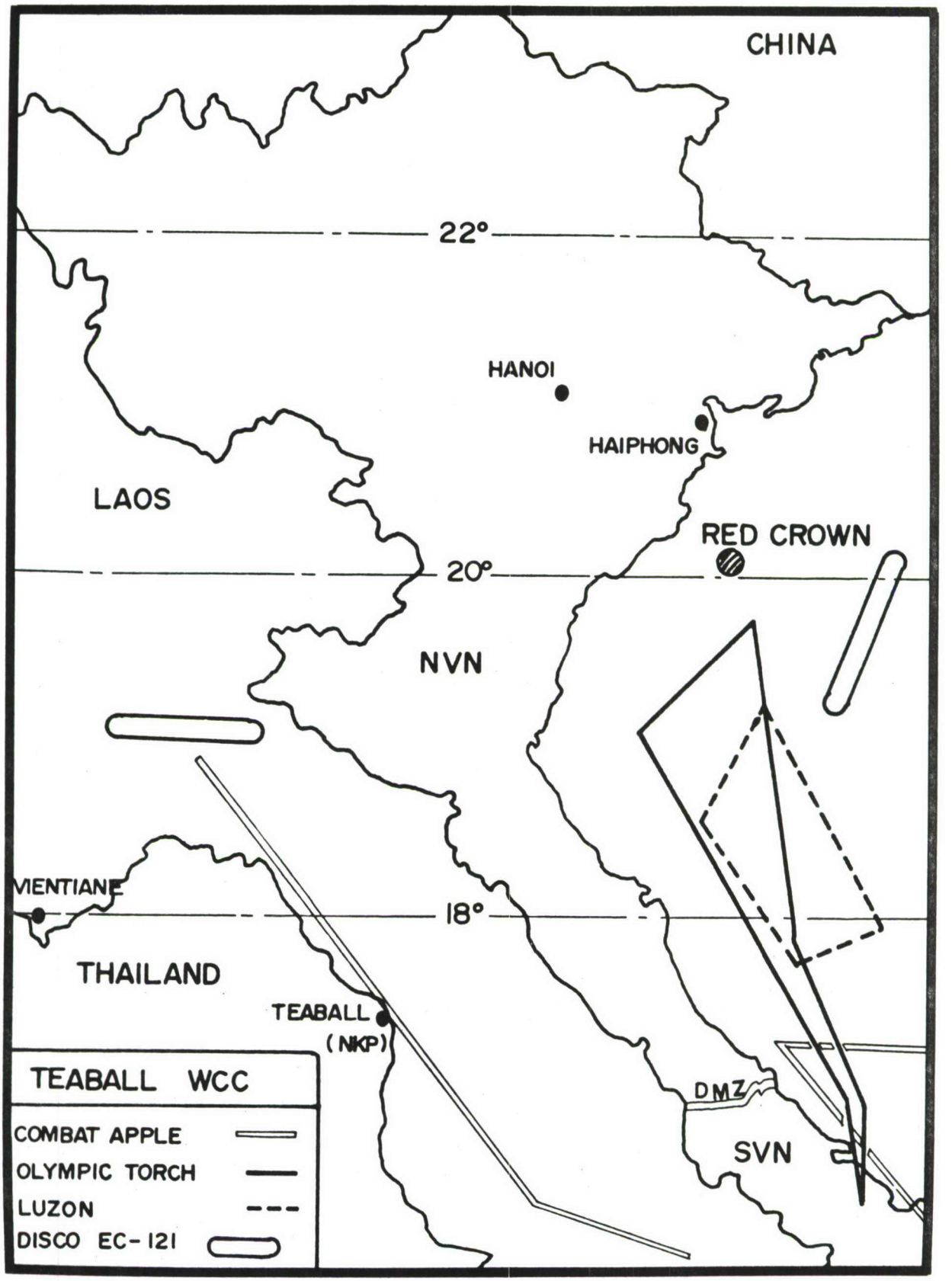


Figure 5 (S-REVW 9 Oct 92)

ELEMENTS AND ORBITS OF TEABALL WEAPONS CONTROL CENTER

Fig 6).[173] Red Crown and Disco provided positions, relayed information and were designated as back-up weapons control centers should Teaball communications fail. Acting alone, without any Teaball capability, Red Crown and the Disco EC-121 could give "bandit" MIG warnings; however, because of communications difficulties or radar limitations, these warnings came too late or were inaccurate. Luzon played a special role mentioned previously in the general discussion of command and control communications. It flew at high altitudes and acted as a radio relay aircraft.[174]

(S) Some communications problems did arise during the period from early August, Teaball's introduction, to 6 October. In fact, four U.S. aircraft were downed by MIGs during that period. In three or four instances, Linebacker conferences revealed that Teaball communications had been lost, a MIG reaction occurred, and one or more U.S. fighters were shot down.[175] Overall, however, the Teaball statistics were a dramatic improvement over the previous period. From early August to mid-October, there were only five U.S. losses compared to 19 MIGs destroyed, in air-to-air engagements. The new loss rate had improved to an impressively favorable ratio of 3.8 to 1.[176]

(U) One additional factor greatly assisted the Teaball facility in improving the kill ratio--that of identification, friend or foe (IFF) interrogation by specially equipped U.S. fighters. The program was nicknamed Combat Tree, and was an extremely important development in aerial engagements. In September, the 432d TRW electronic warfare staff evaluated Combat Tree as follows:[177]

> *Approximately 17 of our last 20 MIG kills were made possible either directly or indirectly by the use of Combat Tree equipped aircraft. We are certain that NVN is aware of our ability. . . . This has been reflected in a change in their tactics from constantly squawking . . . to use of their IFF only during critical phases of the GCI intercept and recovery.*

U.S. counter-tactics also included faking a failure of the Combat Tree equipment by operating in a passive mode to entice the MIG within range for a coordinated attack by other U.S. aircraft controlled by Teaball.

(S) In the final analysis, the initial effect of Teaball was overwhelmingly favorable to the U.S. forces. General Vogt expressed his obvious pleasure in the sudden turnaround in aerial engagements when he stated:[178]

> *With the advent of Teaball we dramatically reversed this [loss to victory ratio], and in August, September, and October, and for the subsequent months of bombing activity*

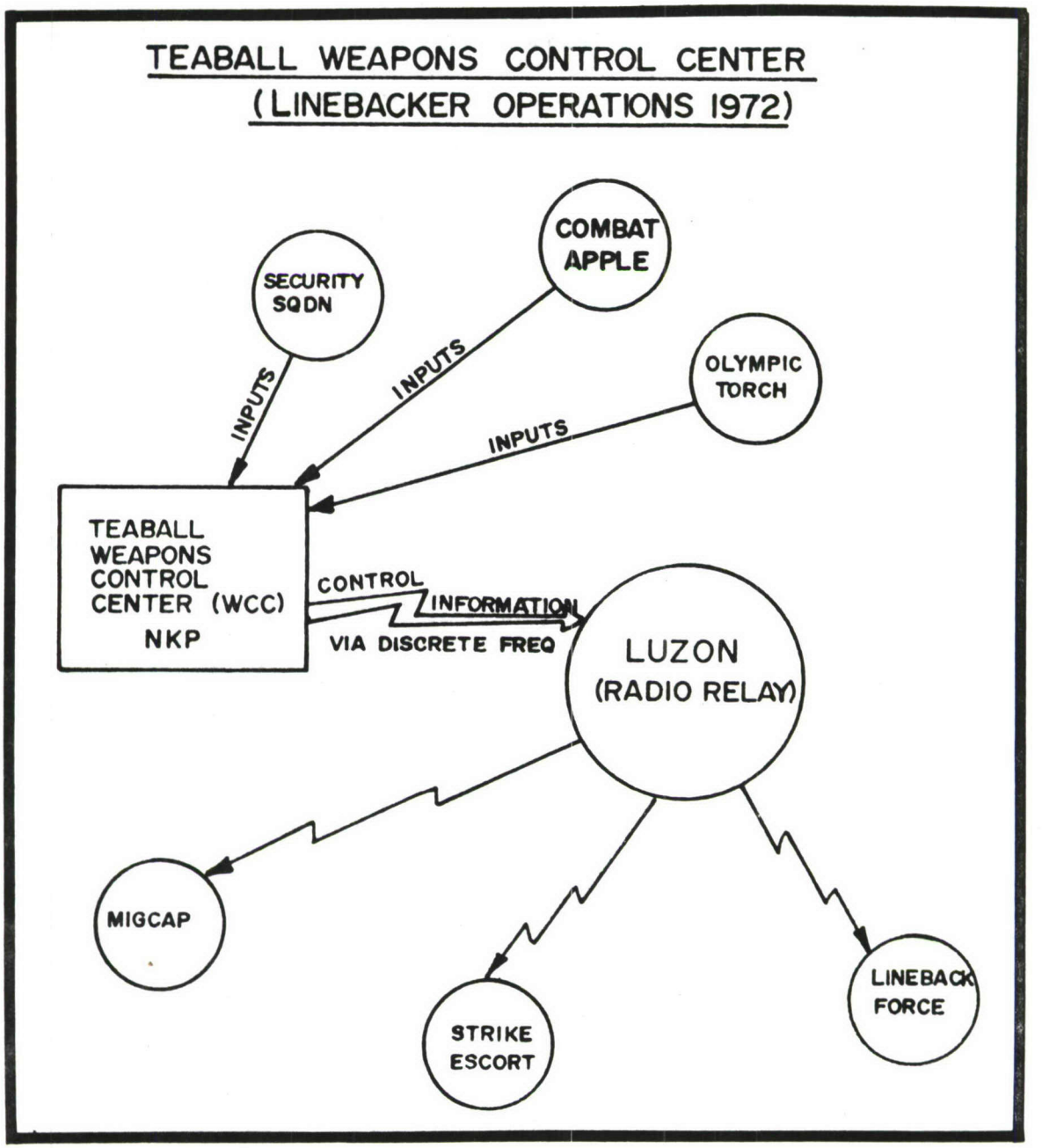


Figure 6 (U)

COMMUNICATIONS NET FOR TEABALL WEAPONS CONTROL CENTER

during Linebacker I, we were shooting down the enemy at the rate of four-to-one. Same airplane, same environment, same situation, same tactics; largely [the] difference [was] Teaball. It was one of the most impressive developments we've had out here.

IV. LINEBACKER II OPERATIONS

OVERVIEW

(U) Where Linebacker I had been an interdiction campaign directed against supply routes throughout North Vietnam, Linebacker II was a sustained maximum effort using air power to destroy all major target complexes located in the Hanoi and Haiphong areas (Fig 7). Linebacker II operations were a significant departure from all previous campaigns. This brief but intensive campaign provided USAF and USN forces with specific objectives and specific targets and removed many of the restrictions and frustrations surrounding earlier operations (underscored in the conduct of Rolling Thunder, Proud Deep Alpha, Freedom Train, and Linebacker I).

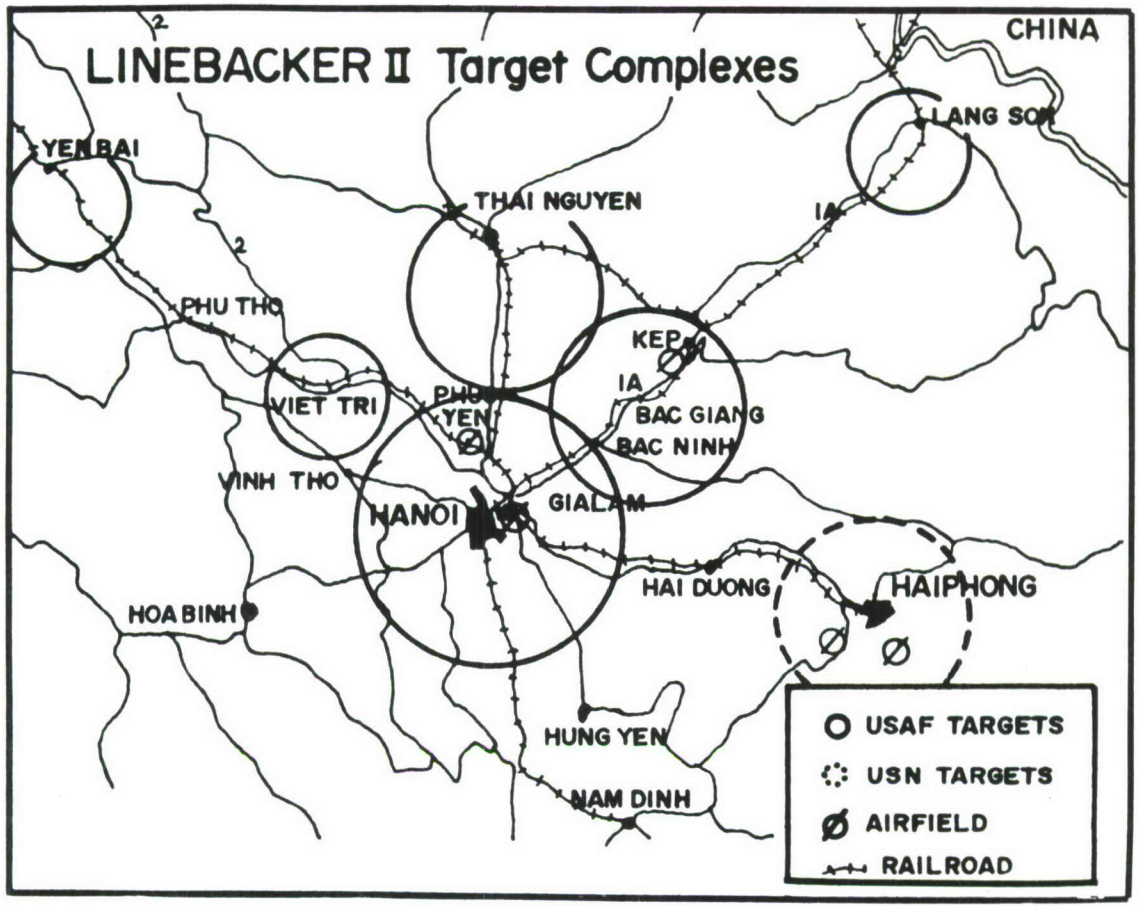
(U) Linebacker II operations north of 20°N were initiated on 18 December 1972 and were ordered by the JCS to "continue until further notice." During these operations, USAF/USN tactical aircraft and B-52s commenced an around-the-clock bombardment of the NVN heartland. The B-52s struck in RPs 5, 6A, and 6B during the hours of darkness with F-111s and USN TACAIR providing diversionary/suppression strikes on airfields and SAM sites. In addition, MIGCAP, chaff support, BARCAP, escort aircraft, and SAC tankers were active members of the strike force. The daylight TACAIR effort was maintained primarily by A-7s and F-4s bombing visually or with LORAN techniques, depending upon the available weather windows over each target. The huge support effort, for both B-52 and TACAIR strikes, included the same mission functions mentioned in the previous chapter, and the details in planning and coordination were by no means reduced in scope. The timing required to optimize the total USAF effort in coordination with Navy and Marine support/strike missions was enhanced by a computerized fragmentary operations order (frag) during Linebacker II.[179]

(S) Linebacker II was characterized by three distinct phases covering the 12-day period, 18 through 29 December 1972. The operation came to be known as the "Eleven Day War" (there was a standdown on Christmas Day), and was divided as follows:[180]

- Phase I (18-20 Dec): A 3-day maximum effort against 11 target complexes with a total of 314 B-52 night sorties.

- Phase II (21-24 Dec): A reduced level of effort accompanied by a shift in target areas (to Haiphong and lower-threat areas). Only 120 B-52 sorties struck in the night attacks.

- Phase III (26-29 Dec): An increased level of effort with 295 B-52 sorties against 13 separate targets in the vicinity of Hanoi, Haiphong, selected railroad yards, and 5 SAM sites.



(U)

Figure 7

LINEBACKER II TARGET COMPLEXES

(S) Although comprised of three phases, Linebacker II was construed by planners to be two distinct operations, simultaneously imposed on the NVN war-making capability. The first operation involved the night strike/support package of B-52s, F-111s, and USAF/USN TACAIR. The second operation involved the day strike/support package of USAF A-7s and F-4s and USN/USMC A-6s, A-7s, and F-4s.[181] Actual force structure, planning and employment will be discussed in this chapter.

(S) Linebacker II forces encountered intense enemy defensive reactions, losing 26 aircraft in the 12-day period. USAF losses included 15 B-52s, two F-4s, two F-111s, and one HH-53 SAR helicopter. USN/USMC losses included two A-7s, two A-6s, one RA-5, and one F-4. Seventeen of these losses were attributed to SA-2 missiles, three to daytime MIG attacks, three to AAA, and three to unknown causes. The threat picture was heavier than U.S. losses indicate, and the 2.1 percent B-52 attrition rate was far below that expected (see Appendix 5).[182]

(C) Specific bomb damage results by weapon systems and targets indicated some surprising conclusions to planners (as discussed in Chapter III, LORAN and LGB results). The impact of the bombing was obvious in the severe damage to the NVN logistic and war supporting capability. Railroad complexes received the greatest number of bombs per target and also showed the highest damage level of all targets struck by the USAF. Another key factor in the Linebacker II success was the ability of USAF weaponeers to cope with the severe weather constraints in scheduling their LGB and LORAN strikes.[183]

FORCES, TARGETS, AND PLANNING

(S) Three days prior to the commencement of Linebacker II, plans were initiated in an alerting message from the JCS to Admiral Gayler, CINCPAC. This message proposed a 3-day maximum effort of B-52 and TACAIR strikes in the Hanoi and Haiphong areas utilizing visual and all-weather bombing capabilities. Thirty-two specific targets were authorized by the JCS for the initial strikes. Additional guidance indicated appropriate targets for both B-52 and LGB forces. The emphasis on railroad yards, shipyards, and storage capacity was revealed by the scope of the first JCS target authorizations:[184]

- Hanoi Target Complex (total 13): Radio station, power plant, railroad yards, repair shops, port, and Bac Mai Airfield.
- Haiphong Target Complex (total 8): Power plant, railroad yard, warehouses, shipyards, naval base, and airfield.
- Electric Power Facilities (total 3): Thermal power plants at Uong Bi, Thai Nguyen, and Bac Giang.
- Radio Communications Facilities (total 3): Hanoi international radio transmitter and Hanoi and Lang Truoc radio communications transmitters.

- Air Defense Targets (total 4): Strikes by B-52s on Phuc Yen, Kep, Yen Bai, and Hoa Lac Airfields.
- Transshipment Point (1): Strikes by B-52s on the Bac Giang TSP.

Actual target complexes struck during the Phase I bombardment included all of those listed above. For a detailed list of strikes by date and aircraft type, see Appendix 6.

(S) The general authorizations for Phase I allowed commanders to reduce their B-52 operations during the 24-hour period prior to initiation of Linebacker II in order to achieve a maximum effort on the first day. That B-52 effort was to include use of all resources which would not have a detrimental effect on support of operations in RVN and emergency/priority situations in Laos and Cambodia. Another planning guideline was the authorization to strike NVN airfields and active SAM sites as the tactical situation dictated (so as to improve the effectiveness of attack forces and to minimize losses). This guideline enabled CINCPAC to direct TACAIR and F-111 pre-strikes against selected airfields and SAM sites on subsequent days. The USN/USMC sortie planning included the assets of three attack carriers and portions of the Marine force located at Nam Phong, Thailand and Bien Hoa, SVN (those not required by MACV operations in SVN, Laos, and Cambodia).[185]

(S) After a 24-hour delay to improve planning objectives and coordination, Linebacker II operations were initiated with the following execute message from the JCS to CINCPAC:[186]

> *You are directed to commence at approximately 1200Z [1900 hours NVN time], 18 December 1972 a three-day maximum effort, repeat maximum effort, of B-52/TACAIR strikes in the Hanoi/ Haiphong areas against the targets [identified on 15 December]. . . . Object is maximum destruction of selected military targets in the vicinity of Hanoi/Haiphong. Be prepared to extend operations past three days, if directed.*

(S) Seventh Air Force first-day plans called for 129 B-52s striking in three waves against seven targets previously authorized by the JCS. Approximately 15 F-111s were to strike at night against targets in RPs 5 and 6A. USAF TACAIR resources were to be used, where available, to provide support such as ECM, chaff, Iron Hand, and CAP for all three B-52 waves. Owing to a limited F-105G force, Navy A-7s supplemented the Iron Hand mission on one B-52 wave. F-111 strikes were used throughout the first night to maintain pressure on enemy airfields and eliminate as much of the radar/radio communications network as possible. The following daylight hours were filled with USAF/USN TACAIR strikes against Hanoi (precision bombings were scheduled, but weather downgraded the strikes to LORAN drops) and Yen Bai Airfield. The point targets, Hanoi radio communications and the Hanoi international radio transmitter, were rescheduled until they were successfully struck. Although operational

reporting of the first night's efforts followed the normal command/control procedures, a preliminary summary of strike information and BDA was immediately transmitted to keep the President informed of any significant activities that might affect the peace negotiations in Paris.

(S) The kick-off of Linebacker operations represented the maximum sustained effort maintained throughout the period of Phase I. Certain similarities existed during the three days of heavy bombardment; namely:[188]

- All attacks were conducted in a manner that would minimize danger to the civilian population to the extent feasible without compromising effectiveness.

- All attacks avoided known POW compounds, hospitals, and religious structures.

- The criteria for support aircraft for B-52s was coordinated at command level between 7th AF, SAC, and the chief of the Fleet Coordinating Group (USN).

- All SAC B-52 strikes were designated as "press-on" missions and would proceed with or without chaff support.

- All strike/support forces received full assistance and monitoring by Olympic Torch, Luzon, Combat Apple, Teaball WCC, ABCCC, College Eye, and Red Crown. Teaball/Red Crown controlled the CAP forces, and Disco controlled the strike/chaff forces using normal Linebacker/Arc Light control procedures.

- Naval gunfire operations were conducted in conjunction with air strikes, concentrating on continuing the pressure in RP 6B. (Ships were not pre-positioned prior to Linebacker II execution, to preserve maximum surprise effect.) NGF was continued along the entire NVN coastline to prevent the logistics movement southward.

- USAF/USN TACAIR conducted defensive suppression strikes on airfields and SAM sites prior to B-52 TOTs. USN diversionary strikes on other targets further reduced NVN pressure on the B-52 strike force.

(S) The second phase of the B-52 operations (21-24 Dec) represented a significant reduction in sortie numbers and a variation in employment. During Phase II, only one B-52 wave struck the targets each night vice three during Phase I. The effort shifted to Haiphong on 22 December and then to lower-threat areas such as Lang Dang, Kep, and Thai Nguyen. A new target category was introduced with the attack on three SAM sites on 23 December. Additionally, the SAM suppression support was augmented by F-4Es loaded with CBU-52s and CBU-58s.[189]

(S) In Phase III (26-29 Dec), 295 of 300 scheduled B-52 sorties struck 13 separate targets using the powerful single wave concept (striking all targets on a given night simultaneously). Significantly, more sorties were flown on 26 December after a standdown on Christmas Day. On 27 December, after a 4-day absence from Hanoi, B-52s struck three railroad yards and one supply depot in the area. Other strikes were directed against Haiphong (30 sorties) and Thai Nguyen (18 sorties). The majority of the last two days' efforts were expended against the Lang Dang railroad yard in Hanoi and two nearby SAM support facilities.[190]

(S) Throughout the night campaign, F-105s, F-4Cs with AGMs, F-4Es with CBUs, and Navy A-7s flew SAM suppression sorties. Overall, 93 percent of the F-105s and 88 percent of the F-4Cs expended ordnance using the Iron Hand procedures discussed in Chapter III. Eight of the F-4Es (26 percent) expended their CBUs. SAM suppression and chaff support comprised 49 percent of the TACAIR support effort. The remaining 51 percent was devoted to an anticipated MIG threat which did not materialize.[191]

(S) The USAF day strike and support campaign was sustained primarily by A-7s and F-4s bombing visually or using LORAN techniques, depending upon the weather over each target area. (See Fig 8 for the weather windows available on 21, 27, and 28 December.) A total of 497 USAF sorties (271 F-4s and 226 A-7s) flew strikes and expended ordnance during Linebacker II day operations. A low daytime support-strike ratio of 0.94 was attained with 530 support sorties being flown, including 126 F-4/F-105 Iron Hand sorties. The remainder of the support force included 85 chaff sorties, 273 F-4 sorties performing CAP, and 46 fulfilling other roles such as photo reconnaissance, SAR, and escort. The USN/USMC day strike and support contribution was 226 sorties involving A-6s, A-7s, and F-4s. (See Appendix 7 for the USAF day support sorties during Linebacker II.)[192]

SIGNIFICANT EVENTS

(U) The total employment of various weapon systems, tactics, and command and control during Linebacker II operations produced a number of significant results--large B-52 losses during the first three nights of strikes against Hanoi targets, a rapid attrition of SAMs as Phase I drew to a close, NVN AAA ineffectiveness, and the significance of weather on operations.

B-52 Losses

(S) Fifteen B-52s were downed by SA-2s on five separate days (18, 20, 21, 26, and 27 December). Losses were high during Phase I as nine of the bombers were downed in this period, including six on the 20th. Commanders recommended changes to "control the SAM environment,"

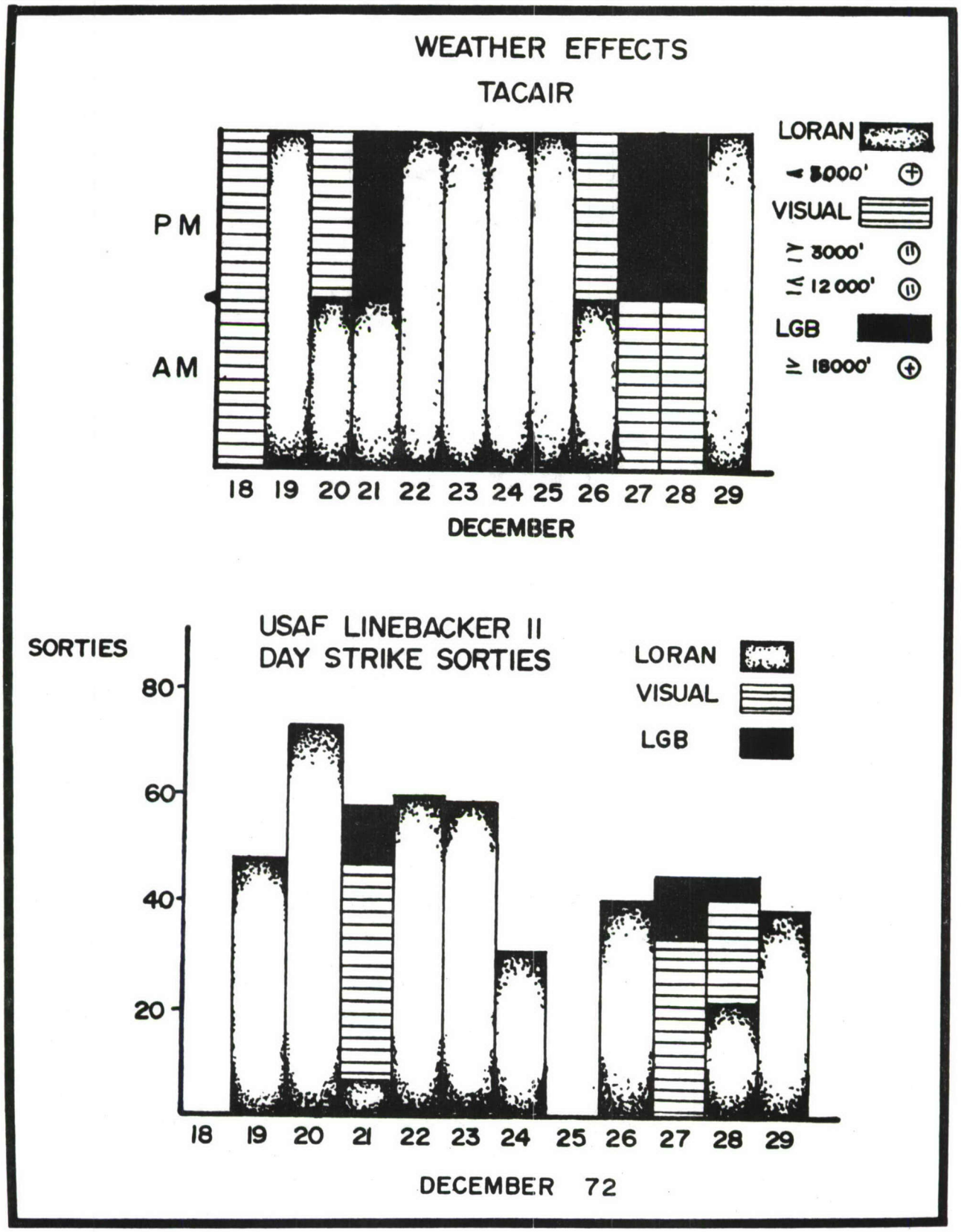


Figure 8 (C-DECL 30 Apr 79)

WEATHER WINDOWS AND LGB STRIKES ON 21, 27, AND 28 DECEMBER 1972

considered essential for B-52 survival. Concern for the high initial loss rate was expressed by the CINCPACAF in a message to 7th AF, in which he said: "Events of the past 4 days produced significant B-52 losses which obviously are not acceptable on a continuing basis. . . . [I recommend the] following for your consideration:[193]

> *a. Use Navy EA-6B for support jamming in racetrack pattern just outside the SAM ring, . . . one to cover ingress and one to cover egress area.*
> *b. Vary B-52 flight altitudes within the chaff corridor on ingress. Change release altitudes and the ingress/egress headings on a daily basis.*
> *c. Increase the density of our chaff pattern (by combining B-52 targets to enable the use of one chaff corridor per mission, or increasing the number of chaff-dropping aircraft from 12 to 16, or having the B-52s dispense chaff as they approach the target, thus increasing chaff corridor density for subsequent flights.*

(S) The CINCSAC concurred with most of the recommendations on 23 December. A chaff blanket was eventually employed over the entire target area for added protection in conjunction with the chaff corridor (first used on the Haiphong strike). Throughout Linebacker II, bomber tactics were continuously evaluated and modified. These modifications included changes in the bomber wave (single waves used in Phase II and III), stream composition, timing (simultaneous TOTs in different target areas), direction of attack, and altitudes. Base altitudes were varied each day; immediate pre- and poststrike altitude changes were used to counter enemy height-finder radars. The large-scale effort on 26 December used the chaff blanket technique for the first time. Finally, the use of widely divergent axes of attack for 120 B-52s against 10 targets on 26 December (plus the other diversionary tactics) were found to be highly effective in diluting the enemy defensive effort.[194]

(S) A significant reduction in B-52 losses during Phase III indicates a partial success in controlling the SAM environment. No B-52s were downed by MIGs; instead, two B-52D tail gunners were eventually credited with MIG kills themselves. Timely MIG warnings and MIGCAP/escort control by the control and warning platforms, plus degraded enemy night intercept capability, prevented the anticipated losses.[195]

SAM Activity

(S) The most serious threat to U.S. aircraft during Linebacker II was the SAM reaction. The total number of SAMs fired during the 12-day offensive was greater than during any previous month in the SEA conflict. Specifically, a total of 1,321 SAMs were launched at U.S. planes over NVN, 1,250 of which were directed against Linebacker II forces. B-52s attracted 1,032 SAMs, to give the SAM operators a kill ratio of 68.8 to 1 (SAMs fired per B-52 downed).[196]

(S) The North Vietnamese SAM order of battle had been shifted towards the north and northwest in the latter part of Linebacker I in an apparent effort to counter the attacks on rail and highway networks. The trend during the remainder of the offensive was to increase SAM coverage in RPs 6A and 6B. When Linebacker II began, 9-10 occupied SA-2 sites (photo confirmed) defended targets within a 10-mile radius of Hanoi. All B-52 hits and losses to SAMs were incurred within that 20-mile circle. The SAM threat remained static thereafter in terms of photo-confirmed sites and operating areas. A marked decrease in SAM launches during Phase III indicated a shortage in the SA-2 supply, and photography showed this to be the case at a few individual sites. Photography taken of three sites in the Hanoi area on 31 December showed less than the standard complement of six missiles on launchers and six in reserve. All-source intelligence indicated that the supply of assembled SA-2s in the Hanoi/Haiphong area had reached a low level at the cessation of the bombing.[1977]

AAA Activity

(S) North Vietnamese AAA enjoyed limited success during Linebacker II. Losses to AAA included three USN/USMC (A-6A, F-4J, A-7E) aircraft and one USAF helicopter on a SAR mission. Five additional USAF and nine USN aircraft received light to moderate AAA damage. Most of the reported 547 AAA reactions occurred in Hanoi, Haiphong, and Thai Nguyen.[198]

(S) AAA threat areas were inadequately defined at the start of both Linebacker I and II because of limited photography. U.S. reconnaissance and tactical aircraft had not been flying over RPs 5 and 6 with any degree of regularity. Similarly, the forces did not have the immediate advantage of daily aircrew reports. The majority of firings reported by tactical aircrews during Linebacker II were 23mm and 82mm. In most cases, as aircraft approached major targets in the Hanoi/Haiphong areas, AAA fire was observed in a continuous stream all along the route. This tactic was contrary to the expected concept of employment in separate AAA high threat areas. The lack of any significant success by NVN AAA might be attributed to the following factors:[199]

- The high altitude of the B-52s (31,000 - 39,000 ft).
- The low approach altitude of the F-111s (200 - 500 ft).
- Poor NVN AAA firing tactics and discipline.
- Complete saturation of the system by a large attacking force, ECM/chaff employment, and diversionary strikes.

Weather Significance

(S) Weather made increased demands upon planners during Linebacker II operations, especially with respect to scheduling of weapons and photo reconnaissance missions recording bomb damage. Thunderstorms, extreme

high wind velocities at chaff corridor altitudes, and low cloud ceilings all hindered operations. Weather had a significant impact on day USAF TACAIR strike sorties. Owing to poor visibility, 76 percent of the strikes employed LORAN deliveries. Only 6 percent of the strikes delivered LGBs or EOGBs.* Cloud forecasts for LGB operations were routinely given to mission planners 24 hours in advance and updated six to eight hours prior to TOTs. To take advantage of mission weather windows, LGB sorties were scheduled daily. There were three brief periods of clear weather in the afternoon hours of 21, 27, and 28 December Fig 8). Visual and LGB deliveries were made on those dates, but no apparent effort to take advantage of those three periods with surge capabilities is shown in the TACAIR sortie rates. Good reasons existed for this shortcoming. LGB pods were in short supply, and the requirement to support night B-52 strikes limited the option for generating additional daytime LGB strikes.[201]

(S) Another means of taking advantage of available weather windows was to schedule all A-7s with non-LGB F-4 sorties that had either a visual or LORAN delivery capability. An F-4 pathfinder element (with LORAN capability) led two or three flights of A-7s to the target area. If visual release were possible, all aircraft released in that manner. When nonvisual conditions prevailed, the pathfinder element directed the drop using LORAN equipment. Planners did emphasize visual and guided bomb releases within RP 6 whenever the strike forces and weapons were available and planning directives permitted. In the event of nonvisual bombing weather, the primary TACAIR mission was to support B-52 operations.[202]

TACTICS EMPLOYED

(S) Linebacker II support for B-52 strikes included all available SEA assets. Tactics involved the phasing of EB-66 standoff jamming, chaff delivery aircraft, SAM suppression, and MIG protection (MIGCAP and B-52 escort). U.S. Navy assets augmented the support package (within the capability and range limitations of USN forces). All resources were employed to the maximum extent possible. Initial SAC requirements for chaff protection exceeded the 18th TFW chaff seeding capability. (SAC requested corridors for all targets plus diversionary chaff corridors.) Lack of chaff assets to meet even the primary target requirements, accompanied by the high initial B-52 losses to SAMs, played a large role in the "single-wave" B-52 tactics of Phases II and III. Wind velocities further complicated normal chaff corridor seeding. At 35,000 feet (mean B-52 bombing altitude), the measured winds during the critical first

**(C) For planning purposes, 3/8th or less cloud cover below 18,000 ft and visibility in excess of 3 NM was considered favorable for LGB/EOGB operations. 4/8th or more coverage was considered marginal.*[200]

three days exceeded 25 knots. Insufficient chaff seeding assets prevented reseeding the rapidly shifting corridors. Red Crown radars offered only limited assistance in ascertaining chaff corridor location or effectiveness because of the extended range. Wind forecasts from Fuchu Air Station, Japan, provided the critical wind velocities for 7th AF and 8th TFW planners. Chaff missions were then planned at 7th AF headquarters to give a desired location for the chaff at a specified time. The massive SA-2 response to U.S. bombing around Hanoi indicated less than adequate protection because of chaff dispersion and showed the need for accurate wind forecasts.[203]

(S) Changing the B-52 strike tactics simplified many of the support roles, especially chaff corridor seeding. SAC requested, and received, a 20x20-NM chaff square or blanket over the target during the compressed TOTs. Initially, ingress and egress routes were not covered by chaff when the blanket technique was employed. Later variations were employed to concentrate chaff bombs within a chaff blanket dispensed by the F-4 configured with the ALE-38 chaff dispensor. Aircraft capabilities were used to the maximum, as indicated by 7th AF:[204]

> *[The F-4 aircraft configured for weapons/chaff delivery]. . . were operated at 6,000-8,000 ft above combat service ceilings with one engine in afterburner and one engine in military rated power. Maneuverability and visibility under these conditions were marginal.*

(S) SAM suppression support used essentially the same tactics as discussed in Chapter III; however, weather limited the hunter-killer effectiveness. The hunter-killer teams operated throughout each mission, but required sighting of the SAM launch to effectively strike them. Similarly, the Iron Hand aircraft required 5,000-6,000 ft clearance above cloud tops to successfully evade missiles launched against them. Although SAM support facilities had not been included in the initial JCS approved list of targets, they were subsequently struck after the list was revised. The reported correlation of the T8209* with SA-2 sites and track-on-jamming techniques for SAM launches contributed to the unsatisfactory SAM suppression during Linebacker II.[206]

(S) MIGCAP tactics were similar to Linebacker I, but the MIG threat was considerably reduced during Linebacker II. Initially, said General Vogt, "There was a great deal of concern on the part of SAC that the MIGs would get to them, and many of the SAC people felt that the MIG would be a greater threat than the SAMs. This did not turn out to be the case."[207] There were 27 MIG reactions during December, 26 of which were related to Linebacker II operations. All reactions were by MIG-21

**(S) NVN acquisition radar, using India band, and considered more reliable than normally used Fan Song.*[205]

aircraft. The early strikes against airfields and intensive jamming were major contributors to the low level of MIG activity, thus making the losses low on both sides. A major change in MIG tactics was observed for the first time. Whereas, previous MIG tactics were directly from Soviet manuals, Linebacker II saw instead the simultaneous employment of MIGs and SAMs against U.S. forces:[208]

> *During the first half of Linebacker II operations, MIGs were repeatedly vectored against B-52s within periphery of the lethal SAM ring, while SAM units were actively engaging targets. It appears that SAM units have been able to discriminate B-52s from the smaller and faster MIG interceptors. After the Christmas bombing pause, it appeared that the NVN changed their tactics by indirectly vectoring MIGs to a point east of Dien Bien Phu to attack B-52s from the rear before they arrived in the SAM defended area [due to near misses by SA-2s or the complicated SAM firing formula]. . . . Since the NVN experienced far greater success in downing B-52s using SA-2s, removal of the MIGs from the SAM threat areas probably simplified their air defense coordination.*

(U) Another 7th AF analysis of the 20 December operations indicated that MIGs were flying "formation" with the B-52s, possibly to provide precise altitudes, airspeeds, and course to defense controllers on the ground. SAM sites were thus able to accurately engage the B-52 force. The MIG-21 force was formidable, fluctuating between a high of 93 at the start of Linebacker to a low of 39 at NVN bases during the successful employment of Teaball. (See Fig 9 and Appendix 8.)

LESSONS LEARNED - LINEBACKER II

(S) On 22 December, the Linebacker conferences resumed with a review of the missions flown on 18-20 December over Hanoi. Some specific aircrew comments from the review of the first three days of Linebacker II were as follows:[210]

- Day 1: Four Udorn MIGCAP flights reported no MIG reactions against the MIGCAP; however, all flights reported SAM firings. The two Korat Iron Hand flights expended all their SAM suppression ordnance preemptively at the fragged B-52 targets or against active signals. Udorn chaff and escort flights reported heavy SAM reaction coordinated with the tracking AAA. The tracking AAA and random MIG sightings appeared to be at the normal chaff flight altitude used on previous Linebacker day operations (15,000-16,000 ft). Night chaff altitudes were 36,000 ft for Day 1. It was felt that a 1-minute TOT spacing, with both chaff flights at the same altitude could lead to a mid-air collision and should be brought to the attention of 7th AF planners.

Figure 9

(S-REVW 15 Jul 93)

NORTH VIETNAM AIR ORDER OF BATTLE

▪ Day 2: Iron Hand flights reported an almost complete lack of Fan Song signals during SAM launches on the first two days, and SAMs appeared to be salvo-fired. Two of the MIGCAP flights reported that MIGs appeared to be confirming B-52 altitudes to aid fusing of the SAMs. These incidents were followed by accurate SAM salvos at B-52 altitudes in the target area. SAMs were used to force escort flights down into AAA tracking envelopes. Tankers transferred portions of fuel planned for egressing aircraft to enable ingressing aircraft to strike their targets. Spread-out fighter launch times caused excessive loiter time prior to their ingress refueling. SACADVON promptly scheduled three extra tankers for Day 3.

▪ Day 3: Brigham (Udorn control and reporting center) reported their VHF frequencies were saturated. The Nam Phong (Marine) aircrew representative wanted to conduct rendezvous by fighter-tanker back-up procedures because of communications saturation. It was also requested that tankers broadcast their positions from a TACAN station in the clear about every two or three minutes for post-strike refueling. (Several fighters had nearly run out of fuel during post-strike rendezvous.) The Teaball representative reported good communications and no MIG reaction because of weather. (On Day 4, Teaball experienced severe communications jamming, apparently originating from Hainan Island, China.)

(U) The comments by aircrew and staff representatives were typical, relating problems in all Linebacker II mission elements. Glaring planning errors, poor command and control procedures, and adverse weather conditions precluding effective bombing by LGB strike elements were all subjects to be reviewed and improved before the Hanoi strikes were to be resumed following a one-day standdown on 25 December. Aircrew comments received careful analysis and had great validity in measuring Linebacker II's effectiveness. The complaint of saturated communications was made at an Arc Light critique:[211]

> *No problems with the escort rendezvous were reported and apparently the use of a common strike/escort/bomber frequency has eliminated most of the problems with join-ups. . . . The serious problem of frequency saturation has been addressed repeatedly throughout all of Linebacker I and now again in Linebacker II. Frequency saturation nearly cost us an airplane on the Day 12 [Arc Light] mission. There have been missions where radio discipline was bad, particularly during Linebacker I and recently during the initial [Arc Light] Linebacker II missions. The last several [Arc Light] missions . . . have seen a vast improvement in individual flight radio discipline. The problem now seems to be the total number of aircraft on single frequencies.*

(S) Stereotyped ingress/egress maneuvers were rapidly assimilated into the daily frags, as was the single TOT B-52 strikes from multiple axes of attack. The planning concept of Linebacker II bombers on 26 December illustrates the new concept:[212]

> *Timing and altitude are very critical on this mission. . . . The altitudes listed in the route section [of the frag] are ingress altitudes and Commander 8AF is authorized to descend 1,000 feet at 120 seconds TTG [time-to-go] for Hanoi targets. . . . The Haiphong target descent will be started no later than 180 seconds TTG. Post target descent for all cells (Hanoi and Haiphong) is at the discretion of 8AF commander.*

(S) Improvements in the overall command and control system received compliments from aircrews and from General Vogt, 7th AF commander. Specific aircrew comments regarding Red Crown control indicated that Red Crown had done an outstanding job for both the fighters and bombers. Four Udorn MIGCAP flights received Red Crown vectors against MIGs, and one MIG was eventually shot down during the 28 December Linebacker II mission. The MIGCAP flight involved had received its initial vector immediately after ingress.[213]

(C) Command and control coordination was not a significant problem during Linebacker I because the areas of responsibility had long been divided by route packages. The Air Force operated in RPs 1, 5, and 6A, while the Navy operated in RPs 2, 3, 4, and 6B. Under these circumstances, the only problems were in limiting the respective forces' activities to their appointed areas. When Linebacker II commenced, however, a high degree of coordination had to be enforced, because all U.S. forces were concentrating their total effort in the small area of RPs 5, 6A, and 6B with emphasis on prime targets in the Hanoi-Haiphong complexes. The Saigon Coordinating Group (Navy liaison, SAC liaison, and the 7th AF commander) determined the level of participation when coordination was required. General Vogt's summary of the command and control function was simply stated: "I think command and control, and lessons learned, during Linebacker II have been taken seriously, and next time we would be able to do the job much better."[214]

(C) The overall PACAF evaluation of Linebacker II bombing effectiveness opened the door for continued improvements in all-weather bombing systems (LORAN), laser guided bombing during marginal weather conditions, and accurately determining the level of bomb damage as it is inflicted. General Vogt stressed the importance of verifying BDA in order to discredit any public outcry of intentional damage to non-military targets. During Linebacker, extensive BDA photographs were taken of every mission in RPs 5 and 6. General Vogt said of his BDA policy:[215]

I wanted to know precisely where every bomb had gone. . . . I can say with certainty that we knew where just about every bomb went in the two route pack areas. We persisted until we got the photography, even if it took a week or two.

(C) The BDA photography served a second useful purpose. It helped rate weapon systems against different types of targets. Poststrike analyses indicated that damage and disruption could have been much higher and more significant if these same targets had been struck with a short duration effort at the start of Linebacker I, a period just before the enemy's shift to truck movement and dispersed storage. The truck-oriented supply system which was developed in the heartland areas reduced the effect of massive B-52 bombing raids on the railroad yards and storage facilities during Linebacker II.[216]

(C) General employment of U.S. air power against existing North Vietnamese weapon systems (SAMs, MIGs, and AAA) was good. However, one old problem which hindered efficient targeting in air operations over Southeast Asia surfaced again during Linebacker II. There was a definite need for a single manager for air, a single command agency for air resources. This lack of a single responsible commander was thought to have degraded the specific capabilities of all-weather operations, area bombing, and pinpoint bombing. It was shown in a PACAF bombing survey of Linebacker II that a less-than-optimal mix of aircraft and ordnance had been used against specific target categories. "Additionally," according to PACAF, "the isolation of Navy strikes in Route Package 6B and Air Force TACAIR in Route Packages 5 and 6A prevented the optimal integration of forces and ordnance to maximize destruction in each of the areas."[217]

(U) The North Vietnamese moved to counter the massive Linebacker II raids, and their ability to field a suitable defensive team raised questions for planners of future air operations. The implication in the following remarks by Brigadier General Cross is clear:[218]

For every action that we took there was a reaction by the North Vietnamese. They never waited to make some corrective action when they felt like they had failed the course. . . . If they were provided even more modern equipment they could certainly be able to make us stop and think about the worth of our continued bombing of the North, because the SA-3 and SA-4 missile would present new and more complex problems to us and make our survivability more difficult in an unfriendly environment.

CONCLUSION

(U) While Hanoi anticipated an expansion of U.S. bombing (according to press reports and intelligence sources), the intensity of air strikes undoubtedly was greater than expected. Massive evacuations of Hanoi and Haiphong were reported, and there were indications that the people were anxious to leave the cities for the first time in the war. The intended objective, as stated by CINCPAC to COMUSMACV, had been achieved. U.S. forces had been ordered to "conduct maximum/combined TACAIR and B-52 sustained strikes in [the] NVN heartland [and to] strike targets that have [the] greatest military/psychological impact on NVN leaders and populace."[219]

(C) Although the psychological impact is difficult to measure, some indications were evident after U.S. air strikes in the Gia Lam area. Employees were seen wandering around completely disoriented and foreigners were permitted to walk anywhere in the airport area, which was normally restricted. Other reports indicated similar instances undoubtedly occurred throughout the target areas in Hanoi and Haiphong. Although the NVN leadership appeared to maintain control of the situation, all the facts point to Linebacker II as the one campaign which brought the North Vietnamese back to the conference table in Paris, according to a PACAF study.[220]

(U) During his press conference on 24 January 1973, presidential advisor Dr. Henry Kissinger was asked if Linebacker II was the key to achieving agreement. He answered: ". . .there was a deadlock. . .in the middle of December. . . . There was a rapid movement where negotiations resumed. . .on January 8. These facts have to be analyzed by each person for himself."[221]

NOTES

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2. "The 11-Day Air Campaign," Supplement to Air Force Policy Letter for Commanders, Jun 73, pp 22-25.

3. Hist (TS-NF-REVW 15 Jul 93), Hq MACV, Jan 72 - Mar 73, 15 Jul 73, I, B-9 (material used S) (hereinafter cited as MACV Hist).

4. Msg (TS-REVW 9 May 92), JCS to CINCPAC, subj: NVN Interdiction Program, 090247Z May 72 (material used U) (CMR TS-137, 20).

5. Msg (TS-REVW 14 May 92), 7AF to wings, subj: Linebacker Standing OpOrd, 141200Z May 72 (material used S) (CMR TS-137, 24).

6. Rprt (C-DECL 1 Mar 79), Proj CHECO, Rules of Engagement, November 1969 - September 1972, 1 Mar 73, pp 48-56.

7. Ibid, pp 50-56.

8. Msg (TS-REVW 10 May 92), CINCPACFLT to COMSEVENTHFLT, subj: NVN Interdiction Program, 100925Z May 72 (material used S) (CMR TS-139, 150).

9. Msg (TS-REVW 9 May 92), JCS to CINCPAC, subj: NVN Interdiction Plan, 092356Z May 72 (material used S) (CMR TS-137, 73).

10. Msg (TS-REVW 3 Jun 92), JCS to CINCPAC, subj: Linebacker, 030020Z Jun 72 (material used S) (CMR TS-140, 92).

11. Current History, Aug 72, p 92.

12. Msg (TS-REVW 4 Jun 92), CINCPAC to COMUSMACV, subj: Temporary Operating Authorities - SEAsia, 040425Z Jun 72 (material used S) (CMR TS-137, 68).

13. Rprt (TS-NF-REVW 30 Jun 92), Hq USAF/XO, subj: Rolling Thunder - Linebacker: A Preliminary Comparative Analysis, Jun 72, Tab 2 (material used S) (CMR TS-180, 11).

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17. Msg (TS-REVW 3 Sep 92*), CINCPAC to CINCPACFLT, subj: Linebacker/Prime Choke Extension, 030248Z Sep 72 (material used S).

18. Msg (TS-REVW 25 Sep 92*), 7AF/DO to wings, subj: Fragmentary Operations Order Special Instructions, 251135Z Sep 72 (material used S).

19. Msg (TS-REVW 11 Oct 92*), Adm Clarey to VAdm Holloway, 110915Z Oct 72 (material used S).

20. Msg (TS-REVW 22 Oct 92*), JCS to all AF units, subj: Operations in NVN, 221956Z Oct 72 (material used S).

21. Msg (U), CINCPAC to JCS, subj: Linebacker/Pocket Money Assessment, 050339Z Oct 72 (hereinafter cited as CINCPAC, Pocket Money Assessment) (CMR TS-168, 45).

22. Msg (U), 7AF/DO to CINCPACAF/DO, subj: Linebacker Intentions, 230829Z Aug 72 (CMR TS-184, 8).

23. Ibid.

24. Ibid.

25. Msg (U), CINCPAC to 7AF/CC, subj: SEADAB/OPREP-3 Reporting, 150345Z Jul 72.

26. Msg (TS-REVW 10 May 92), CINCPAC to CJCS, subj: NVN Interdiction Program CINCPAC Master Target List, 100427Z May 72 (material used S) (CMR TS-139, 149).

27. Msg (U), 7AF/DO to CINCPACAF/DO, subj: Linebacker Intentions, 230829Z Aug 72 (CMR TS-184, 8).

28. Msg (TS-REVW 22 Dec 92*), CINCPAC to COMUSMACV, subj: Operations in NVN, 222031Z Dec 72 (material used S).

29. Msg (TS-REVW 9 May 92), CINCPACFLT to COMSEVENTHFLT, subj: NVN Interdiction Program, 090745Z May 72 (material used S).

30. Msg (TS-REVW 25 Oct 92*), CINCPAC to CINCPACFLT, subj: Linebacker Target Validation, 250812Z Oct 72 (material used S).

31. Memo (U), 7AF/DO, Policy Memorandum No. 1, subj: Linebacker Target Selection Cycle, 11 Sep 72 (CMR TS-170, 194).

32. Msg (TS-REVW 29 Dec 92), CINCPACAF to 7AF/CC, subj: B-52 Strike Coordination, 290245Z Dec 72 (material used S) (CMR TS-184, 115); msg (TS-REVW 31 Dec 92*), 7AF/DO to PACAF/DO, subj: B-52 Strike Coordination, nd (material used S).

33. Msg (TS-REVW 2 Aug 92), CINCPAC to CINCPACFLT, subj: Linebacker Target Priorities, 022211Z Aug 72 (material used S) (CMR TS-184, 9).

34. Ibid.

35. Msg (TS-REVW 4 Jan 92), CINCPAC to all AF units, subj: Temporary Operating Authorities - SEAsia, 040425Z Jan 72 (material used S) (CMR TS-137, 67).

36. CINCPAC, Pocket Money Assessment.

37. Ibid.

38. Ibid.

39. Msg (U), CINCPAC to CINCPACFLT & CINCPACAF, subj: Air Intentions Message Number Two, 260330Z Oct 72 (CMR TS-180, 125).

40. Msg (U), CINCPACAF to 7AF/CC, subj: KC-135 Utilization, 020340Z Dec 72 (CMR TS-170, 196).

41. Msg (U), CINCPACAF to 13AF, subj: Thailand Tanker Beddown, 140342Z Oct 72 (CMR TS-160, 110).

42. Intv (U), Proj CHECO Staff with Brig Gen Richard G. Cross, Jr., MACV/Asst DO, 18 Dec 72 (hereinafter cited as Cross Intv) (CMR S-899, 164).

43. Briefing (U), MACV/DO-211, subj: 7AF Air Operations, 2 Oct 72 (hereinafter cited as MACV Briefing, 2 Oct 72) (CMR TS-180, 104).

44. Draft 7AF OPlan 715 (TS-REVW 1 Nov 92*), ca 1 Nov 72 (material used U) (hereinafter cited as Draft 7AF OPlan 715) (CMR TS-180, 131).

45. Briefing (U), MACV/DO-223, subj: Counteroffensive Operations Summary, 5 Sep 72 (CMR TS-180, 103).

46. Draft 7AF OPlan 715 (material used U).

47. Msg (U), CINCPACAF/XP to 7AF/CC, subj: Constant Guard VI, 230410Z Sep 72 (CMR TS-180, 165).

48. Msg (TS-REVW 2 Nov 92), CINCPACAF/DO to CINCPAC, subj: PACAF OPlan C-101, Commando Flash, 022202Z Nov 72 (material used S) (CMR TS-180, 118); msg (TS-REVW 2 Nov 92), CINCPACAF/DO to CINCPAC, subj: PACAF OPlan C-102, Commando Hawk, 022201Z Nov 72 (material used S) (CMR TS-180, 117); msg (TS-REVW 2 Nov 92), subj: PACAF OPlan C-103, Commando Fly, 022200Z Nov 72 (material used S) (CMR TS-180, 120).

49. Msg (U), CINCPACAF/CC to CINCPAC, subj: Contingency Withdrawal Planning, 010810Z Nov 72 (CMR TS-180, 122); msg (U), CINCPACAF/CC to 7AF/CC, subj: Contingency Withdrawal Planning, 030200Z Nov 72 (CMR TS-180, 123); msg (U), CINCPACAF to CSAF, subj: PACAF F-4 Redeployment and Beddown, 231035Z Dec 72 (CMR TS-180, 144).

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51. Cross Intv.

52. MACV Hist, I, B-39 (material used C-DECL 15 Jul 79).

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59. Draft 7AF OPlan 715 (material used U)

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62. Msg (TS-REVW 27 Dec 92), CINCPACFLT to COMSEVENTHFLT, subj: Linebacker II, 270945Z Dec 72 (material used S) (CMR TS-184, 115).

63. Msg (TS-REVW 27 Dec 92), CINCSAC to CINCPAC, subj: Linebacker II, 272245Z Dec 72 (material used S) (CMR TS-184, 86).

64. Msg (TS-REVW 11 Aug 92*), CINCPACAF to 7AF/CC, subj: Linebacker Operations, 112151Z Aug 72 (material used S); msg (TS-REVW 17 Aug 92*), 7AF/CC to CINCPACAF, subj: Linebacker Operations, 170736Z Aug 72 (material used S).

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87. Msg (U), 8TFW/DO to 13AF/DO, subj: Escort Tactics, 231045Z Aug 72 (CMR S-789, 154).

88. Olshefski Intv.

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92. Msg (U), COMUSMACV to AIG 0294, subj: Linebacker Refueling Support Frag Order, 300353Z Aug 72 (CMR TS-181, 66).

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114. CHECO, F-111 in SEA, pp 26-28.

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116. PACAF, Concept for F-111 Employment, p II-3.

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118. Msg (U), 7AF/DO to AIG 7939, subj: Change to SPINS and Route Planning Information, 210959Z Oct 72 (CMR TS-184, 12).

119. Msg (U), CINCPACAF to 7AF, subj: F-111 Operations, 230330Z Dec 72 (CMR TS-184, 86); msg (U), 7AF to CINCPACAF, subj: F-111 Operations, 251040Z Dec 72 (CMR TS-184, 86).

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122. CHECO, F-111 in SEA, p 63.

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217. Ibid, p 35.

218. Cross Intv.

219. Msg (U), CINCPAC to COMUSMACV, subj: Air Intentions Message Number Six, 150101Z Dec 72 (CMR TS-180, 129).

220. PACAF, Linebacker II Bombing Survey, p 37.

221. "SAC Chief Lauds US Raids," Pacific Stars and Stripes, 24 Mar 73, p 23.

*Ed note: Most restrictive of declassification rules under EO 12065 applied to documents for which regrading instructions could not be confirmed.

GLOSSARY

AAA	antiaircraft artillery
AB	air base
ABCCC	airborne battlefield command and control center
ACM	air combat maneuvering
ADVON	advanced echelon
AF	Air Force
AFB	Air Force Base
AGM	air-to-ground missile
AIG	address indicating group
AIM	air intercept missile
AOA	air operating authorities
ARM	anti-radiation missile
AWACS	airborne warning and control system
BARCAP	barrier combat air patrol
BDA	bomb damage assessment
Blue Chip	7AF command and control center which controlled out-country combat operations
Brigham	radar control and reporting center which was located at Udorn RTAFB
CAP	combat air patrol, an aircraft patrol provided over an objective area, over the force protected, over the critical area of a combat zone, or over an air defense area, for the purpose of destroying hostile aircraft before they reach their target
CBU	cluster bomb unit
CCK	Ching Chuan Kang (AB, Taiwan)
CEA	circular error average, arithmetic average of the circular error of all munitions delivered on a particular target
CEP	circular error probable, an indicator of the accuracy of munitions delivery; the radius of a circle within which half of all munitions expended are expected to fall
CETF	College Eye Task Force, EC-121D aircraft which provided airborne navigational assistance and/or border warnings by use of IFF/SIF, and MIG warnings to friendly aircraft
CHECO	Contemporary Historical Examination of Current Operations
CINCPAC	Commander in Chief, Pacific Command
CINCPACAF	Commander in Chief, Pacific Air Forces
CINCPACFLT	Commander in Chief, Pacific Fleet
CINCSAC	Commander in Chief, Strategic Air Command
CJCS	Chairman, Joint Chiefs of Staff
CMR	CHECO microfilm roll

COA	confirmed (SAM) operating area
COM	commander
COMUSMACV	Commander, US Military Assistance Command, Vietnam
CONUS	continental United States
COS	confirmed (SAM) operating site
CSAF	Chief of Staff, US Air Force
CTF	commander task force
CVA	attack aircraft carrier (US Navy)
DASC	direct air support center
DCS	deputy chief of staff
D/D	destroyed/damaged
DECL	declassify (on:)
DMZ	demilitarized zone
DO	director of operations
DR	dead reckoning
ECM	electronic countermeasures
ELINT	electronic intelligence
EOGB	electro-optical guided bomb
EW	electronic warfare; early warning (radar)
FAC	forward air controller
frag	fragmentary operations order
G	gravity
GCI	ground-controlled intercept (radar)
H	HOTEL time zone (Greenwich mean time + 8 hours, as in South Vietnam)
HF	high frequency
IFF/SIF	identification, friend or foe/selective identification feature
IFR	instrument flight rules
IMC	instrument meteorological conditions
in-country	that part of the SEA conflict within South Vietnam
Invert	control and reporting post which was located at Nakhon Phanom RTAFB
JCS	Joint Chiefs of Staff
KCAS	knots calibrated air speed
KTAS	knots true air speed
LASER	light amplification by stimulated emission of radiation
LOC	line(s) of communication
LOP	(LORAN) line of position
LORAN	Long-range navigation

LT GAP	LORAN targeting (through) grid annotated photography
MHz	megahertz
MIG	Soviet fighter aircraft designed by Mikoyan and Gurevich
Monkey Mountain	a radar, communications, and electronics complex which was located near Da Nang AB, RVN
MR	military region (of South Vietnam)
MSQ-77	MSQ-35 radar bomb scoring equipment modified for radar guidance of bombers
nd	no date
NF	not releasable to foreign nationals
NGFS	naval gunfire support
NKP	Nakhon Phanom (RTAFB, Thailand)
NM	nautical mile
NVN	North Vietnam(ese)
out-country	that part of the SEA conflict outside the borders of South Vietnam
PACAF	Pacific Air Forces
PACFLT	Pacific Fleet
PACOM	Pacific Command
Pave Phantom	LORAN equipped F-4 aircraft
pod formation	a two- or four-ship fighter formation which was flown in such a manner that the ECM pods on each aircraft offered mutual ECM protection
POL	petroleum, oil, and lubricants
POW	prisoner of war
PRC	People's Republic of China
QRF	quick reaction force
Red Crown	US Navy destroyer on station in the northern part of the Gulf of Tonkin for radar surveillance
RESCAP	rescue combat air patrol
REVW	review (for declassification on:)
RHAW	radar homing and warning
RITS	reconnaissance intelligence technical squadron
ROE	rules of engagement
RP	route package (area, of North Vietnam)
RTAFB	Royal Thai Air Force Base
RVN	Republic of Vietnam
SAC	Strategic Air Command
SAM	surface-to-air missile
SAR	search and rescue
SEA	Southeast Asia
Sentinel Lock	a method of determining LORAN coordinates

7AF	Seventh Air Force
Shrike	AGM-45A, a passive homing anti-radar air-to-surface missile designed for use against hostile gun- or missile-directing radar
Snakeye	bomb fin structure providing high-drag ballistics
SPINS	special instructions (in a frag)
Standard ARM	AGM-78B anti-radiation missile
SVN	South Vietnam(ese)
TACAIR	tactical air
TACS	tactical air control system
TCS	tactical control squadron
TD	(LORAN) time delay
TDY	temporary duty
TESS	test squadron
TFR	terrain following radar
TFW	tactical fighter wing
TG	(seconds) to go (before release)
TOT	time over target
TRS	tactical reconnaissance squadron
TRW	tactical reconnaissance wing
TSP	transshipment point
TTG	time to go (before release)
UHF	ultra-high frequency
USAF	United States Air Force
USMC	United States Marine Corps
USN	United States Navy
USSAG	United States Support Activities Group
USSR	Union of Soviet Socialist Republics
VHF	very high frequency
WCC	weapons control center
WS	weather squadron
XP	(Deputy Chief of Staff) Plans
Z	ZULU (Greenwich mean time)

APPENDIX 1

CHRONOLOGY OF MAJOR EVENTS
(September 1972 - January 1973)

1972

11 Sep — USAF jets again destroyed the Paul Doumer Bridge in Hanoi, just as repairs were nearing completion.

18 Sep — US Seventh Fleet off-shore strength in Gulf of Tonkin was announced at 39,000.

28 Sep — USAF F-111s returned to combat for the first time since 1968.

30 Sep — US troop strength in South Vietnam was reduced to 35,500.

8 Oct — B-52s struck a supply buildup near Vinh in the deepest raids into North Vietnam in 6 months.

16 Oct — The US reported that 400 fighter bombers struck NVN yesterday in the second heaviest bombing of 1972.

23 Oct — B-52s did not bomb NVN, for the first time in 18 days; TACAIR strikes were at the lowest level in 3 weeks.

27 Oct — Defense Secretary Melvin Laird announced a halt to bombing above the 20th parallel in NVN, in response to NVN's indicated willingness to sign a peace agreement in Paris.

31 Oct — B-52s staged the heaviest raids in 3 months over NVN, south of the 20th parallel.

US troop strength in SVN was reduced to 32,200.

1 Nov — NVN announced there would be no further peace talks in Paris until the US signed the draft cease-fire agreement.

22 Nov — The first B-52 combat loss of the Vietnam War occurred when one was hit by a SAM near Vinh.

30 Nov — US troop strength in SVN was reduced to 25,500.

18 Dec — President Nixon ordered a resumption of bombing north of the 20 parallel, suspended since 27 October.

26 Dec — Bombing of NVN continued after a 36-hour Christmas pause.

30 Dec — President Nixon announced a halt to bombing of NVN above the 20th parallel.

31 Dec — Revised figures of Linebacker II (18-29 December) showed a total of 15 B-52s lost and 12 other aircraft shot down.

US troop strength in SVN was reduced to 24,000.

1973

8 Jan — Serious private negotiations resumed between Henry Kissinger and Le Duc Tho in Paris.

15 Jan — President Nixon ordered that bombing, shelling, and mining be suspended over all of NVN.

27 Jan — In Paris, US, North Vietnamese, South Vietnamese, and Viet Cong delegates signed a cease-fire agreement to end the war and restore peace in South Vietnam. It became effective at 2400Z (0800 on 28 January, SVN time).

APPENDIX 2

NORTH VIETNAM SORTIE SUMMARY

Type Sortie	May 72	Jun 72	Jul 72	Aug 72	Sep 72
USN Attack	3,920	4,151	4,175	4,746	3,937
USAF Attack	1,919	2,125	2,310	2,112	2,297
USMC Attack	23	34	8	38	102
TOTAL Attack	5,862	6,310	6,493	6,896	6,336
TOTAL Sorties*	10,982	12,121	12,879	13,316	13,233
B-52	1	271	308	572	411

	Oct 72	Nov 72	Dec 72	Jan 73
USN Attack	2,674	1,716	1,383	863
USAF Attack	2,214	1,606	1,548	716
USMC Attack	84	79	119	50
TOTAL Attack	4,999	3,401	3,050	1,629
TOTAL Sorties*	11,368	8,909	7,894	6,731
B-52	616	846	1,381	535

*Excludes B-52 sorties.

Linebacker operations officially commenced on 10 May and terminated on 29 December 1972.

Source: Hist, MACV, Jan 72 - Mar 73, I, B-19 (material used S-REVW 15 Jul 93).

APPENDIX 3

LASER GUIDED BOMBS
Effects of Threat Level on Operational Effectiveness

	Target Area and Percent Effective				
Bridge Target	Khmer, Laos, SVN MR II-IV	SVN MR I	NVN RP 1	NVN RP 2-5	NVN RP 6
D/D per Target Attacked	.96	.87	.74	.77	.56
D/D per Sortie	.76	.70	.67	.37	.16
D/D per Bomb	.45	.40	.36	.21	.10

D/D - Destroyed or damaged.

Source: Rprt (C-DECL 28 Jun 79), Hq 7AF/Tac Anal Div, subj: Analysis of Laser Guided Bombs in SEA, 28 Jun 73, p 26.

APPENDIX 4

USAF AIRCRAFT LOSSES TO MIGS
(May - September 1972)

By Mission Function		By Month	
MIGCAP	6 F-4	May 72	5 F-4, 1 F-105
Strike Escort	6 F-4	Jun 72	7 F-4
Chaff Escort	3 F-4	Jul 72	5 F-4
Chaff	2 F-4	Aug 72	None
Strike	1 F-4	Sep 72	1 F-4
SAM Suppression	1 F-105		

Source: Rprt (U), Hq PACAF/OA, Analytical Notes on Support/Strike Ratios, 11 Oct 72.

APPENDIX 5

LINEBACKER II AIRCRAFT LOSSES
(18-29 Dec 72)

Date/Time	Type	Call Sign	Target	Cause
18/1300Z	F-111A	Snug 40	Hanoi Radio	Unknown
18/1317Z	B-52G	Charcoal 01	Yen Vien Complex	SA-2
18/1701Z	B-52G	Peach 02	Yen Vien Complex	SA-2
18/2200Z	A-7C*	Streetcar 303	(Iron Hand)	SA-2
18/2205Z	B-52D	Rose 01	Hanoi Radio	SA-2
20/1310Z	B-52D	Quilt 03	Yen Vien Complex	SA-2
20/1321Z	B-52G	Brass 02	Yen Vien Complex	SA-2
20/1332Z	B-52G	Orange 03	Yen Vien Complex	SA-2
20/1656Z	A-6A*	Milestone 511	Cat Bi Airfield	SA-2
20/2205Z	B-52D	Straw 02	Gia Lam RR Yard	SA-2
20/2213Z	B-52G	Olive 01	Kinh No Complex	SA-2
20/2219Z	B-52G	Tan 03	Kinh No Complex	SA-2
21/1110Z	A-6A*	Flying Ace 500	SAM Site/Port Fac	AAA
21/2045Z	B-52D	Scarlet 03	Bac Mai Airfield	SA-2
21/2046Z	B-52D	Blue 01	Bac Mai Airfield	SA-2
22/1438Z	F-111A	Jackle 33	Hanoi Port Fac	Unknown
23/	EB-66C	Hunt 02	(non-combat loss)	Eng failure
23/0903Z	F-4J*		(photo escort)	AAA
24/0402Z	A-7E*	Battle Cry 314	SAM site	Susp AAA
26/1504Z	B-52D	Ebony 02	Giap Nhi RR Yd	SA-2
26/1544Z	B-52D	Ash 01	Kinh No Complex	SA-2
27/0620Z	F-4E	DeSoto 03	(strike escort)	MIG-21
27/0646Z	F-4E	Vega 02	(MIGCAP)	MIG-21
27/0830Z	HH-53	Jolly Green	(rescue)	Small arms
27/1600Z	B-52D	Ash 02	VN-243 SAM site	SA-2
27/1603Z	B-52D	Cobalt 02	Truang Quan RR Yd	SA-2
28/0415Z	RA-5C*	Flint River 603	(photo recce)	MIG-21

*USN/USMC

Source: Rprt (S-REVW 31 Mar 93), Hq PACAF/OA, subj: Linebacker II Air Operations Summary (18-29 Dec 72), Mar 73.

APPENDIX 6

USAF LINEBACKER II STRIKES

Target	No/Type Acft	TOT (ZULU)	Reported BDA
Day 1 (18 Dec 72)			
Kinh No Complex	36/B-52	1301-1311	Numerous SE
		1717-1719	
		2222-2228	
Yen Vien Complex	27/B-52	1314-1318	Numerous SE
Hoa Lac Afld	6/B-52	1245-1247	4xSE
Kep Afld	9/B-52	1249-1253	3xSE
Phuc Yen Afld	6/B-52	1255-1257	13xSE
Gia Lam RR Yd	24/B-52	1704-1706	None
		2207-2217	
Hanoi Radio	21/B-52	2150-2202	None
Yen Bai Afld	3/F-111	1210	Not obs
		1225	Not obs
		1244	Not obs
Hoa Lac Afld	1/F-111	1210	Not obs
Phuc Yen Afld	2/F-111	1210	Not obs
		1225	Not obs
Kep Afld	2/F-111	1210	Not obs
Lang Truoc Rad Transm	1/F-111	1328	Not obs
Hanoi/Bac Mai Afld	2/F-111	1337	Not obs
		1607	2xSE
Hanoi Port Fac	2/F-111	1430	Not obs
		1820	1xSE
Hanoi Transf Stn	1/F-111	1848	Not obs
Bac Giang TPP	1/F-111	2105	Not obs
Day 2 (19 Dec 72)			
Hanoi Rad Transm 2	16/F-4	0515	Not obs - LORAN
Hanoi Int Rad Transm	12/F-4	0510	Not obs - LORAN
Yen Bai Afld	20/A-7	0453	Not obs - LORAN
	(4/F-4 pathfinders, no ordnance)		
Bac Giang TSP	21/B-52	1650-1715	100xSE
Kinh No Complex	21/B-52	1310-1322	Not obs
Hanoi Radio	15/B-52	1650-1710	Not obs
Yen Vien Complex	9/B-52	2210-2218	Not obs
Thai Nguyen TPP	27/B-52	2222-2250	Not obs
Yen Bai Afld	1/F-111	1300	Not obs
Hoa Lac Afld	1/F-111	1250	Not obs
Phuc Yen Afld	1/F-111	1251	Not obs
Kep Afld	1/F-111	1250	Not obs
Bac Giang TPP	4/F-111	1346	Not obs
		1639	Not obs
		1858	Not obs
		2100	Not obs

APPENDIX 6 (cont)

Target	No/Type Acft	TOT (ZULU)	Reported BDA
Day 2 (cont)			
Hanoi Rad Transm 2	3/F-111	1426	Not obs
		1736	Not obs
		2108	Not obs
Lang Truoc Rad Transm	4/F-111	1437	Not obs
		1612	Not obs
		1822	Not obs
		2027	Not obs
Hanoi Int Rad Transm	3/F-111	1448	Not obs
		1550	Not obs
		1755	Not obs
Hanoi Port Fac	4/F-111	1459	Not obs
		1538	Not obs
		1833	Not obs
		1938	1xLSE
Hanoi Bac Mai Afld	3/F-111	1520	Not obs
		1945	Not obs
		1615	1xLSE
Hanoi Transf Stn	3/F-111	1620	Not obs
		1840	Not obs
		1933	Not obs
Day 3 (20 Dec 72)			
Hanoi Transf Stn	20/F-4	0540	Not obs - LORAN
Lang Truoc Rad Transm	28/F-4	0540	Not obs - LORAN
Yen Bai Afld	20/A-7	0530	Not obs - LORAN
	4/F-4		
Gia Lam RR Yd	21/B-52	1300-1304	Numerous SE
		1715-1719	
		2200-2208	
Yen Vien Complex	27/B-52	1309-1342	7xSE
Thai Nguyen TPP	15/B-52	1723-1739	4xSE
Bac Giang TSP	12/B-52	1749-1753	Numerous SE
		2248-2252	
Kinh No Complex	12/B-52	2212-2224	9xSE
Hanoi	12/B-52	2229-2241	Numerous SE
Bac Giang TPP	3/F-111	1156	Not obs
		1359	Not obs
		1905	Not obs
Hanoi Bac Mai Afld	3/F-111	1272	Not obs
		1501	Not obs
		2031	Not obs
Hoa Lac Afld	1/F-111	1240	Not obs
Phuc Yen Afld	1/F-111	1240	Not obs
Kep Afld	1/F-111	1240	Not obs
Hanoi Port Fac	3/F-111	1429	1xSE
		1921	
		2145	

APPENDIX 6 (cont)

Target	No/Type Acft	TOT (ZULU)	Reported BDA
Day 4 (21 Dec 72)			
Trung Quang RR Yd	16/F-4	0602	Not obs - LORAN
Giap Nhi RR Yd	24/A-7	0610	4xLSE
	4/F-4		2xLSE
			Numerous POL fires, rolling stk D/D
Duc Noi RR Yd	12/F-4	0606	3xLSE, w/smoke to 7-9,000 ft
Hanoi TPP	4/F-4 LGB	0605	6 LGB on tgt, 2 50-ft miss, results not obs
Hanoi RR Stn/Yd	4/F-4 LGB	0610	All on tgt, 2xLSE, rail cuts
Hanoi AM Rad Transm	4/F-4 LGB	0600	All on tgt; control bldg dest
Quang Te Afld	6/B-52	2033-2034	Not obs
Van Dien Sup Dep	12/B-52	2036-2041	1xSE
Bac Mai Stor	12/B-52	2043-2048	2xLSE, 1-10xSE
Bac Giang RR Yd	3/F-111	1122	Not obs
		1530	Not obs
		1913	1xLSE
Hanoi Bac Mai Alfd	2/F-111	1157	Not obs
		1649	Not obs
Viet Tri TSP	2/F-111	1508	2xLSE
		1836	Not obs
Kep RR Yd	2/F-111	1231	Not obs
		1548	Not obs
Hanoi Port Fac	2/F-111	1512	1xMSE
		1957	1xLSE
Hoa Lac Afld	1/F-111	2013	Not obs
Kep Afld	1/F-111	2013	Not obs
Phuc Yen Afld	1/F-111	2013	Not obs
Yen Bai Afld	1/F-111	2013	Not obs
Day 5 (22 Dec 72)			
Viet Tri TSP	24/A-7	0649	Not obs - LORAN
	2/F-4		
Bac Giang RR Sdg	16/F-4	0704	Not obs - LORAN
Kep RR Sdg	16/F-4	0700	Not obs - LORAN
Haiphong RR Sdg	12/B-52	2150-2156	30xSE
Haiphong POL Stor	18/B-52	2210-2214	Numerous SE
Yen Bai Afld	1/F-111	2200	Not obs
Kep Afld	2/F-111	2138	Not obs
		1803	1xSSE
Hoa Lac Afld	1/F-111	2132	Not obs

APPENDIX 6 (cont)

Target	No/Type Acft	TOT (ZULU)	Reported BDA
Day 5 (cont)			
Phuc Yen Afld	1/F-111	2130	Not obs
Hanoi Transf Stn	2/F-111	1155	Not obs
		2121	Not obs
Hanoi Rad Transm 2	2/F-111	1214	Not obs
		1749	Not obs
Hanoi Stor, Gia Thuong	3/F-111	1251	Not obs
		1603	Not obs
		2222	Not obs
Lang Truoc Rad Transm	2/F-111	1403	Not obs
		1828	1xSE
Bac Giang TSP	1/F-111	1520	Not obs
Day 6 (23 Dec 72)			
Hoa Lac Afld	24/A-7	0710	Not obs - LORAN
	4/F-4		
Hanoi Int Rad Transm	32/F-4	0657	Not obs - LORAN
VN 537 SAM Site	2/B-52	1210-1212	Not obs
VN 660 SAM Site	2/B-52	1210-1212	Not obs
VN 563 SAM Site	2/B-52	1210-1212	Not obs
Lang Dang RR Yd	24/B-52	1215-1232	Not obs
Yen Bai Afld	1/F-111	1150	Not obs
Kep Afld	1/F-111	1150	Not obs
Phuc Yen Afld	1/F-111	1148	Not obs
Duc Noi RR Yd	1/F-111	1309	Not obs
Bac Giang TSP	2/F-111	1326	Not obs
		1755	Not obs
Lang Truoc Radcom	1/F-111	1436	Not obs
Trung Quang RR Yd	2/F-111	1514	Not obs
		1822	Not obs
Cao Nung RR Br	2/F-111	1528	1xSE
		1848	Not obs
Hanoi Rad Transm 2	1/F-111	1600	1xSSE
Day 7 (24 Dec 72)			
Bac Giang TPP	15/F-4	0503	Not obs - LORAN
Thai Nguyen TPP	15/F-4	0503	Not obs - LORAN
Kep RR Yd	12/B-52	1250-1257	Not obs
Thai Nguyen RR Yd	18/B-52	1257-1310	Not obs
Kep Afld	1/F-111	1230	Not obs
Phuc Yen Afld	1/F-111	1235	Not obs
Yen Bai Afld	1/F-111	1230	Not obs

Day 8 (25 Dec 72 - Christmas standdown)

APPENDIX 6 (cont)

Target	No/Type Acft	TOT (ZULU)	Reported BDA
Day 9 (26 Dec 72)			
Hanoi Transf Stn	32/A-7	0630	Not obs - LORAN
Dong An	8/F-4		
Gia Lam RR Yd	9/B-52	1530-1536	2xSE
Hanoi POL Stor Than Am, Hanoi Stor area Gia Thuong	9/B-52	1538-1545	8xSE
Thai Nguyen RR Yd	18/B-52	1530-1545	Not obs
Van Dien Army Sup	18/B-52	1530-1545	Not obs
Giap Nhi RR Yd	18/B-52	1530-1545	Not obs
Duc Noi RR Yd	9/B-52	1530-1535	Not obs
Kinh No Complex	9/B-52	1537-1545	Not obs
Haiphong RR Sdg	15/B-52	1530-1542	6xSE
Haiphong Transf Stn	15/B-52	1530-1542	26xSE
Yen Bai Afld	1/F-111	1515	Not obs
Kep Afld	1/F-111	1515	Not obs
Hoa Lac Afld	1/F-111	1515	Not obs
Phuc Yen Afld	1/F-111	1515	2xLSE
Lang Lau RR Br	1/F-111	1226	Not obs
Bac Giang RR Yd	1/F-111	1350	Not obs
Viet Tri TSP	1/F-111	1446	2xLSE
Kep RR Yd	1/F-111	1757	Not obs
Hanoi Int Rad Transm	1/F-111	1835	Not obs
Bac Giang TSP South	1/F-111	2019	Not obs
Day 10 (27 Dec 72)			
Hanoi AM Transm Me Tri	4/F-4	0640	Miss
Hanoi Int Rad Transm	8/F-4	0640	Dest
	10/A-7		
Hanoi Int Radcom 2	7/F-4	0642	3xSE
	16/A-7		Dest
Van Dien Sup Dep	9/B-52	1602-1609	4xSE
Lang Dang RR Yd	21/B-52	1600-1612	25xSE
Duc Noi RR Yd	9/B-52	1603-1609	5xSE
Trung Quan RR Yd	12/B-52	1600-1609	30xSE
VN 234 SAM Site	3/B-52	1559	Not obs
VN 243 SAM Site	3/B-52	1600	Not obs
VN 549 SAM Site	3/B-52	1600	Not obs
Bac Giang RR Yd	1/F-111	1730	Not obs
Hanoi Rad Rcvr	1/F-111	1739	Not obs
Hanoi SAM Site VN 549	1/F-111	1537	Not obs
Lang Lau RR Br	1/F-111	1354	Not obs
Cao Nung RR Br	1/F-111	1405	Not obs
Kep RR Yd	1/F-111	1452	Not obs
Lang Truoc Radcom	2/F-111	1526	Not obs
		1727	Not obs

APPENDIX 6 (cont)

Target	No/Type Acft	TOT (ZULU)	Reported BDA
Day 10 (cont)			
Viet Tri TSP	2/F-111	1313	Not obs
		1731	Not obs
Kep Afld	2/F-111	1206	Not obs
		1820	Not obs
Hoa Lac Afld	2/F-111	1214	Not obs
		1543	Not obs
Day 11 (28 Dec 72)			
Hanoi RR/Hwy Br ov Canal	4/F-4	0559	Dmg
Hanoi Stor Quinh Loi	8/F-4	0606	Not obs (1/2 ea
	32/A-7		visual & LORAN)
Lang Dang RR Yd	24/B-52	1515-1539	8xSE
Phuc Yen SAM Spt Fac	18/B-52	1515-1523	20xSE
Duc Noi Stor	12/B-52	1519-1523	Numerous SE
VN 266 SAM Site	3/B-52	1515	
VN 158 SAM Site	3/B-52	1515	7xSE
Lang Truoc Radcom	1/F-111	1331	Not obs
Bac Giang RR Yd	1/F-111	1330	Not obs
Thai Nguyen TPP	1/F-111	1406	Not obs
Kep Afld	1/F-111	1436	Not obs
Phuc Yen Afld	1/F-111	1444	Not obs
Yen Bai Afld	1/F-111	1442	Not obs
VN 266 SAM Site	1/F-111	1540	1xLSE
VN 119 SAM Site	1/F-111	1652	Not obs
VN 159 SAM Site	1/F-111	1453	2xLSE, num SE
VN 014 SAM Site	1/F-111	1459	Not obs
VN 004 SAM Site	1/F-111	1459	Not obs
VN 186 SAM Site	1/F-111	1500	Not obs
Viet Tri RR Yd	1/F-111	1638	Not obs
Viet Tri TPP	1/F-111	1824	Not obs
Trai Ca SAM Spt Fac	8/F-4	0212	Not obs
	32/A-7		
Phuc Yen SAM Stor	23/B-52	1620-1626	Not obs
Lang Dang RR Yd	17/B-52	1620-1638	Not obs
Trai Ca SAM Spt Fac	15/B-52	1636-1644	Not obs
Kep Afld	1/F-111	1540	Not obs
Hoa Lac Afld	1/F-111	1622	Not obs
Yen Bai Afld	1/F-111	1543	Not obs
VN 159 SAM Site	1/F-111	1553	Not obs
SAM Site	1/F-111	1551	Not obs

S-small, M-medium, L-large, SE-secondary explosion, D/D-destroyed or damaged, Rad-radio, TPP-thermal power plant, TSP-transhipment point.

Source: Rprt (S-REVW 31 Mar 93), Hq PACAF/OA, subj: Linebacker II Air Operations Summary (18-29 Dec 72), Mar 73.

APPENDIX 7

LINEBACKER II PHASE I (18-20 DEC 72)
USAF Night B-52 and Support Sorties

Day 1	B-52	SAM Suppression F-105	SAM Suppression F-4	CAP/ Escort	Chaff	Total
Wave 1	48	5	4	20	4	81
Wave 2	30	8	0	20	10	68
Wave 3	51	0	0	23	8	82
Day 2						
Wave 1	21	5	4	21	8	59
Wave 2	36	10	0	20	8	74
Wave 3	36	0	0	20	8	64
Day 3						
Wave 1	33	4	4	18	8	67
Wave 2	27	10	0	18	4	59
Wave 3	39	0	0	19	14	72
TOTAL	321*	42	12	179	72	626

*Scheduled; only 314 B-52 sorties were actually flown.

USN/USMC night sorties for Day 1/2/3 were: 34/41/21 A-6, 9/26/19 A-7, and 0/10/0 F-4; total 43/77/40.

LINEBACKER II PHASE II (21-24 DEC 72)
USAF Night B-52 and Support Sorties

Day	B-52	SAM Suppression F-105	SAM Suppression F-4C	SAM Suppression F-4E	CAP/ Escort	Chaff	Total
4	30	4	4	5	23	9	75
5	30	4	6	5	27	15	87
6	30	7	2	4	12	3	58
7	30	7	4	5	22	16	84
TOTAL	120	22	16	19	84	43	304

USN/USMC night sorties for Day 4/5/6/7 were: 9/14/14/3 A-6, 6/4/0/2 A-7, 0/0/0/4 F-4; total 13/20/14/9.

APPENDIX 7 (cont.)

LINEBACKER II PHASE III (26-29 DEC 72)
USAF Night B-52 and Support Sorties

Day	B-52	SAM Suppression F-105	F-4C	F-4E	CAP/ Escort	Chaff	Total
9	120	9	4	5	34	23	195
10	60	14	4	5	32	23	138
11	60	6	1	0	28	23	118
12	60	6	3	2	33	25	129
TOTAL	300*	35	12	12	127	94	580

*Scheduled; only 295 B-52 sorties were actually flown.

USN/USMC night sorties for Day 9/10/11/12 were: 10/3/14/9 A-6, 11/1/6/3 A-7, and 0/0/2/2 F-4; total 21/4/22/14.

LINEBACKER II (18-29 DEC 72)
USAF Day Support Sorties

Day	SAM Suppression F-105*	F-4*	CAP/ Escort	Chaff	Other F-4	A-7	Total
1	0/0	0/0	0	0	0	0	0
2	6/6	6/0	24	12	6	0	54
3	6/4	6/6	31	8	0	0	51
4	8/5	8/8	36	8	0	0	60
5	8/4	8/2	34	12	0	0	62
6	8/4	8/0	18	4	0	0	38
7	5/2	4/0	24	8	0	4	45
8	----------	----------	(Christmas standdown)				----------
9	6/6	5/0	24	8	0	9	52
10	6/4	5/5	34	8	10	12	75
11	5/2	6/6	26	8	0	0	45
12	6/0	6/0	22	9	0	5	48
TOTAL	64/37	62/27	273	85	16	30	530

*Flown/expended

Source: Rprt (S-REVW 31 Mar 93), Hq PACAF/OA, subj: Linebacker II Air Operations Summary (18-29 Dec 72), Mar 73.

APPENDIX 8

NVN AIR ORDER OF BATTLE

Airfield	MIG-21	MIG-19	MIG-15/17
(10 May 72)			
Bai Thuong	2	0	0
Dong Suong	0	0	12
Kep	46	1	0
Kien An	12	0	0
Phuc Yen	8	0	49
Quan Lang	0	0	3
Yen Bai	25	32	14
TOTAL	93	33	78
(15 Oct 72)			
Dong Suong	13	0	0
Gia Lam	4	2	5
Hoa Lac	2	3	0
Kep	4	3	27
Kien An	0	0	4
Phuc Yen	8	4	8
Quan Lang	1	0	0
Yen Bai	7	28	22
TOTAL	39	40	66
(28 Jan 73)			
Bai Thuong	6	0	0
Dong Suong	12*	0	0
Kep	0	1	44
Kien An	0	0	6
Phuc Yen	49	0	2
Quan Lang	1	0	0
Yen Bai	18*	32	25
Gia Lam	0	0	6
TOTAL	86	33	83

*Aircraft in storage.

Note: There were 7 IL-28 light bombers at Phuc Yen.

Source: Hist, MACV, Jan 72 - Mar 73, p B-18 (material used S-REVW 15 Jul 93).

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USAFE
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- DOLO. 1
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- XPX 1
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