

# PATTERNS AND PREDICTABILITY: THE SOVIET EVALUATION OF OPERATION LINEBACKER II

by  
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The opinions expressed are those of the authors and their sources and do not necessarily reflect the opinions of the Department of Defense or the US Army

1972 was President Richard M. Nixon's winter of discontent. Although elected to bring peace to Southeast Asia, Congress and his own Secretary of Defense were trying to tie his hands in dealing with a stubborn North Vietnam. Nixon was trying to extricate the US from the war with dignity. Nixon wanted North Vietnamese guarantees that the South Vietnamese government would be left intact, that all fighting in Indo-China would end, that northern infiltration into the South Vietnam would cease, that North Vietnam would withdraw from Laos and Cambodia, that U.S. prisoners of war would be returned and that US missing in action would be accounted for.<sup>1</sup> North Vietnam's negotiators had walked out of the Paris Peace talks and were refusing to return, figuring that U.S. politics would force Nixon to abandon South Vietnam and the POWs without any concessions on their part. Congress was recessed, but when they returned from the Christmas recess, they were expected to force Nixon into unilateral withdrawal by stopping all funds for the war. Nixon's position looked untenable, but he decided to launch a massive bomber strike against Hanoi to force the North Vietnamese back to negotiations before Congress could reconvene. The bomber campaign was named Operation Linebacker II.

Linebacker II remains a controversial operation. The USAF Strategic Air Command (SAC) made some serious mistakes, suffered serious losses and their campaign came close to failure, yet after the war they launched a massive media and public relations blitz (and internal witch hunt) to prove that Linebacker II was an unqualified success that unfolded as planned. The North Vietnamese, glorying in their unprecedented destruction of USAF B-52 bombers, hailed Linebacker II as the "Dien Bien Phu of the Air"—despite their heavy losses to the bombers. Incredibly, the most-objective observers and commentators of Linebacker II may be the Soviet advisers attached to the North Vietnamese air defense forces. They recorded their observations in official after-action reports which remained classified and inaccessible until recently. They provide a professional assessment of both belligerents during Linebacker II.

## **Linebacker II chronology**

*Night of 18/19 December 1972.* 129 B-52 bombers (divided into three waves of 48, 30 and 51), attacked Hanoi, along what was to become a well-used track from the Northwest, paralleling an escarpment known to fighter pilots as Thud Ridge, using the same single line and altitude with 30-60 seconds between each aircraft exposing each aircraft to the entire air defense net. Accompanying F-4s, F-111s and A-7s protected the B-52s and continued the fight well into the daylight hours. Three B-52s were downed by surface-to-air missiles (SAMs) and two were heavily damaged by SAMs.<sup>2</sup>

*Night of 19/20 December 1972.* 93 B-52 bombers (divided into three waves of 21, 36 and 36) attacked Hanoi in the same single line using the same times, routes, altitudes and targets as the previous night. Accompanying F-4s, F-111s and A-7s protected the B-52s and continued the fight well into the daylight hours. No B-52s were lost and one was severely damaged.<sup>3</sup>

*Night of 20/21 December 1972.* 72 B-52 bombers (divided into three waves of 33,27 and 12) attacked Hanoi in the same single line using the same times, routes, altitudes and targets as the previous nights. Accompanying F-4s, F-111s and A-7s protected the B-52s and continued the fight well into the daylight hours. The second wave was aborted after the first wave lost three B-52s, but SAC ordered the third wave to continue the attack using the same single line, the same times, routes, altitudes and targets as the previous nights. Six B-52s were lost that night and one was severely damaged.<sup>4</sup>

*Night of 21/22 December 1972.* 30 B-52 bombers attacked Hanoi in a single wave using the same single line, the same route, most of the same targets and same altitude, however the exit route from the target was changed. Accompanying F-4s, F-111s and A-7s protected the B-52s and continued the fight well into the daylight hours. Two B-52s were lost.<sup>5</sup>

*Night of 22/23 December 1972.* In a victory for the Hanoi air defenders, no attack was launched against the main objective of Hanoi. Instead, 30 B-52s attacked the less-defended Port of Haiphong. Tactical aviation protected the B-52s and attacked SAM sites. No B-52s were lost or damaged.<sup>6</sup>

*Night of 23/24 December 1972.* 30 B-52s struck a relatively unprotected area 50 miles northeast of Hanoi. Pilots were allowed to vary altitudes throughout the flight. Tactical aviation support was limited by weather and poor staff procedures. No B-52s were lost or damaged.<sup>7</sup>

*Night of 24/25 December 1972.* 30 B-52s struck railroads outside of the Hanoi air defenses. One B-52 was badly damaged by 100-mm anti-aircraft gun fire.<sup>8</sup>

*Night of 25/26 December 1972.* Nixon orders the Christmas truce and no B-52s were launched, although tactical aviation continued some missions. The North Vietnamese used the break to improve their defenses.<sup>9</sup>

*Night of 26/27 December 1972.* SAC (in Omaha) finally abdicated most mission planning to the 8<sup>th</sup> Air Force (in Guam). 120 B-52s conducted a single attack against Hanoi, Haiphong and Thai Nguyen lasting 15 minutes using four approach routes, seven attack routes, varying altitudes, varying attack patterns and varying spacing. 110 tactical aircraft supported the attack. Nine B-52 missions were aborted for mechanical problems. Two B-52s were lost.<sup>10</sup>

*Night of 27/28 December 1972.* The North Vietnamese sent a note to President Nixon offering to resume negotiations. Nixon agreed to negotiations beginning on 2 January, but continued the bombing. 60 B-52s and support aircraft attacked Hanoi and the area north of Hanoi. SAM sites were included among B-52 targets for the first time. B-52s employ multiple entry headings,

large altitude separations and varied break-off patterns. Two B-52s were lost—one to MIG-21 aircraft and one to a SAM.<sup>11</sup>

*Night of 28/29 December 1972.* Sixty B-52s attacked Hanoi. Few SAMs responded. One MIG-21 attacked B-52s, but was shot down by F-4s. No B-52s were lost.<sup>12</sup>

*Night of 29/30 December 1972.* 60 B-52s attacked away from Hanoi, striking SAM storage areas and railroad yards. Linebacker II ended at 0659 hours, 30 December Hanoi time. There were no B-52 losses.<sup>13</sup>

*31 December 1972.* The US declared a cease fire.

*23 January 1973.* The peace agreement was signed in Paris. Linebacker II cost SAC 15 B-52s shot down and nine damaged.<sup>14</sup> These figures are based on USAF records and should be accepted with caution. The USAF has a track record, going back to the Korean conflict, of hiding aircraft and pilot losses. If a plane is badly damaged, but manages to land, it is not always carried as a loss, even if it is too shot up ever to fly again. During the operation, the Air Force told the press that 17 B-52s were lost. Later, the Air Force told Congress that only 13 B-52s were lost. Nine B-52s that returned to U-Tapao airfield were too badly damaged to fly again. The number of B-52s that managed to return to Guam but were combat losses remains unknown. The overall B-52 loss is probably between 22 and 27.<sup>15</sup> Additional official aviation losses were two F-111s (USAF), two F-4s (USAF), two A-7s (USN), two A-6s (USN), one F-4 (USN) and one RA-5 (USN).<sup>16</sup>

## **The Soviet View**

Soviet military aid to Vietnam began after the Second World War to assist Ho Chi Minh in his struggle against returning French rule. This aid continued after Vietnam divided. North Vietnamese-backed guerrillas tried to overthrow the South Vietnamese government using this aid. On 17 November 1964, the Soviet Politburo decided to send increased support to North Vietnam. This aid included aircraft, radar, artillery, air defense systems, small arms, ammunition, food and medical supplies. They also sent Soviet military personnel to North Vietnam—the Democratic Peoples' Republic of Vietnam (DRVN). Some 15,000 Soviet personnel served in Indo-China as advisers and occasionally as combatants. The largest part of the Soviet adviser personnel were air defense officers. The Soviets provided the aging V-75 (SA-2 GUIDELINE) missile system as the primary air defense system. They supplemented this with anti-aircraft guns and possibly some S-125 'Neva' (SA-3 GOA) missiles. Short-range air defense weapons included the Strela 2 (SA-7 GRAIL) shoulder-fired missiles. The Soviet advisers primary mission was to train the North Vietnamese to use the Soviet equipment. The Soviets wore North Vietnamese uniforms while they performed their duties.<sup>17</sup> The DRVN had a nationwide integrated air-defense system with the bulk of assets in the north.

Colonel-General Anatoliy Ivanovich Khyupenen arrived in Hanoi in 1972 to direct the

Soviet air defense advisory effort.<sup>18</sup> He was present during Linebacker II and directed the after-action report. His book-length after action report was entitled Combat Actions of the Air Defense Forces and Air Forces of the Vietnamese Peoples' Army in December 1972.<sup>19</sup> Khyupenen is now retired and has written a series of articles based on this after-action report.

### **The Soviet View of the Bomber Offensive**

*Operation "Linebacker-2" began on the evening of 18 December 1972 as US aviation simultaneously struck all the principle fighter airbases of the air forces of the DRVN. Throughout the years, the large collection of B-52 strategic bombers conducted the initial combat strike, which developed into the primary combat strike. Participating in the operation were all the B-52 strategic bombers located at Anderson airbase on the island of Guam and at U Tapao airbase in Thailand.<sup>20</sup> Usually more than 50 B-52 sorties would launch in a 24-hour period and sometimes up to 90. Hanoi, Hai Phong, Thai Nguyen (the principle industrial region of the DRVN), air fields, railroad stations, heavy industry and military targets were subjected to bombing. In the course of this operation, over 300 B-52 sorties were directed against Hanoi alone. Their losses were significant. According to the reports of the High Command of the Vietnamese Peoples' Army of the DRVN, 25 B-52s were lost over Hanoi out of a total of 34 total B-52 losses. It is true that the Americans only acknowledge the loss of 22 B-52s, but even those losses are significant under these circumstances.<sup>21</sup>*

*It must be noted that the B-52s were used only during nighttime, their actions were thoroughly planned and they were supported by a significant force of fighters providing cover for the strike force, sealing the airbases, suppressing the air defenses with ordnance and radio-electronic combat and also conducting observation of the airspace over the territory of the DRVN.*

*Thus, operation "Linebacker-2" planned for the use of massed B-52s, so the American command had to thoroughly organize and support their combat actions. The essence of the combat use of the strategic bombers included: mass force for the strikes; attach tactical aviation for combat support of the B-52s; carefully select the targets, the times to inflict the strikes and the flight routes; use massed electronic combat means.*

*Massing force to inflict strikes on targets in the DRVN during the operation dictated the necessity of achieving important military-political goals in a short time. Characteristically, up until December 1972, the significant bombing attacks on targets in the DRVN involved only a single B-52 or a small group<sup>22</sup>, while the massed strikes by strategic aviation were carried out only in South Vietnam, Laos and Cambodia where it was necessary for the American command to disrupt the preparations of the patriotic forces of liberation and to conduct powerful offensive operations against them.*

*More than 60 aircraft participated in the first massive raid into the DRVN.<sup>23</sup> These included 21 B-52s, with F-4 and F-105 combat support aircraft comprising the rest. Then, during the course of the night, two more mass raids were conducted on Hanoi. American aviation conducted all its strikes on Hanoi at night since the fighter aviation of the Vietnamese Peoples' Army had no experience in night action, although during the daylight hours of 1972,*

*they downed about 90 enemy aircraft.*

*The second characteristic peculiar to the use of B-52s was the careful thought and excellent organization of the combat support by tactical aviation. The combat formation of aviation in a mass raid consisted of strike groups of B-52 bombers, groups for passive ECM and blocking airfields, groups for finding and suppressing air defenses and groups to provide direct cover against Vietnamese fighters. The B-52 combat formation, as a rule, consisted of a "column of squadrons" (from two to seven), separated by a time interval of five to seven minutes.*

*Every strike group (or squadron) flew in a "column of detachments"<sup>24</sup> (with two-three detachments in a column) separated by time intervals of two-three minutes. The detachment flew in a "column of aircraft" with a time separation of one-two minutes between them (1,800-3,600 meters). Every trailing aircraft flew 200-500 meters higher than the aircraft in front of it. The detachment was the basic tactical fire unit and usually inflicted a strike on a single target, therefore they strictly maintained the prescribed formation even in zones of anti-aircraft fire. In order to maintain the combat formation and support a good flight, they flew with their navigation lights on for the entire route including over the territory of the DRVN.*

*The combat support group constituted 60-70% of the aircraft participating in the raid. Tactical aviation, supporting the strategic bomber raid, provided uninterrupted cover of the B-52 formations throughout their entire flight over the DRVN, particularly during strikes on Hanoi, Hai Phong and targets in the central provinces. F-4 and F-105 fighters, based in Ubon and Udorn, Thailand were attached for this mission. They joined the bomber groups over Laos near the city of Sam Neua. The primary mission of the F-105 was to find and suppress air defense systems along the B-52 flight path and in the strike area. F-4 fighters provided direct cover to every B-52 detachment and they flew close to the B-52 combat formations.*

*Individual groups of six-eight F-4s were designated to block airfields of the air forces of the Vietnamese Peoples' Army. They would arrive over these airfields 10-15 minutes prior to the appearance of the B-52 aircraft in the strike region. Additional fighter groups provided chaff coverage along the bomber flight path.*

*The third characteristic particular to the use of strategic aviation in these operations was the careful selection of the B-52 flight path, the direction of approach to the target and the delivery of the strike. The B-52 flight from U Tapao and Andersen airbase merited particular attention. A B-52 from Andersen airbase carried a bomb load of nine-ten tons (27-29 bombs weighing 340 kilograms each) in the fuselage. The flight to the target passed through a refueling area which was located east of the Philippines. At check point "Lima" (150-200 kilometers southeast of Da Nang), the flight routes were divided with the objective of overcoming the weaker air defense systems of the DRVN. To breakthrough the air defenses from the southwest and west, the operational-tactical flight direction from checkpoint "Lima" proceeded west to the Mekong River, then north to Laos to the vicinity of Sam Neua, [195800 Latitude and 1044100 Longitude—translator] and then into the DRVN to the cities of Phu Tho, Yen Bai or Viet Chi*

*(depending on the designated target and the selection of the combat course) and then the flight path went directly to the target.<sup>25</sup>*

*In the majority of cases, the breakthrough of the air defenses occurred in the western and southwestern approaches, since it was a shorter approach to the target (particularly from U Tapao), using ground orientation. Having dropped their bombs, the B-52s withdrew over Laos (in the majority of cases) or over the Tonkin Gulf. If the bombers were returning to Andersen Airbase, they had to have a fuel reserve of 56 to 65 tons of fuel remaining after dropping their bombs. If it was necessary, they could conduct an aerial refueling at an altitude of 7000-7,500 meters and a speed of 680-720 kilometers/hour. A B-52 would take on an average of 20 tons of fuel during air refueling. The KC-135 aircraft was used for this mission.*

*B-52s flying from U Tapao airbase carried 19.7 tons of bombs (24 bombs under the wings and 42 in the fuselage) or 25.1 tons (24 bombs under the wings and up to 75 in the fuselage).<sup>26</sup>*

*B-52 bombers flying from U Tapao flew over Korat when selecting the southeast breakthrough of the air defenses) or Vientiane and Sam Neua (when selecting the western or southwestern breakthrough of the air defenses). The time from takeoff to landing took 12-13 hours from Andersen Airbase and 4-5 hours from U Tapao Airbase. On the flight route, the B-52s averaged 840-870 kilometers/hour at an altitude of 10,000-11,000 meters. Some 60-70 kilometers from the objective, the B-52 detachment lay on a combat course assuming the height and speed that they would maintain until they released their bombs.<sup>27</sup> Afterward, this course was immediately changed with a turn of not less than 40-50 degrees and the B-52s dropped chaff.*

[Authors' note: The origin of the post-bomb turn requires explanation, which should illustrate a bureaucratic failure to adjust for changing conditions. When nuclear weapons were first designed for release from B-29 bombers during World War II, scientists noted that releasing any kind of bomb results in its maintaining the aircraft's course all the way down to impact. The blast effect from a nuclear bomb would likely destroy the delivery aircraft overhead. They determined that the best chance a bomber had to escape the blast effects was to make a hard turn immediately after release, with the airplane going eventually 150 to 180 degrees (reverse course) in another direction while the bomb continued its long descent to the target. That post bomb release turn technique was first used, successfully, at Hiroshima and was taught without modification for the next 30 years to all SAC crews. Even when releasing conventional weapons, the post release turn was almost always included in SAC bombing procedures. It is the opinion of author Drenkowski, who flew both B-52s and fighter planes in Vietnam combat, that the post-release target turns over Hanoi during the Linebacker II raids were simply left-over procedures that no one dared to change, regardless of the fact that the maneuver turned the belly-based, downward-pointing electronic countermeasures antennae away from the immediate target area, where the enemy defenses were thickest.]

*One or several detachments would hit the target depending on the nature of the target and*

*the required probability of destruction. In all cases, they used “area bombing” from a horizontal plan from a height of 10,400-10,600 meters above sea level. A single B-52 carrying 20 tons of bombs could lay a linear swath of destruction from 700 to 1600 meters with a width of 150-100 meters. The distance between craters was 10-50 meters as a result of the actual dispersion and speed of drop. The bombing was conducted individually since every aircraft had an on-board radar sight which was used earlier to plan the shape and dimensions of the swath of destruction.*

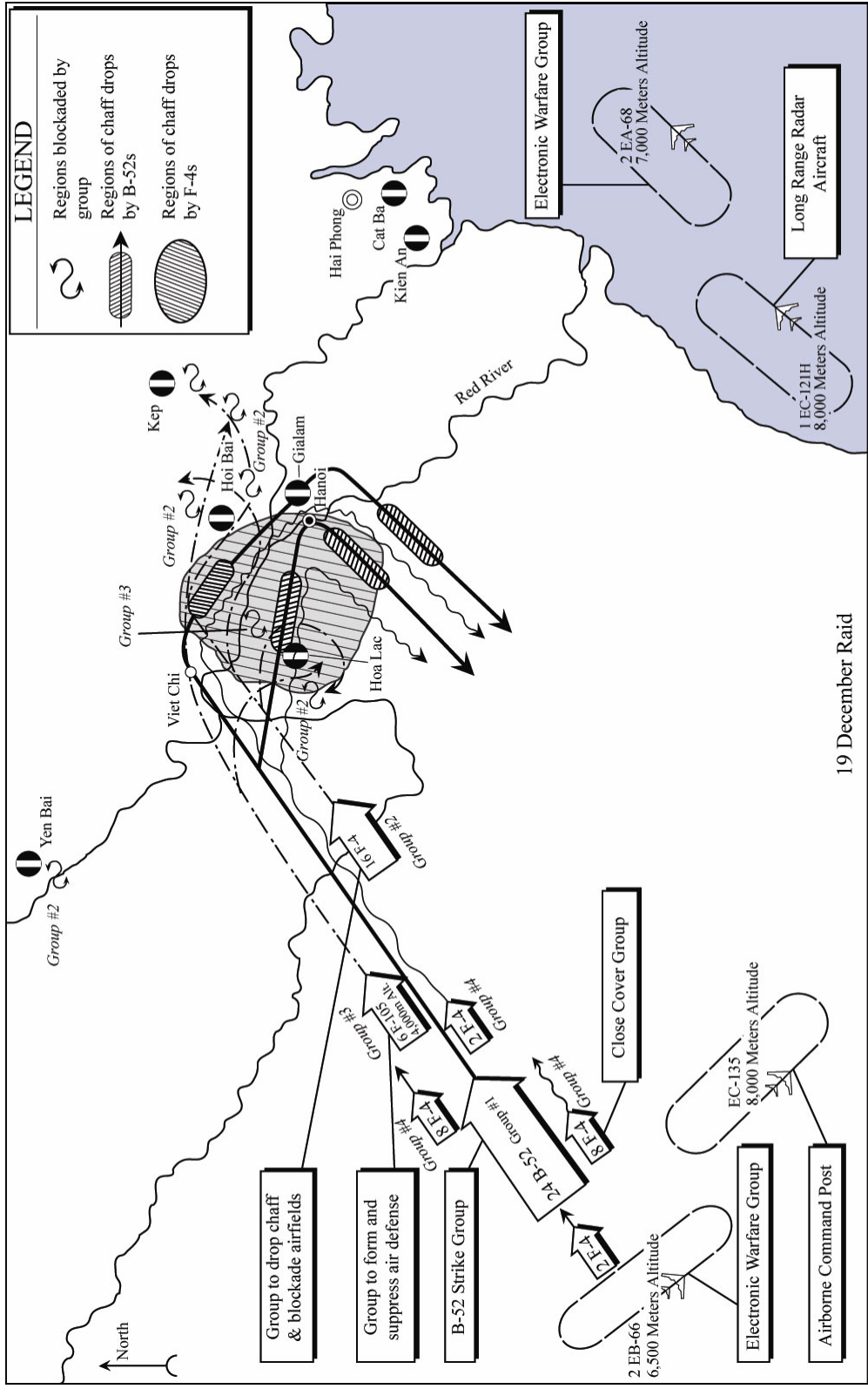
*The fourth characteristic particular to the use of strategic aircraft in these operations was the high level of use of radio-electronic combat employed by the American command. Without this radio-electronic combat, the slow-moving B-52s would have been a much easier target for the air defense missiles of the Vietnamese Peoples Army.*

*Strategic bombers were also used for carrying out single strikes (using one or two detachments) against targets located south of the 20<sup>th</sup> parallel where the air defense system was weaker. These targets were primarily concentrations of troops and equipment at crossing points, on road marches and in assembly areas. Usually, the sorties for these missions were flown out of U Tapao airbase. The bombing was conducted from a horizontal plane from a height of 10,000-11,000 meters. The combat support, in this case, was simply direct cover by F-4s along the entire flight route and the staging of EB-66 aircraft for jamming which joined them temporarily over Laos and the Gulf of Tonkin.<sup>28</sup>*

General Khyupen discussed the USAF bombing raids focusing on the second night’s mass raid (19/20 December) and the first mass raid after the change in tactics (26/27 December). See Map 1 for the 19 December raid.<sup>29</sup>

*The 19 December raid on Hanoi involved 66 aircraft of which 24 were B-52s formed into three strike groups (squadrons). Sixteen F-4s dropped chaff and blocked the airfields, six F-105s found and suppressed air defenses and 20 F-4s covered the B-52s. The total number of aircraft does not include those aircraft that supported the raid but did not cross into North Vietnamese airspace. These aircraft included an EC-135 airborne command post, four electronic warfare aircraft (two EB-66 and two EA-6B), a EC-121 long range radar aircraft and covering aircraft (20-22 airframes in all).<sup>30</sup>*

*The raid began a 0432 hours and lasted 62 minutes. The first group (detachment) of B-52s was detected at 0412 hours by the forward radar company of the Radio Technical Forces. The group was detected 350 kilometers from the radar site flying at an altitude of 10 kilometers. A pair of F-105 fighter-bombers preceded the lead detachment of B-52s by a minute at a height of 4,000 meters—their mission was to find and suppress air defenses. They were each armed with two “Shrike” anti-radar missiles and bombs. F-105 targets, in order of priority, were air defense missile battalions, antiaircraft guns and radar units of the Radio Technical Forces. At the strike area, one pair of F-105s split off from the strike group and began to conduct an air patrol at an area 20-30 kilometers northeast of Hanoi. A second pair of F-105s continued to fly with the second squadron of the B-52 strike group for another two minutes and then split off to duplicate*





*the mission of the first pair. The area they patrolled was 30-40 kilometers west of Hanoi. Finally, a third pair of F-105s flew at the tail, one minute behind the strike group, at an altitude of 4,500-5,000 meters. They carried out the same mission as the first pair, but did not carry out an air patrol but followed the strike group. At 0432, the detachment crossed the national border of the Democratic Republic of Vietnam on a course to the city of Viet Chi, but did not stay on this course, but turned and began bombing targets in the southwest part of Hanoi at 0442 hours. After carrying out their missions with the B-52 s, pairs of F-105s, after five to seven minutes, apparently received a special signal and returned independently to their airbases.<sup>31</sup>*

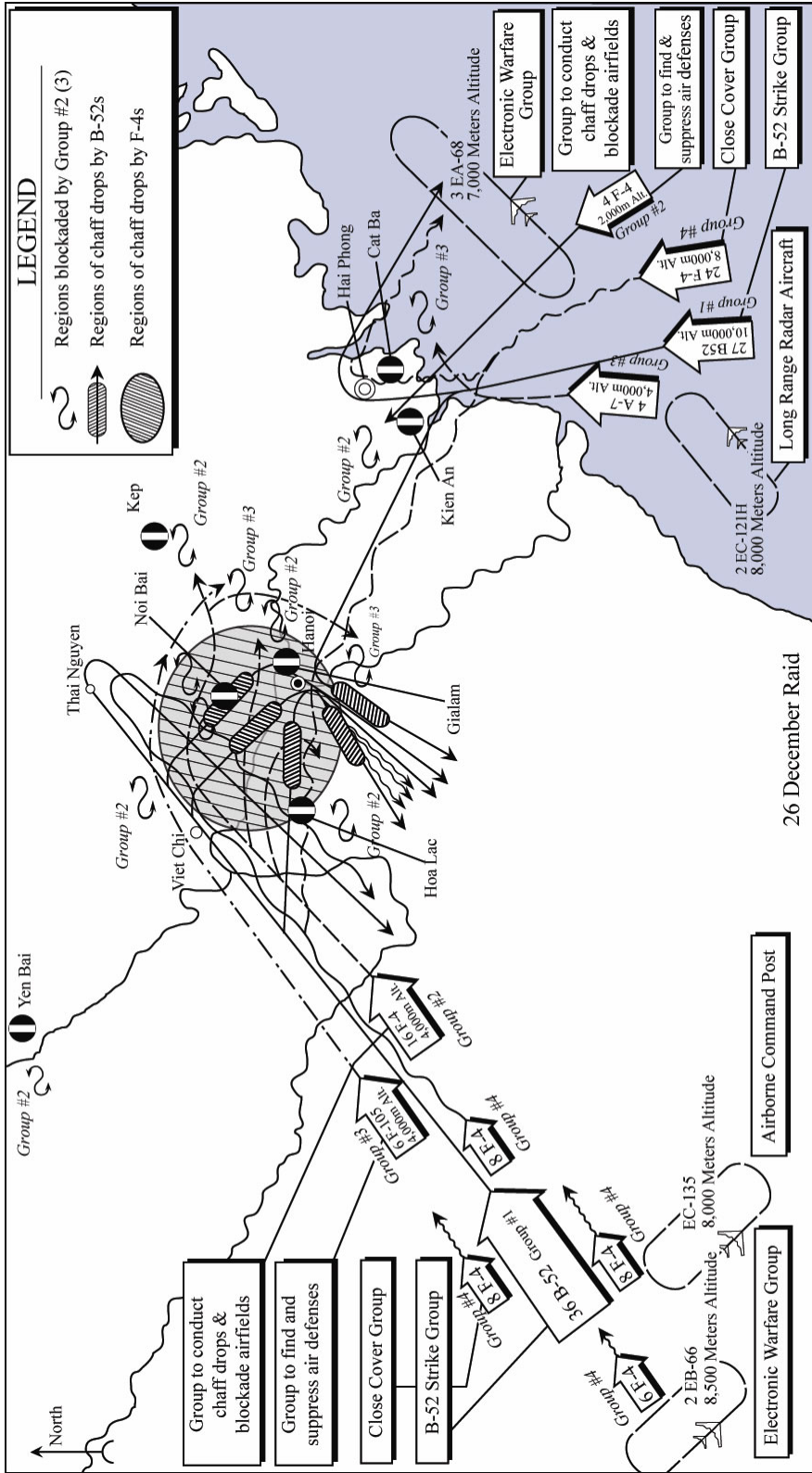
*The second and third strike groups penetrated the air defenses on the north-west approach at a height of 10,000-11,000 meters and struck the western part of Hanoi and the Gialam airport. During this time, all the strategic bombers conducted electronic warfare against the air defenses of the Vietnamese Peoples Army using jamming and chaff.*

*At 0420 hours, the Radio Technical Forces of the Vietnamese Peoples Army detected a group of aircraft over Laos flying at an altitude of 7,000 meters and heading in the direction of Viet Chi. The group consisted of four wings of F-4 fighter-bombers in a "column of wings" formation with 2,000-4,000 meters between wings. At Viet Chi, every wing went into a "front" formation with a 600-800 meter interval and began dropping chaff along the western and northwestern approaches to Hanoi. Then the wings blocked the airbases at Kep, Hoi Bai, Gialam, Hoa Lac and Yen Bai. They blocked the airbases with wings or pairs at heights from 2,000-6,000 meters. In a wing, pairs would fly a "figure eight" maneuver over the long axis of the take-off and landing strip. The maneuver was conducted in such a manner that the pairs were located on the opposite ends of the airfield. Three to five minutes after the B-52s completed their bombing run, the wings of F-4s independently flew off toward Laos.*

*When flying the air route over the DRVN, the B-52s were covered by special groups of F-4s flying direct protection against the Vietnamese fighters. The F-4s flew 1,000-2,000 meters lower than the main strike groups. During the flight over the DRVN, the F-4s flew the "snake" anti-missile maneuver several times and, in the region of the B-52 strike, they moved 15-20 kilometers away from the formation. If they detected air defense missile battalions, radar companies or command posts, they bombed them, after which the F-4s re-occupied their positions in the formation.*

*The airborne command post maintained two-way radio traffic with the B-52 raiding aircraft and also the covering F-4s and F-105s as they approached the link-up site. As the mission continued, it became one-way traffic between the airborne command post and the B-52 crews until they completed their mission and exited from DRVN airspace. The fighters providing direct cover used the navigation lights of the strategic bombers for orientation.*

The 26/27 December raid reflected the change in USAF tactics and planning. [See Map 2 for this raid.]<sup>32</sup>



*The concluding stage of operation "Linebacker 2" was the especially brutal mass raid on Hanoi and Haiphong on 26 December. 147 aircraft participated in the raid, including 63 strategic bombers, 54 F-4 fighter-bombers in the direct cover groups, 20 F-4s for chaff dropping and blocking airfields, and 10 F-105 and A-7 fighter-bombers for detecting and suppressing air defenses. Besides these aircraft, support aircraft which did not cross into DRVN airspace included five electronic warfare aircraft (EB-66 and EA-6B) two EC-121H long-range radar aircraft, one EC-135 airborne command post and about 20-24 F-4s flying direct cover.*

*As in previous raids, the Radio Technical Forces of the Vietnamese Peoples' Army detected the lead detachment of B-52s over Laos at a distance of 350 kilometers, then they detected 11 detachments of strategic bombers on the same heading. At 2146 hours, more B-52s appeared over the Gulf of Tonkin. There were simultaneous strikes on Hanoi (36 B-52s), Hai Phong (15 B-52s) and Thai Nguyen (12 B-52s). The raid lasted from 2215 to 2323 hours, that is for 69 minutes.*

*The first strike hit the region of the Gialam international airport, the last hit the Yen Bien railroad station.*

*Five detachments of B-52s hit the city of Hai Phong practically simultaneously (the shipyard, cement factory, and the old fuel dump). The air defenses were penetrated from the south at a height of 10,000-11,000 meters along a very thin break (some 10-15 kilometers). From 2307 to 2317, four detachments of B-52s bombed the metallurgical works and the electric power plant in Thai Nguyen. During this action, the combat support aircraft did not split away as in previous raids.*

*At the end it should be noted that the actions of the US aviation in Vietnam used four templates that allowed the air defense forces to not only detect the enemy in a timely fashion but also to oppose him successfully.<sup>33</sup>*

Authors' comments: General Khyupenen's account is sometimes quite accurate, but he often relied upon Democratic Republic of Vietnam (DRVN) sources for details. Thus, his story suffers from the fact that all participants had reasons to inflate success and deny failure. Although the actual B-52 loss total is still disputed by both SAC and the DRV, he is correct in his assessment that SAC's losses were "significant".<sup>34</sup> SAC later used total sortie numbers to make its losses appear lower, saying that its claim of 15 bombers lost (as noted, there were several figures SAC provided over the course of time for its losses) should be taken in context with the total of 700+ sorties, meaning there was a "2%" loss rate. If the total number of bombers available were 150-200, the loss rate becomes more "significant", showing that upwards of 10-15% of the available force was lost. SAC never acknowledged in its "loss" figures the bombers too badly damaged to be flown in combat again and lost to the overall strategic bomber force, which brings the loss rate up. Nonetheless, the goals of the raids were achieved—a quick response and return to the negotiation tables before a hostile American Congress could convene in January, followed by agreements, release of the POW "hostages" by the DRVN, and a general cease fire

allowing the US to withdraw gracefully.

Khyupenen's version notes the differences between the attacks of the second night, following the same route and tactics of the first night (and carried out again and again afterwards) and the attacks of the night of the 26/27th December raids. He does not discuss whether the changes in tactics affected the DRVN's war effort, however, he does call them "especially brutal," which from the DRV and Soviet point of view could be interpreted to mean they were extremely distressed with either the irresistible force of the attacks themselves or the results. Further, he names which military/industrial targets were struck, suggesting that mass civilian raids were neither the aim nor the result, contrary to both official DRVN and Soviet reports to a gullible Western media.

Of particular note was his last comment (in the portion translated *supra*): "it should be noted that . . . US aviation in Vietnam used four templates that allowed the air defense forces not only to detect the enemy in a timely fashion, but also to oppose him successfully." Apparently, Khyupenen was addressing the identical routes, airspeeds, headings, and tactics used by SAC, particularly on the first five days of the raids.

As author Drenkowski made clear in his first accounts of the Linebacker II operations a few years after the events, SAC continued using certain patterns and approaches for six years during its Vietnam operations prior to the "all out" Linebacker II efforts. Using those same predictable maneuvers and procedures enabled the DRVN to better defend itself, almost successfully, against the big Linebacker II raids of December, 1972.

A recent article by Khyupenen about electronic warfare (EW) in Vietnam seemed to praise the American electronic warfare systems used in Vietnam, saying "the American command was able to reduce the effectiveness of the electronic equipment of the [People's Army of Vietnam (PAVN) Anti Aircraft Defenses (AAD)]." <sup>35</sup>

However, he noted that there were serious weaknesses to exploit, noting most importantly patterns of operation in Linebacker II which enabled the Peoples' Army of Vietnam (PAVN) to overcome this effectiveness—similar to the "four templates". One he noted was that "the jammers were turned on in the entire wave range before the [B-52s] approached the RT [Radar Troops] zones."<sup>36</sup> As Drenkowski noted in his earlier articles, B-52 Electronic Warfare Officers (EWOs) were required to turn on and test all jammers at a pre-set in-flight point prior to entering the threat zone, then turn them off until they entered enemy airspace. This created a huge blossom on radar screens, announcing to everyone that B-52s were a particular distance away from their targets in North Vietnam—while they were too far away to do anything effective. If anyone did not know it before, enemy radar operators hundreds of miles away now knew a large attack was going to take place in about a half an hour.

Later, when the jammers were turned on, according to Khyupenen, it happened out of the distance at which the jammers would be effective, which would likely highlight the attacking

forces for the defenders. Further, “the jammers’ operating mode [frequency bands] were set ahead of time regardless of the mode in which the [missile guidance systems] were operating.” The latter procedure may well have led directly to additional losses when other missile systems were encountered.<sup>37</sup>

As Khyupenen noted, “Premature switching on of EW equipment and continuous jamming (without taking into account the operating time of the target radar) enabled the PAVN’s [People’s Army of Vietnam] electronic and air defense forces to *detect* B-52 strike groups in time, *provide target acquisition data* to the ADMF, and *prepare* the necessary initial firing data.” [Emphasis added]<sup>38</sup>

U.S. aircrews had long requested changes to such procedures without effect. Failure to change those procedures contributed to their losses during Linebacker II.

Khyupenen did indicate the chaff was particularly effective, showing that even the most simple techniques sometimes work best.

“Linebacker II” was built around the heavy bombers, but tactical and carrier aviation also played a major role.

### **The Soviet View of Tactical and Carrier Aviation in “Linebacker II”**

*The US employed tactical and carrier aviation in “Operation Linebacker 2” in combat support of the strategic bombers, which conducted massive strikes on various targets in North Vietnam. The American high command felt that the massed use of tactical and carrier aviation would inflict the maximum casualties on their enemy while minimizing their own losses. In the course of operations in December 1972, tactical and carrier aviation carried out a total of 16 mass raids on the DRVN using 303 aircraft. Nine of these raids were by tactical aviation, six were joint raids using tactical and carrier aviation and one was a carrier aviation raid.*<sup>39</sup>

*Mass raids, as a rule, were conducted in a single region which offered several targets for destruction. It followed that the raid concentrated the force of the strike group on the principle targets and then chose the more advantageous considering the conditions. Thus, 12 of the 16 massed raids were conducted on targets in a single region. The force of massed tactical aviation hit Hanoi five times, Thai Nguyen twice, Viet Chi once, while carrier aviation hit Hai Phong four times. Further, four massed raids were carried out simultaneously on various regions of the country. One of these used joint tactical and carrier aviation which the other three used only tactical aviation.*

*The optimum time for massed strikes of tactical aviation was during daylight, usually at noon, since it is necessary to see small targets in order to use guided bombs against them. Carrier aviation carried out massed raids, in the majority of cases, at night in conjunction with strategic aviation raids, but in different regions.*

*There are many instances of the use of tactical and carrier aviation in massed raids, but to study the organization of such a raid, it is sufficient to examine the characteristics of one—the mass raid conducted on 27 December on the cities of Hanoi and Hai Phong.*

*Sixteen F-4 aircraft were selected for the strike on Hanoi and 24 A-6 and A-7 aircraft were selected for the strike on Hai Phong. Their actions were supported by groups dropping chaff and blockading airfields (20 F-4s for the Hanoi raid and eight F-4s and a EA-6B for the Hai Phong raid). There were also groups for finding and suppressing air defenses (six F-105s for Hanoi and four A-7s for Hai Phong). Further, two EB-66 and two EA-6B aircraft provided electronic warfare support.*

*The massive tactical aviation raid on Hanoi occurred as follows.*

*At 1316 hours, the duty subunit of the Radio Technical Forces of the Vietnamese People's Army discovered that they were being jammed by the enemy, which is one of the indicators of the beginning of a mass raid. After several minutes, they detected the aircraft flying from Laos toward the DRVN. At 1330 hours, they noted a chaff drop some 40-45 kilometers from Hanoi on the southeast approach. It was a single belt which gradually formed into a single cloud. Then a chaff-dropping group of aircraft blocked the airfields of Hoi Bai, Kep, Gialam, Hoa Lac and Yen Bai.*

*Two F-105 aircraft, that were part of a group that detected and suppressed air defenses, flew at a height of 3,000-4,000 meters outstripping the first wing of the F-4 strike group by one-two minutes. At Hanoi, this pair split away from the strike group to fly a combat air patrol 20-30 kilometers northeast of the city. The second pair of F-105s followed the same flight route as the first, but with an interval of 5-6 minutes relative to the second strike group. During the strike, they conducted a combat air patrol 20-30 kilometers southwest of the city. The third pair of F-105s flew at the same height leading the third strike wing by a minute. This pair conducted a combat air patrol some 20-30 kilometers southeast of Hanoi.*

*The wings of the F-4 direct cover groups followed the flight route along with the first strike wing and at the strike zone, they flew off some 15-20 kilometers to the north of the city and protected all the strike groups from attack by Vietnamese fighters.*

*Under the cover of passive chaff and jamming, the first flight of the strike group hit targets in the southwest of the city from 1338 to 1342 hours. The approach was conducted at a height of 4,500-5,500 meters in a "column of pairs" formation along the designated flight path. Every aircraft dropped its bombs in order from a height of 1,500-2,000 meters. The second strike flight of F-4s arrived some three-four minutes after the first strike flight to finish the bombing. The third and fourth F-4 strike flights hit targets on the southern suburbs of Hanoi with an interval of eight minutes between wings.*

*The breakthrough of the air defenses occurred on the southeast approach also at an*

*altitude of 4,500-5,000 meters. All aircraft of the strike groups and the covering groups used jamming.*

*At the same time (from 1338 to 1424 hours), carrier aviation conducted a mass raid on Hai Phong. A flight of EA-6B aircraft flew the air route at a height of only 5,000 meters dropping chaff in a belt that was 25-30 kilometers long and about 3 kilometers wide. A flight of carrier-launched F-4s flew behind the EA-6B and somewhat higher, protecting it from Vietnamese fighters. After the EA-6B completed its chaff cloud, it returned to its aircraft carrier, while the flight of carrier-based fighters blocked the airfields at Kien An and Kat Ba.*

*The aircraft of the strike group flew in pairs and flights in a range of altitudes from 300-400 meters to 5,000-6,000 meters and bombed the Kien An airfield and the city of Hai Phong (the cement factory, the railroad station, the hospital and living quarters on the streets of An Vin, To Hiey, Me Lin and Chan Phu). Every pair or flight made three-four passes on the target from various approaches. During this, the remaining aircraft of the strike group flew in a holding area some 40-50 kilometers from the target at a height of 5,000-6,000 meters—outside the zone of air defense missile fire. On the average, the time each aircraft spent inside the air defense missile zone did not exceed five-ten minutes. In the majority of cases, aircraft delivered their ordnance from a height of 500-700 meters. Inside the air defense missile zone and the antiaircraft zone of the Vietnamese People's Army, the aircraft made a steep climb to a height of 3,000-4,000 meters. Strikes on target were made from a dive at 30-35 ° after which the aircraft rose to an altitude of 1,500-2,000 meters and flew off over the ocean.*

*A flight of A-6As flew one-and-a-half to two minutes in front of the first strike group at a height of 3,000-4,000 meters. Their mission was to suppress enemy air defenses. At the target area, the flight split into two pairs, one of which flew a combat air patrol to the west and the other to the east at an altitude of 4,000-5,000 meters.*

*In addition to the combat support group, other remote aircraft participated in the raid either over Laos or the Tonkin Gulf. Electronic warfare aircraft, long-range radar aircraft, radio-technical reconnaissance aircraft and an airborne command post and aircraft flying combat air patrols supported the raid. Thus, two EB-66 aircraft flying over Laos at a height of 6,000-7,000 meters provided jamming to screen to strike groups over Hanoi. Two EA-6B (or EKA-3B) electronic warfare aircraft flew over the Gulf of Tonkin to provide jamming to screen strike groups over Hai Phong. Three E2-A (or E1-B) long-rang radar aircraft flew over the Gulf of Tonkin at an altitude of 9,000-10,000 meters to provide radar control over the airspace of the DRVN and conduct radio-technical reconnaissance, while the RC-135 was conducting strategic reconnaissance. Two-three combat air patrols protected them from Vietnamese fighters. The patrols consisted of two-four F-4s or F-8s.*

*From a comparison of the nature of the conduct of mass raids using tactical and strategic aviation, one may note many general characteristics, especially in the actions of the support group. The tactics for delivering the strike on target varied in every instance depending on the*

*selected means of destruction and the possibilities for their use.*

*Many examinations allow an analogy about the general scheme and organization of a mass raid by tactical and carrier aviation. As a whole, mass raids by tactical and carrier aviation were characterized by thorough preparation and well thought-out organization. The American military command paid particular attention to combat support by photo and radio-electronic reconnaissance prior to the raid, during the raid and post-strike. The Americans also paid close attention to organizing electronic warfare, suppression of air defenses and also the rescue of downed crewmen and the evacuation of shot-down aircraft.*

*Equally with these mass raids, the US command widely practiced operations and strikes using solitary aircraft or small groups that had special features for carrier operations and fighter-bombers such as the variable-sweep wing geometry of the F-111, which was used without special support. The first attempt to use the F-111 to strike targets in the DRVN took place in 1968. However, after losing three aircraft under different circumstances, the Americans were forced to send the remaining aircraft home for extensive testing and improvements. In the fall of 1972, the US Air Force sent 48 F-111A aircraft to an airbase in Takhli, Thailand.*

*From 18 to 30 December 1972, these aircraft flew 10-12 sorties every night (for a total of 112) regardless of the meteorological conditions and dropped approximately 700 tons of bombs. Especially distinctive about the combat use of these aircraft was that they flew a fixed route from their base at Takhli, Thailand to Moc Chau [20.5000 North and 104.3800E], in the Province of Son La, DRVN and then from Moc Chau to their designated target. The altitude of the flight profile varied: from the airbase to Sam Neua, Laos, they reached an altitude of 8,000-9,000 meters and then their altitude decreased and from Moc Chau they flew at a lower and lower altitude in order to easily overcome the air defense systems of the DRVN and inflict surprise strikes on airfields, rail yards, depots, ports etc. The bomb load was about 5,000 kilograms: normally 12 Mk83 1000 pound (452 kilogram) bombs. The principle way of delivering the strike was to bomb from the horizontal plane and then pitch up when departing with the goal of helping orientation. For example, the Hanoi water tower provided such orientation when striking the river port of Pha Den and the airport of Gialam.<sup>40</sup> They flew at lower and lower levels, thanks to the special radar mounted on the aircraft which allowed them to bypass obstacles and follow the terrain relief.*

*Analysis of bombing strikes conducted by the F-111A aircraft showed, on the average, that they were not very effective due to the low accuracy of their bombing and the high number of dud bombs. At the same time, the systematic night actions of these aircraft at 15-40 minute intervals during the first three days of the operation and their surprise strikes produced a significant psychological effect on the populace and exhausted the air defense forces and armed forces of the Vietnamese Peoples Army.<sup>41</sup>*

*With regards to carrier aviation ( primarily A-6 and A-7 ground attack aircraft), it operated off of four aircraft carriers of the US 7<sup>th</sup> Fleet located in the Tonkin Gulf some 150-200 kilometers from the shores of the DRVN. More than two-thirds of its aircraft sorties were by small*



*groups, which in the first days of the operation supplemented the mass strikes on Hanoi by bombing targets in the coastal areas of the DRVN. The aircraft of the strike group assembled some 50-65 kilometers from the aircraft carriers after launch per command of the air traffic control post. Groups of five-six aircraft flew in the column, diamond or wedge formation at an altitude of 5,000-6,000 meters into regions being struck or while waiting. The depth of their combat formations was 600-1,500 meters and their width was 200-1,000 meters.*

*A-6 aircraft ground attack aircraft were included in the strike group to improve the accuracy of night strikes since the A-6 has special on-board radar for navigation and bombing. The A-6 aircraft led the group to target and directed the bombing efforts of the A-7s that followed. As a rule, a strike group of A-6s and A-7s were escorted by F-4 and F-8 fighters which flew 600-700 meters higher and slightly forward of the main group. When they approached the target, they slipped off some 15-20 kilometers from the strike groups and protected it from Vietnamese fighters. The number in the fighter escort varied depending on the nature of the target and the likelihood of a response by the Vietnamese aviation, but it was normally 20-25% of the total number of aircraft in the strike group.<sup>42</sup> Nighttime bombing was conducted from a horizontal plane and then a pitch up when departing with the goal of helping orientation.*

*Beginning on 23 December 1972, carrier aviation began striking targets in the coastal area of the DRVN during the daylight hours following thorough photo and radar reconnaissance. Pairs (or three) aircraft flew on various approaches to the targets at an altitude of 500-600 meters. After they were detected by radar, they executed a sharp climb to 3,000-4,000 meters and approached the target with the sun at their backs while flying a twisting course. After they bombed the target, they executed a sharp dive and flew out to the sea at low altitude. While one flight was bombing, the remaining aircraft loitered in an area outside the air defense missile and anti-aircraft artillery engagement zones (some 35-50 kilometers from the targets at an altitude of 5,000-6,000 meters). In daytime engagements, as in night, up to 60% of the participating carrier aviation were in support. It should be noted that, due to the narrow territorial depth of the DRVN, the Americans were able to establish an uninterrupted airborne radar observation field over the Tonkin Gulf which three-five long-range radar aircraft patrolled at an altitude of 9,000-10,000 meters. The carrier-based A-6 and A-7 ground-attack aircraft provided their own cover using various types of on-board response-impulse jamming. Besides this, the EA-6B "Prowler" provided jamming and, in some cases, ships from the US 7<sup>th</sup> Fleet also did.*

The Soviets also examined the North Vietnamese ground air defense.

### **The Soviet View of the North Vietnamese Ground Air Defense**

*At the start of the "Linebacker-2" air operation, the air defense missile forces of the Vietnamese Peoples' Army had 36 air defense missile battalions armed with the Soviet-manufactured SA-75 M "Dvina" [SA-2 "Guideline"] missile system. They were supported by nine technical battalions. The SA-75M missile system was a three-component variant employing the V-750M missile with a P-12 ["Spoonrest"] target acquisition radar and a target engagement station.*

*These battalions were organized into nine air defense missile regiments and these were further organized into four air defense divisions. The divisions were assigned to three air defense groups (Hanoi, Haiphong and the 4<sup>th</sup> combat zone).<sup>43</sup>*

*The bulk of this force was concentrated on the approaches to the capital of the DRVN, Hanoi. In this region were the Hoi Bai, Kep and Gia Lam airbases; the Dong-An and Yuen-Vien rail-yards; the port and industrial region of Hai Phong; as well as the crossing sites, roads, road intersections and force concentrations in the provinces of the 4<sup>th</sup> Combat Zone—Thanh-Hoa and Nghe-An Provinces.*

*While warding off the massive strike by US strategic, tactical and carrier aviation, the missile air defense forces of the Vietnamese Peoples' Army conducted over 180 engagements, two-thirds of which were against B-52s. In all, they destroyed 54 aircraft (31 B-52s, 13 F4s, and 10 A-6s or A-7s) with the expenditure of 244 missiles against the B-52s, that is to say that an average of 7.9 missiles were expended for every B-52 aircraft shot down. If the tactical and carrier-based aircraft are singled out, then 3.3 rockets were expended for every aircraft shot down. (See tables 1 & 2). Without going into technical details, during the course of this combat, they overcame various types of interference and obstacles employed by the US aircraft to interrupt missile engagement, while warding off the strikes of strategic, tactical and carrier aviation in December 1972.*

*Let us look at two typical fights over Hanoi on the early morning of 19 December and the night of 26 December 1972 .*

*In the first example, there were 19 engagements which shot down one aircraft out of 66 strategic bombers [table shows 24 strategic bombers out of 66 total aircraft] . In the second example, the air defense missile forces conducted 24 engagements which expended 45 missiles and shot down six B-52s out of a force of more than 80 aircraft, including 36 strategic bombers (see Table 1).<sup>44</sup> The average effectiveness of the engagement was .25 and the average expenditure of missiles to down an aircraft shrunk to 7.5. The success was due to the growth of coordination among the personnel teams of the command posts at all levels and their increase in combat experience.*

*In the second example, the combat teams of the regimental and battalion command posts were more confident and determined than earlier, they were tactically skilled in selecting targets for engagement, they were more capable of fully utilizing the missile navigation system to destroy the target despite an electronic interference backdrop, and skillfully employed the missile navigation system through chaff and jamming. The missile launches were at an optimum distance. Thus, 36 of 45 rockets were fired at a range of 25-35 kilometers. In five engagements, in which targets were destroyed, the launch distance was 28-32 kilometers. However, besides this, there were a series of mistakes. Two detachments of B-52s were mistakenly identified as groups of F-4s and were not engaged. Several battalions conducted only a single engagement when the air situation and the number of ready missiles [elevated on launchers] would have*

allowed them to conduct no less than three engagements. As before, they violated the rule as to the number of missiles that should be fired at a target in an engagement [three]. For example, four of 24 engagements involved only one missile launch and two of these were “tail chasers”

Date and Time	Strike Region	Total aircraft	Strike aircraft	Number combat-ready AD Bns in strike region	Number of AD Bns participating in fight	Number of ready missiles at start of raid	Number of engagements	Missiles expended	Number of downed aircraft	Effectiveness of engagement	Average missile expenditure
12/18/1972 1935-2030	Hanoi	61	21	9	6	119	11 & 2	20 & 4	2 & 2	0.18 & .1	10.2
12/18/1972 2335-0030	Hanoi	70	24	9	2	99	4	9	No data	0	nul
12/19/1972 0440-0546	Hanoi	66	24	9	9	90	19	35	1	0.05	35
12/19/1972 2000-2035	Hanoi	53	15	10	3	67	4	7	1	0.25	7
12/19/1972 2315-0036	Hanoi	106	42	10	3	60	4	6	0	0	nul
12/20/1972 0430-0535	Hanoi	41	9	10	3	80	4	7	1	0.25	7
12/20/1972 1925-2050	Hanoi	82	36	9	4	73	4 & 2	10 & 3	3 & 1	.75 & .5	3.3 & 3
12/21/1972 0446-0554	Hanoi	69	21	9	6	83	13 & 1	20 & 1	4 & 0	.31 & 0	5 & 0
12/22/1972 0325-0418	Hanoi	69	21	9	6	88	10	17	3	0.3	5.7
12/23/1972 0445-0536	Hai Phong	52	18	5	5	59	11	20	2	0.18	10
12/26/1972 2215-2334	Hanoi	86	36	13	13	125	24	45	6	0.25	7.5
12/26/1972 2215-2320	Hai Phong	49	15	5	3	62	3 & 3	6 & 6	1 & 2	.33 & .67	6 & 3
12/27/1972 2230-2339	Hanoi	145	51	12	11	101	17 & 3	30 & 6	4 & 0	.25 & 0	7.5 & nul
12/28/1972 2140-2235	Hanoi	130	48	11	4	79	4 & 1	6 & 2	2 & 0	.5 & 0	3 & nul
12/29/1972 2300-2340	Hanoi	94	9	8	3	71	3	6	1	0.33	6
Total		1173	390				135 & 12	244 & 22	31 & 6	.23 & .43	7.9 & 4.4

**Missile ADA combat in repulsing mass raids by Strategic Aviation**

Note: Strike aircraft in column 4 are only those B-52s that entered the missile engagement zone.

Note: Columns 8-11 show first the engagements with B-52s and second with tactical aviation

pursuing a target that had already passed over the firing point . In only one engagement were the prescribed three missiles launched and in the rest of the engagements, only two missiles were

launched.<sup>45</sup>

*One of the techniques of missile combat during this period was engagements using the concentrated fire of several missile battalions on a single target or a group of targets. This technique proved most effective. During 23 raids, this massed engagement technique killed 13 B-52s while using a total of 98 missiles. At the same time, massed engagements which concentrated the fires of over three battalions was ineffective due to problems with command and control of multiple battalions.<sup>46</sup>*

*During the first two days, the missile forces participated in the effort to ward off five mass raids by strategic aviation. In these fights, the effectiveness of the engagements was somewhat lower and achieved an overall 0.9. Over 19 missiles were expended to knock down each of the four aircraft.*

*The effectiveness of the engagements increased through the acquisition of combat experience and the growth of the capabilities of the personnel of the air defense missile forces of the Vietnamese Peoples' Army. Thus, on the following days, the combat readiness grew and the average effectiveness of the engagements rose to .27 while the average expenditure of missiles to down a single aircraft decreased to 6.6.*

*Analysis of the general character and effectiveness of the engagements against strategic aviation shows that the effectiveness that they achieved confirmed the high combat attributes of the Soviet SA-75M air defense missile.*

*The air defense missile forces repulsed the air attacks under conditions of various forms of interference which were applied in the course of the US aviation raids. There was jamming, chaff and impulse-response jamming.*

*Further, the combat positions of the air defense missile battalions were repeatedly subjected to blast and fragmentation bombs and "Shrike" anti-radar missiles. However, only nine strikes (eight blast and fragmentation bombs and one "Shrike") were successful for the enemy: they put six battalions out of action temporarily. These strikes destroyed the early-warning antenna station, five DES-75 diesel-powered electric generators, nine missile launchers, 15 missiles, one ATS-59 tractor and damaged cables in three battalions. One air defense missile battalion was put out of action by the "Shrike" missile that knocked the missile guidance system off line. This unit had switched on their high-voltage radar for 80 seconds (if the high-voltage radar is turned on for 15-20 seconds or less, the anti-radar missile does not lock onto the target). It is possible that the jamming supporting the B-52 strike groups interfered with the tactical air force's ability to launch anti-radar missiles.*

*The missile crews were inadequately trained to fight when jammed and under aerial attack. Fearing "Shrike" anti-radar missile strikes, the battalion launch crews tried to fire at the B-52s without turning on the high voltage radars at all during the firing cycle, which prevented them*

*from detecting targets under jamming and switching to manual guidance.*

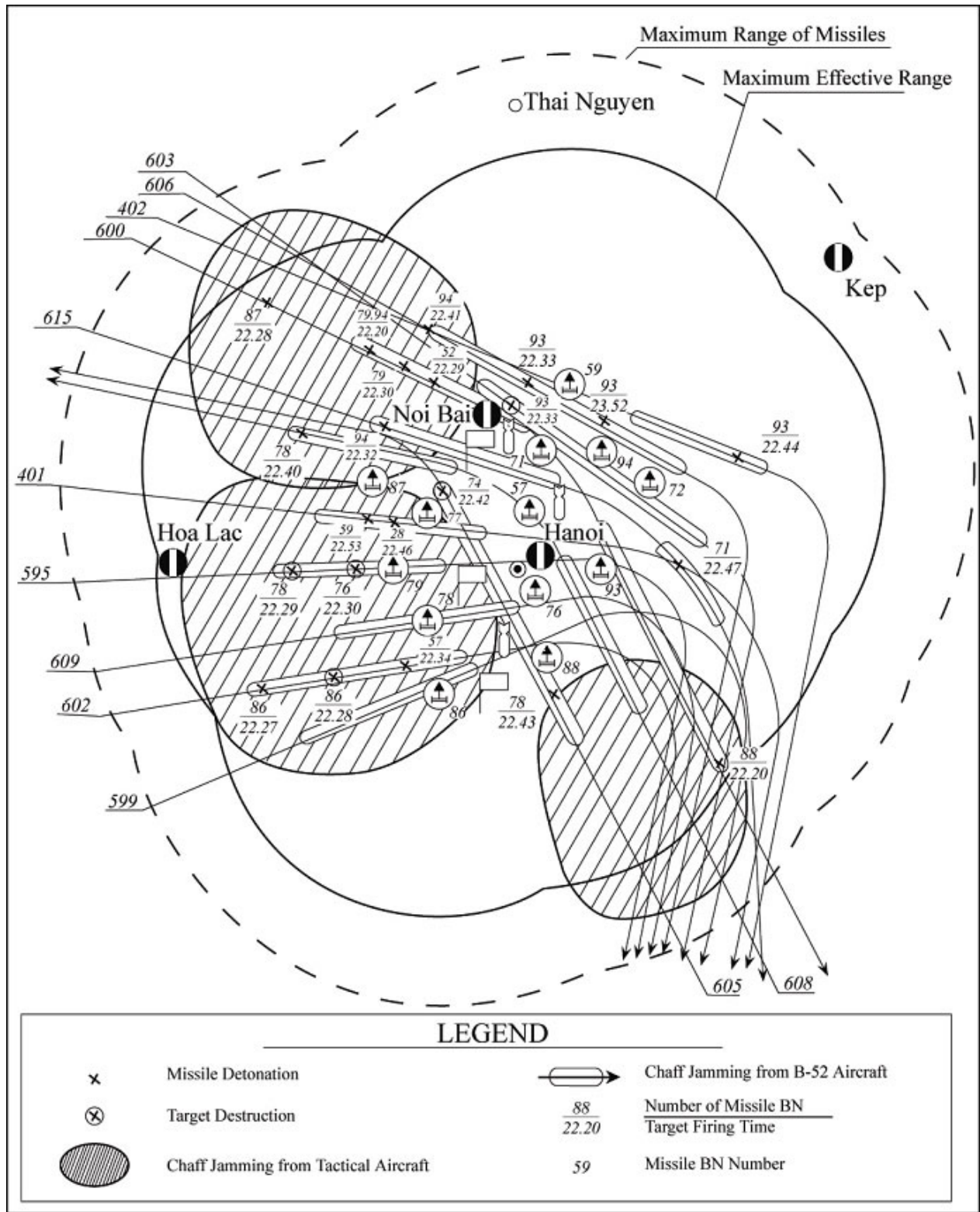
[Authors' note: this commentary on the lack of U.S. anti-radar missile effectiveness contrasts with Khyupenen's own words in another piece he wrote about the activities of the "Radar Troops" during Linebacker II: "It should be noted, however, that there were no serious instances of material damage despite the large number of anti-radar projectiles that were launched against the radar companies' positions."<sup>47</sup> Author Drenkowski interviewed a returning POW who had been driven past a large "park" of wrecked radar vans in a region near Hanoi. He was able to count over 400 damaged vans in the single park. Many had pieces of Shrike or Standard Arm AGM 78 missiles plainly visible in the wrecked equipment. Many or most could have been damaged during the preceding aerial combat of Operation Linebacker (May-October 1972) as well as during Operation Linebacker II. However, it is apparent from his information that the anti-radar missiles and attacks may have been far more effective than Khyupenen was willing to admit in his reports.]

*The most successful missile firings against B-52s combined the active and passive guidance operating mode. Switching on the radar for 5-7 seconds prior to a missile launch made it possible to clarify the aerial and jamming conditions, and, of particular importance, to evaluate the presence of chaff in the area where the missile was expected to intercept its target. Then, the missiles were launched with the radar switched off to provide protection against anti-radar missiles. The operator then turned on the radar for the missile guidance terminal phase (15-18 seconds before intercept), in case a target blip could be detected. Three B-52s were brought down with the conventional method where the radar acquired the target and stayed on for the entire engagement. Three B-52s were destroyed out of seven attempts using the active and passive guidance operating mode.*

*Proper selection of missile launch distance had a major impact on the effectiveness of the firings at B-52 aircraft in jamming conditions (Map 3).<sup>48</sup> The most effective firings were those with a launch distance of 30-35 kilometers.*

*When the strategic bombers deployed chaff during the raid, 64 of 244 missiles reached their targets, 37 self-destructed at terminal guidance, and the rest exploded in the target area but did not destroy the target aircraft. Chaff deployed by the B-52s caused some missiles to detonate. This was possible with tail-chasing as well as head-on firings since the lead aircraft dumps chaff into the lower hemisphere. Not a single B-52 was destroyed in six tail-chasing firings, although all the missiles detonated in the area of the target.*

*The number of missiles affected firing effectiveness. Most firings (99 of 135) were carried out with two missiles, downing 23 B-52 aircraft (firing effectiveness 0.23); 31 firings used one missile, downing 4 aircraft (effectiveness – 0.13); five firings were carried out with three missiles, downing 4 aircraft (effectiveness – 0.8). This confirms that the most effective firings were those with three missiles. Notwithstanding air attack and jamming, the DRVN's air defense missile forces were able to inflict considerable damage on US strategic aircraft. A combination of missile and anti-aircraft artillery fire was particularly effective.*



*Anti-aircraft artillery was used primarily against US tactical and carrier-borne aircraft with missile forces participating only when they were not engaging B-52s.*

*Most of the firings (more than 76 percent) at tactical and deck-based aircraft were carried out in jamming conditions of one kind or another with 0.47 effectiveness. The reason for this relatively high effectiveness is that the firings were carried out selectively and in favorable conditions, i.e. with weak or moderate jamming and no target maneuver. Seventy-five percent of the firings were at non-maneuvering targets. About 37 percent were carried out with one missile, and more than 58 percent with two. Of 46 firings at tactical and carrier-borne aircraft, 18 (or 39 percent) were at targets flying at low altitude (up to 1 km), where aircraft have limited maneuverability. There were 11 tail-chasing firings and eight aircraft were destroyed (firing effectiveness 0.72). [See Table 2].<sup>49</sup>*

*The reasons why tail-chasing firings were highly effective are as follows. The aircraft generally discontinued anti-missile maneuvers after passing the battalion's position. Jamming became much less intense and anti-radar missiles were limited by the large flight-heading angle.*

*Firings were more difficult when aircraft flew at altitudes above one kilometer. Here the aircraft were making anti-missile course and altitude maneuvers. Jamming was effective at these altitudes and Shrike anti-radar missiles were most likely to be used.*

*The EB-66 jammer aircraft jammed the frequency band of the P-12 [Spoonrest] radar. Usually, one or two of the four radar frequency channels were less jammed. This made it possible to select a frequency channel with minimal noise and track targets for one-two minutes, after which the enemy would again jam the selected frequency channel. US Navy vessels in the Gulf of Tonkin also conducted jamming.*

*Tactical aircraft (F-4 and F-105) jammed only in the frequency band of the SA-75M target tracking channels. Jamming was rarely used on the missile channels and did not disrupt missile guidance because they had a high level of anti-jamming protection.*

*Farther away from the missile battalion launch positions(50-60 kilometers), the tactical aircraft usually flew in wings in a wedge, echelon or paired stack formation. Their jammers were switched on at a distance of 70-90 kilometers. Since every aircraft in the group was jamming, they could not be acquired by radar.*

*F-105 aircraft that were detecting and attacking anti-aircraft defenses did so without jamming in order to locate electronic equipment and strike it with anti-radar missiles. These aircraft usually switched on their jammers after detecting a missile launch.*

*F-111A low altitude flights were made with jammers switched off, allowing for a stealth approach to the strike object. Jammers were only switched on when a missile launch was*

detected. The aircraft would simultaneously perform an anti-missile horizontal turn. A blip from an F-111A could still be picked up at 8-10 kilometers against background noise, making it

Date and Time	Strike Region	Total aircraft	Strike aircraft	Number of combat-ready AD Bns in strike region	Number of AD Bns in the fight	Number ready missiles at the start of the fight	Number of Engagements	Missiles expended	Number of downed aircraft	Effectiveness of Engagement	Average missile expenditure
12/19/1972 0410-0510	Hai Phong	30	20	7	4	89	4	5	2	0.5	2.5
12/19/1972 1130-1240	Hanoi	30	12	10	6	71	6	10	2	0.33	5
12/20/1972 0030-0115	Hai Phong	35	25	7	1	78	1	1	1	1	1
12/20/1972 0400-0500	Hai Phong	15 to 20	10 to 15	7	2	78	2	3	2	1	1.5
12/20/1972 0700-0800	Hai Phong	15 to 20	10 to 15	7	7	82	10	17	6	0.8	2.8
12/22/1972 0526-0600	Hai Phong	16	10	5	4	55	4	7	2	0.5	3.5
12/23/1972 1345-1430	Hanoi	54	16	12	3	95	3	6	2	0.67	3
12/27/1972 1330-1430	Hanoi Hai Phong	100	40	17	1	134	1	2	0	0	null
12/27/1972 1555-1635	Hanoi	32	12	12	3	101	3	4	1	0.33	4
<b>Total</b>		<b>327-337</b>	<b>155-165</b>				<b>34</b>	<b>55</b>	<b>18</b>	<b>0.53</b>	<b>3</b>

Table 2: Missile ADA combat in repulsing mass raid by Tactical and Carrier Aviation

possible to track the target manually using angular data and distance.

Carrier-borne aircraft used special jammers, and impulse response jamming by strike aircraft and cover and support group aircraft. This caused 30-40 blips from real and false targets to appear simultaneously on the operators' screens even at five kilometers range.

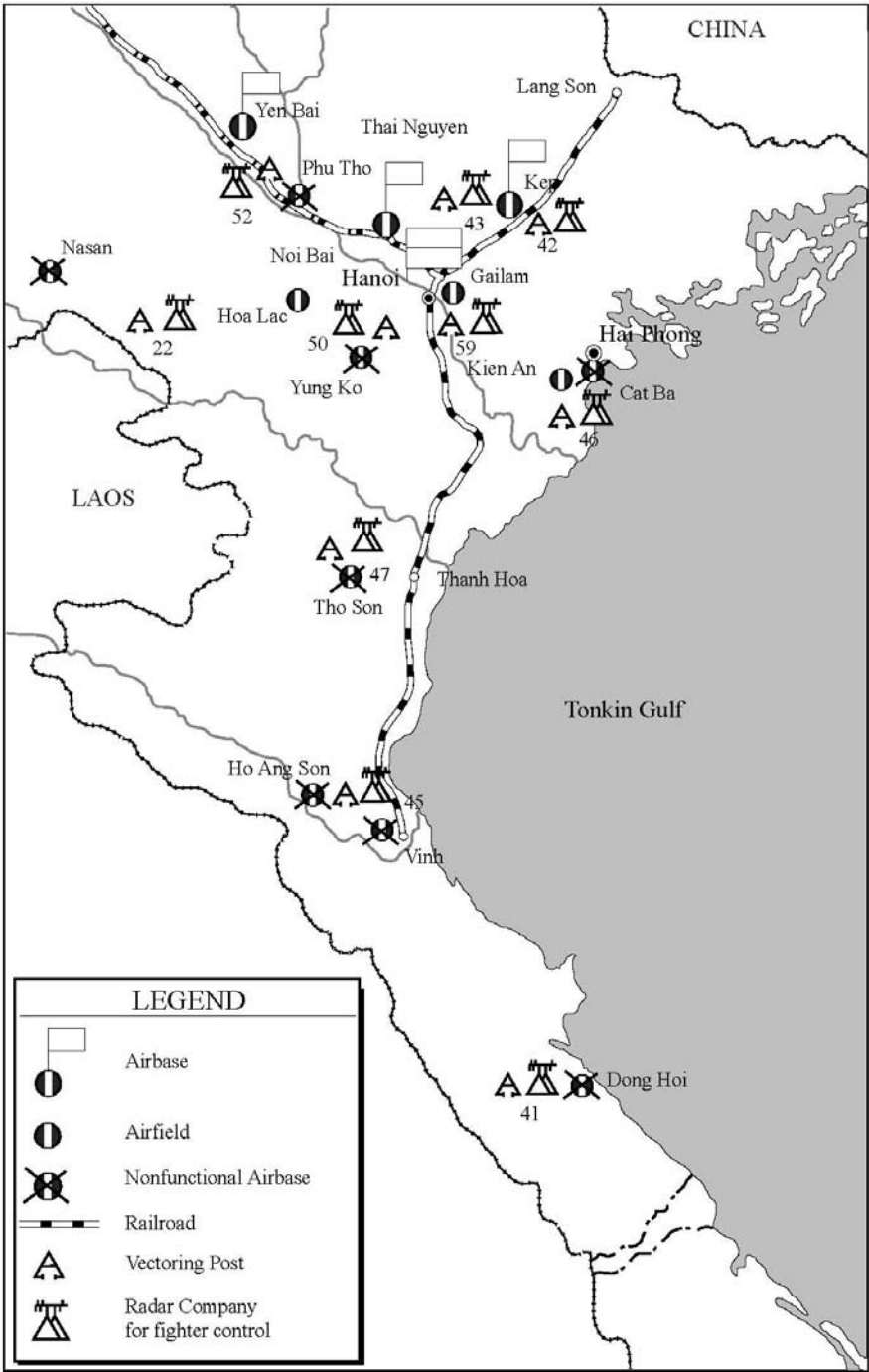
Jamming from B-52s was detectable at a distance of 180-200 kilometers. Jamming from the B-52s was more stable in terms of width, clarity, and intensity than noise bands from tactical aircraft, and they left a deeper residue (tailing). Jamming was most effective at a distance of 24-25 kilometers and a flight altitude of 10-12 kilometers.

The Soviet's also evaluated the effectiveness of North Vietnamese interceptor aircraft.

### The Soviet View of the North Vietnamese Air Force (NVNAF)

The NVNAF had four fighter aviation regiments, a fighter aviation training regiment and a military transport air regiment. These were based on five airfields. The fighter aviation regiments were armed with the MIG-21, MIG-19 and MIG-17 aircraft and were concentrated in the central and northern provinces based on the airfields at Gialam, Hoi-Bai, Yen-Bai and Kep. (See map 4).<sup>50</sup>





*The NVNAF had 187 fighters. Of these, only 71 aircraft were combat ready, i.e. 38%. Of these, only 47 aircraft (31 MIG-21 and 16 MIG-17) could be used for combat—or 26% of the military aircraft. The MIG-19s were made in China and were not used in combat.*

*The NVNAF fighter aviation flight crews were primarily trained for daytime combat in pairs or flights in normal and difficult flying conditions. Only 13 MIG-21 pilots and five MIG-17 pilots were trained for individual night flight in normal and difficult flying meteorological conditions. Of 194 pilots, 75 (about 40%) were young.*

*The primary fighter aviation strength was concentrated to protect Hanoi, the nation's capital, the port of Hai Phong, military and industrial plants, and communications located in the central and northern provinces of the DRVN. Their main mission was to destroy B-52 aircraft.*

*Considering the difficult situation in the DRVN during the period when the USA was conducting its air operation, the actions of the fighter aviation had a limited impact. As a result of this, fighter contribution to the repulse of American aviation was insignificant. However, even with limited forces, they forced the US high command to attach a substantial force of tactical aviation to cover the strike group, that served to weaken the striking power of enemy aviation while attacking targets in the DRVN. All in all, during this period of combat, fighter aviation launched 31 air sorties of which 27 were MIG-21 and four were MIG-17. They conducted eight air combats in which two B-52s, four F-4s and one RA-5C were shot down. This is 9% of the total of all aircraft destroyed by both air defenses and the NVNAF. Their losses were three MIG-21s.*

*Considering the numerical superiority of American aviation and American uninterrupted control of the airspace over the DRVN, the NVNAF command stressed the use of surprise. The covered approach, rapid attack and quick withdrawal from combat after missile launch was the tactic followed by the Vietnamese pilots.*

*Combat readiness of the aviation was carried out, as a rule, by readiness crews of the MIG-21, kept in readiness posture #2 both day and night. Day launches took five-six minutes and night launches took six to seven minutes. Now let's examine several combats against the B-52 strategic bomber.*

*"I am attacking a 'Stratofortress'"*

*The first combat sortie to intercept a B-52 was accomplished by a MIG-21 on the evening of 18 December. At 1928 hours, after launching from Noi-Bai airfield at 220 degrees at maximum thrust, the pilot rose to 5,000 meters and swung to the right for 10-15 kilometers where he saw the navigational lights of a B-52 strategic bomber. Reporting this to the Central Command Post and receiving the order to attack, the pilot switched on his afterburner, dropped his wing fuel tanks and began to climb with a simultaneous turn to the right. Arriving at 10,000 meters, he turned on his RP-21 radar sight (as ordered by the Central Command Post). Three-five seconds later, the*

*pilot noticed that the B-52 navigation lights were extinguished, and the radar screen was completely lit up with static and he was unable to see the target in the background. The pilot reported the presence of interference and continued to fly in the direction of the target. After some time (30-40 seconds after he turned on the radar sight), he saw the explosion of six rockets close to him, after which he made a hard right turn and dive withdrawing from the attack. When the aircraft landed at the airfield, the aircraft ran into a bomb crater and had an accident. The pilot was unharmed.*

*The principle cause of this unfortunate combat—the absence of tactical surprise resulting from an inexperienced approach to the target and turning on the radar sight too early.*

*On 27 December at 2202, a MIG-21 set out from the Yen-Bai airfield to intercept a group of B-52 aircraft. The weather was ten/tenths cloudy, the lower edge of which was at 400 meters and the upper edge at 2000 meters. Visibility was 10 kilometers.*

*Following the orders of the central command post, the pilot took off at 200 degrees at maximum thrust and rose to 5000 meters. After this, the pilot dropped his wing fuel tanks, turned on the afterburner and began to climb to 10,000 meters. When he reached 6000 meters, he saw the navigation lights of an aircraft above him on his left. He continued to gain height during a left turn (35-40 degree bank at a speed of 1200 km/hr). Reaching an elevation of 10,000 meters and following a course of 70 degrees, the pilot approached the target at a speed of 1300 km/hr. At a distance of 2000-2500 meters, he aimed at the target using the collimator sight and launched two rockets. Both rockets hit the B-52 aircraft. Withdrawing from the attack, the pilot turned 180 degrees, pulled out of his dive at 2500-3000 meters and made a successful landing at the airfield.*

*Success in this air combat was supported by the skillful use of the air route during the line up and attack, surprise in the use of the B-52 navigation lights and the accurate maintenance of flight parameters during the launch of the rocket.*

*At 2128 hours on the 28<sup>th</sup> of December, a MIG-21 rose from field airbase located some 12 kilometers north of the Tho-Son airfield to intercept a B-52. The weather was five/tenths cloudy, the lower edge of which was at 800 meters and the upper edge at 1200-1500 meters. Visibility was 10 kilometers. Direction was provided by ground control vectoring post. At a height of 4000 meters, the engines reached maximum thrust and the command was given to drop his wing fuel tanks, turn on the afterburner and set a course of 350 degrees at an altitude of 1000 meters.*

*At an altitude of about 7000 meters, the pilot reported to the vectoring post that he saw navigation lights switching on at a higher altitude on the same heading. The MIG-21 was probably detected by the B-52 tail radar at a range of eight-ten kilometers and an altitude of 9000-9500 meters, since the crew turned off the navigation lights. The MIG-21 pilot reported this to the vectoring post. This was the last transmission by the pilot. The MIG-21 and B-52 collided in the clouds. According to the Vietnamese side, the MIG-21 rammed the B-52.*

[Author's note: this combat is not confirmed by any U.S. records. Its details track a typical "Hero of the Revolution" propaganda story of self sacrifice leading to the destruction of a hated enemy. This fanciful scenario appears in numerous apocryphal Soviet, Chinese Communist and North Vietnamese official accounts designed to encourage the people to sacrifice more.]

*Analysis of combat between Vietnamese fighters and B-52 strategic bombers shows that the principal tactical unit in night combat was the single fighter. Tactical surprise in the attack was supported by the use of the PKI bomb sight for aiming and launching the missile at the rear hemisphere of the B-52 bomber, which strongly supported the parameters of the flight before the launch (exceeding a speed of 300–400 kilometers/hour with the distance of the launch at 1800–2,000 meters) and carry out the launch of the R-3S rocket barrage.*

[Authors' note: Soviet designed and manufactured air-to-air guided missiles were notoriously inaccurate and ineffective, with far less than a 50% capability rate, even when fired well within their designed parameters. "Firing within parameters" was the "excuse mantra" of both U.S. and Soviet missile manufacturers, as seen in this passage above, although the success rates of U.S. air-to-air missiles at that time far exceeded the capabilities of their poorly-made Soviet counterparts. If the guided missile missed or did not explode as designed, investigators would state that "it was not fired within parameters." Many of the early air-to-air missile designs did not take into account the maneuvering typical in any air-to-air engagement.]

*One example of the poor results of the actions of the MIG-21 against the B-52 was the inability to direct them to the target (six of ten attempts were broken off due to strong interference with the radar guidance system).*

*Skirmishes with "Phantoms"*

*Fighter aviation was also used to fight tactical and reconnaissance aircraft. There were 11 such sorties (nine MIG-21 and two MIG-17). The results of the MIG-21 sorties was five American aircraft destroyed—four F-4 "Phantoms" and one RA-5C "Vigilant". The MIG-17 sorties were without result.*

*In the fight against tactical aviation, the basic combat unit was a pair of fighter-bombers. Thus eight of the 11 sorties (73%) were with pairs. During the conduct of air combat, the pilots used a concealed approach to the enemy, conducted a rapid attack and rapidly withdrew after launching rockets. Keeping in mind the numerical air superiority of the enemy, the pilots of the NVAF almost never engaged in extended air combat. There was one incidence on 28 December, however, when a pilot conducted a successful attack and had not received the accurate information on the enemy air superiority. He conducted an attack and hit an F-4.*

*The Vietnamese pilots had their own terminology to describe their more widely used aerial tactics such as "the deep penetration", "the simultaneous strike", the "continual pressure", the "shattered circle", the "attack by dividing an enemy", the "attack using enemy maneuver", the*

*“scissors” and so on. All aerial combat took place in clear visibility at short distance. The principle weapons were missiles.*

*Let us look at several tactical examples of actions against tactical aircraft. On 23 December, a pair of Vietnamese pilots in MIG-21s fought a flight of F-4s using the principle of an “attack by dividing an enemy”. The crux of the tactic is to how to attack in such a way that they could withdraw from combat without letting the enemy assume an advantageous attack posture. It turned out that when a flight of F-4s was attacked, as a rule, it would split into two pairs, one of which would begin a right combat turn and climb and the other would make a left diving spiral. In order to secure success, the Vietnamese pair would either split or continue to follow the pair selected for attack—it all depended on the distance from the F-4 flight (or trail aircraft) at the moment that they split into pairs. If the distance was under 3,000 meters, the Vietnamese pair would split and each pilot would independently attack “his” pair. If the distance was over 3,000 meters, the Vietnamese pair would continue a joint attack on the closest pair of F-4s.*

*In all cases, the combat formation of the pair was echelon right or echelon left. During the hunt (the “passive regime” in Vietnamese terminology), the aircraft would fly at a distance of 400-600 meters between the lead and trail aircraft, with 200-400 meters lateral distance and 50-100 meters difference in altitude. During aerial combat, they would adapt the “active regime”—which was a looser formation with the distance and interval spreading out to 800-1,000 meters.*

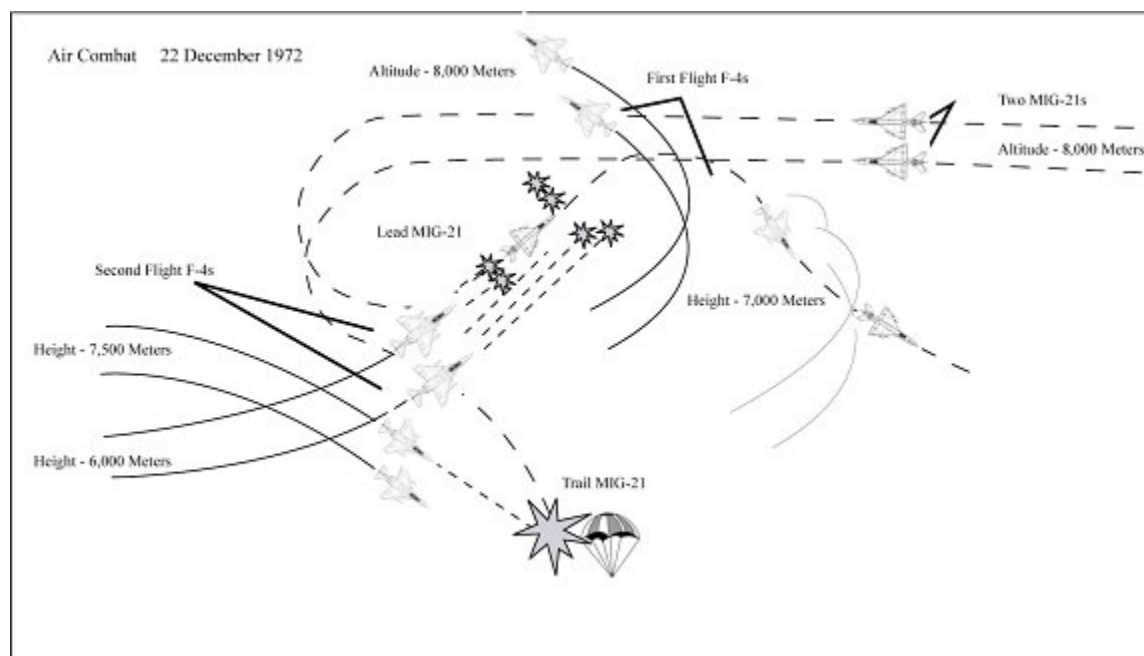
*In several instances, in order to improve observation over the rear hemisphere and protect the tail of the trail aircraft, the lead Vietnamese pilot would conduct the “snake” maneuver. He would continue on the same relative course as the trail aircraft with the maximum distance from it of 1,000 meters and make a 45-50 degree turn with a banking angle of 60-65 degrees.*

*At 1328 hours on 22 December, a pair of MIG-21s at the Hoi Bai airbase were dispatched to intercept a group of F-4 aircraft flying in from Laos. (See Map 5).<sup>51</sup> The cloud cover was ten-tenths, the lower edge of which was at 400 meters and the upper edge was at 1500 meters. Visibility was eight to ten kilometers. The regimental command post provided direction. In accordance with the orders on the command post, the pair set a course of 220 degrees at an altitude of 8,000 meters. After they broke through the clouds, upon direction from the command post, the lead aircraft began to turn left and instantly found a flight of F-4s to the left at an angle of 90 degrees and a distance of 6-8 kilometers. They were flying at a height of 6,000-8,000 meters. The pilot decided to attack the second pair of F-4s and gave the command to his trail aircraft to drop the fuel tanks and turn on the afterburners. In so far as the target of the attack was the closest pair (on the left), the lead aircraft made a sharp turn pulling seven to eight Gs. At that moment, the trail aircraft lost the lead. At the moment he banked into a U-turn, he was hit. The pilot catapulted out of the aircraft and made a safe parachute landing.*

*As became clear during the after action review of the air combat, a second flight of F-4s was trailing the first flight at the same altitude and they attacked the pair of MIG-21s. While the lead MIG-21 was attacking the trailing F-4 of the second pair in the first flight, it was attacked by*

*the lead pair of F-4s of the second flight, which launched six missiles at him. All the rockets passed close by him. In view of the air superiority of the enemy and his limited fuel reserves, the lead aircraft made a sharp dive to break contact. He shook off the enemy at 30-50 meters altitude and landed on the airbase airstrip with 250-300 liters of fuel remaining. The trail pilot was downed by the trail pair of F-4s from the second flight.*

*The causes of the loss of the trail aircraft include: weak group coordination in the selection of the pair and inexpert actions of the trail pilot after he lost the lead aircraft; the tactically incorrect target selection; and the lack of accurate directions from the CP of the fighter regiment.*



*At 1341 hours on 23 December, a pair of MIG-21s at the Hoi Bai airbase were dispatched to intercept a group of F-4 aircraft flying in from Laos at an altitude of 7,000-8,000 meters. (See Map 6).<sup>52</sup> The cloud cover was ten/tenths, the lower edge of which was at 400 meters and the upper edge was at 1200 meters. Visibility was six to eight kilometers. The regimental command post provided direction. After takeoff and climbing to an altitude of 300 meters, the pair flew under the clouds on a course of 160 degrees for one and a half minutes. Then, on orders from the CP, they changed to a course of 260 degrees and began to climb at maximum thrust. At 4,000 meters, the lead aircraft saw a flight of aircraft to his right at an angle of 56-60 degrees. They were flying in a wedge formation at 7,000-8,000 meters. He decided to attack the trail pair of F-4s. Dropping their wing tanks and turning on their afterburners, the pair of MIG-21s turned to the right and closed in on the enemy aircraft from above. When the pair of MIG-21s had flown into the rear hemisphere of the flight of F-4s (at a distance of about ten kilometers), they were discovered. The F-4s dropped their fuel tanks and kicked on their afterburners in an attempt to*

*leave. However, the pair of MIG-21s, having the advantage in speed, quickly shortened the distance. Not able to break away, the flight of F-4s split into pairs: the lead pair began the ascending turn to the right and the trail pair began the spiral dive to the left.*

*The lead MIG-21 pilot decided to attack the trail pair of F-4s with both MIGs. At the distance of 1,500-1,800 meters he launched a single R-3S missile at the trail F-4 and shot it down. The trail MIG-21 pilot was flying in an echelon left at a distance of 2,500-3,00 meters and also launched a missile at the trail pair of F-4s. However, the launch was flawed by the MIG's sharp turn at three-four Gs and the missile flew past the target. The MIG-21 fighters made a power dive to disengage from combat and made a safe landing at the airbase.*

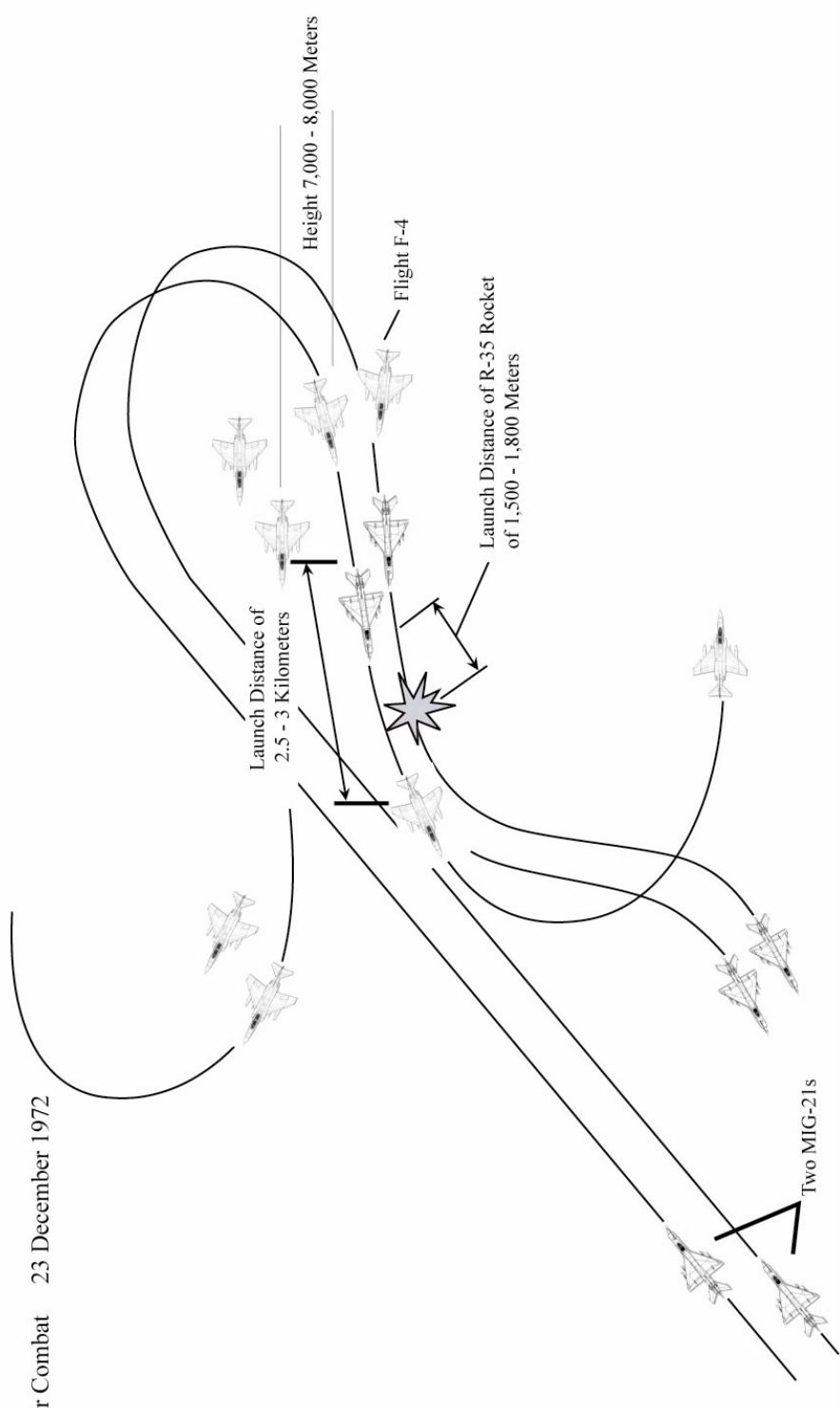
*In this example, the correct formation for air maneuver and the surprise of the attack destroyed the F-4 aircraft. The unlucky second launch showed that, due to the great distance and the G-force, it was launched beyond the maximum permissible tolerances.*

*At 1334 hours on 27 December, a pair of MIG-21s at the Hoi Bai airbase were dispatched to intercept a group of F-4 aircraft flying in from Laos. The cloud cover was six-seven/tenths, the lower edge of which was at 500 meters and the upper edge was at 1500 meters. Visibility was ten kilometers. The regimental command post provided direction. After takeoff and climbing to an altitude of 300 meters, the pair flew under the clouds on a course of 80 degrees. They climbed to 5000 meters, once they flew over the region of the Kep airbase, per direction of the CP. After their altitude was verified, it turned out that the lead pilot had misunderstood the order and that the pair was to have increased their altitude to 500 meters. The pair dove down to the prescribed elevation and just as they broke through the bottom edge of the cloud cover and turned right, the trail pilot saw a pair of F-4s some three kilometers to his right. He advised the lead pilot about the target and received the order to attack. He fired his first R-3S missile at a range of 1,800-2,000 meters at a speed of 900-950 kilometers/hour at an altitude of 200 meters over the ground. The missile flew into the dirt. The pilot increased his speed to 1,000-1,200 kilometers/hour and shortened the distance to 1,300 meters before he launched his second missile. This one hit the target. The lead aircraft of the pair of F-4's was shot down and the pilot catapulted from the aircraft.*

*The lack of success of the first attack is a testimonial to haste and to the non-observance of the correct flight parameters prior to launch. The pilot's incorrect understanding of the correct height and their flight to that height speaks to the weak control that the CP of the Fighter Regiment had over its pilots that night, in a complex aviation picture under enemy air superiority, lead to their loss.*

*At 1407 hours on 27 December, a single MIG-21 at the Hoi Bai airbase was dispatched to intercept a group of F-4 aircraft. (See Map 7) The cloud cover was six-seven/tenths, the lower edge of which was at 500 meters and the upper edge was at 1200 meters. Visibility was eight to ten kilometers. The central command post provided direction. The pilot flew at a height of 150-200 meters over the ground north of Hanoi. Then, on command, he turned on his afterburner,*

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*dropped his wing fuel tanks, climbed to 3,500 meters and lay in a course of 195 degrees. Following this course, the pilot saw a flight of F-4s in a wedge formation flying ahead of him some eight-ten kilometers at a somewhat higher altitude. Using his superiority in speed, he closed the distance to the second trail pair to some 1,500-2,000 meters and launched a R-3S missile (the target was selected correctly, in that the trail F-4 carried out the “scissors” maneuver). The missile hit the target, the F-4 was shot down and the pilot catapulted out.*

*Turning on the afterburner, the MIG-21 pilot made a half-turn and broke contact, returned to his airbase and landed. The tactically sound maneuver prior to the attack, the covered approach to the target and the precise observance of the flight parameters of the aircraft prior to missile launch supported the successful conclusion of this air combat.*

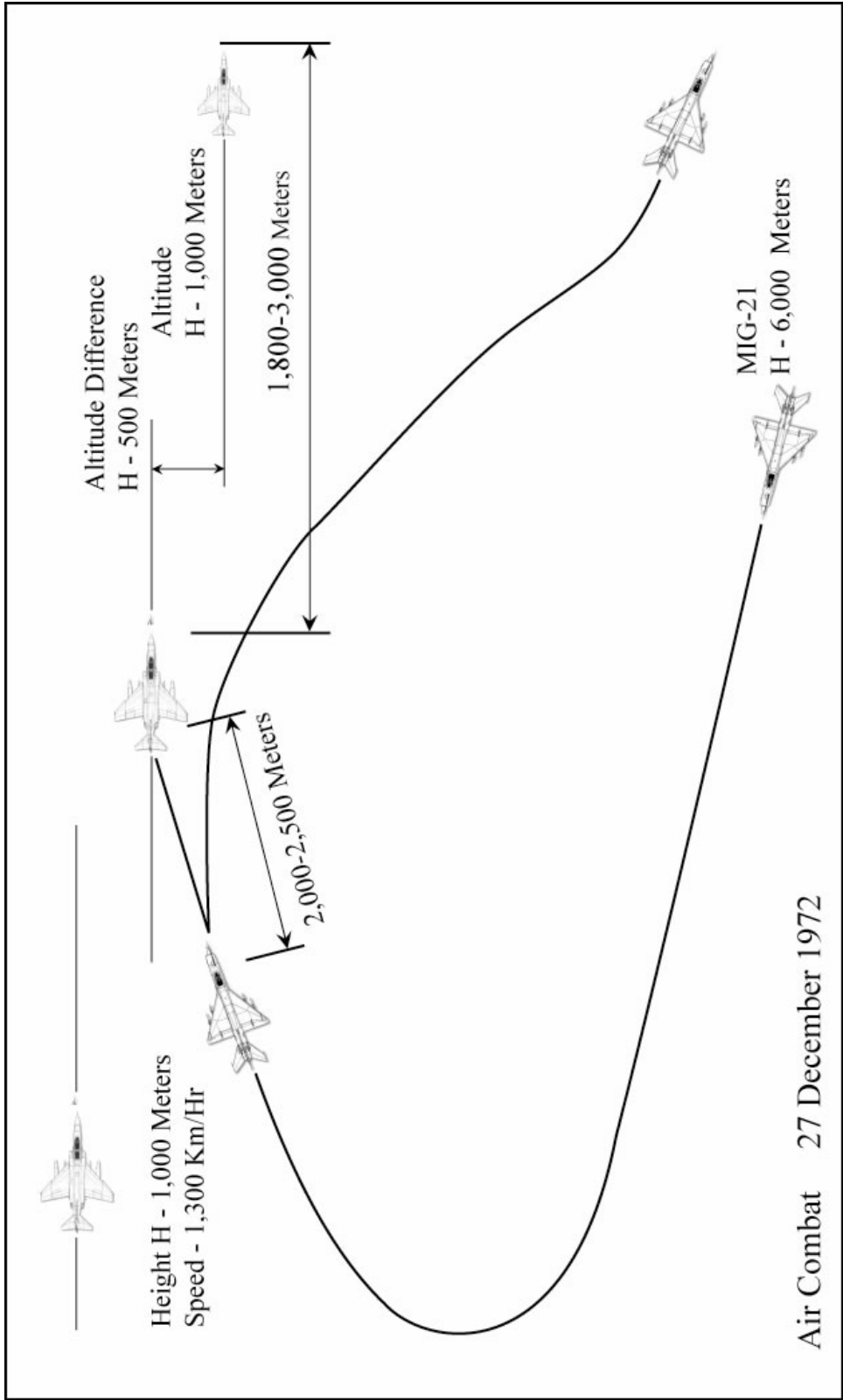
*At 1117 hours on 28 December, a pair of MIG-21s at the Hoi Bai airbase were dispatched to intercept a group of F-4 aircraft flying in from Laos in the direction of Hanoi. The cloud cover was seven-eight/tenths, the lower edge of which was at 800 meters and the upper edge was at 1800 meters. Visibility was eight to ten kilometers. The regimental command post provided direction.*

*After takeoff and climbing to an altitude of 300 meters, the pair turned to the left and lay a course for Hanoi. After two minutes and 30 seconds, the regimental command post told them to drop their fuel tanks, turn on their afterburners and climb to an altitude of 5,000 meters. The trail pilot carried out the “snake” maneuver relative to the course of the lead aircraft, that is consistent with changing the echelon. Flying in echelon left, relative to the lead aircraft, the trail aircraft saw a flight of F-4 aircraft some eight kilometers to his right and somewhat higher. He decided to attack them. At the same moment, the lead aircraft saw yet another flight of F-4s, flying on the same course and altitude as the first. To cover his tail aircraft, the lead aircraft engaged in high energy maneuver in the horizontal and vertical planes in an attempt to join battle with the flight. Then, when his fuel reserves were down to 1,000 liters, he broke contact and landed at the airfield.*

*Per the reports of the combatants of the people’s militia, the personnel of the anti-aircraft artillery, air defense and radar forces established that the trail pilot killed one F-4 and one RA-5C in aerial combat before he was shot down and catapulted from the aircraft. He was dead when he landed. The details of the combat are not available since the lead pilot was himself in combat and unable to observe the actions of the trail pilot. It is necessary to note that in the given aerial combat, tactical surprise, skilled maneuver along with the courage and bravery of the Vietnamese pilots allowed a pair of MIG-21s to fight eight F-4s and obtain success.*

## **Analysis**

Opposing sides at war will seldom agree on the numbers. The USAF launched more B-52s strikes than the North Vietnamese or Soviets detected. The USAF reported 800 to 1000 North Vietnamese missile launches, while the North Vietnamese and Soviets claim to have expended 266



missiles. The North Vietnamese reported downing more B-52s and other aircraft than they actually did, but how many the USAF lost is still a question since the USAF figures are also suspect. If a USAF plane is badly damaged, but manages to land, it is not always carried as a loss, even if it is too shot up ever to fly again. There are other reasons that figures differ. Jamming and chaff hide aircraft, various crews involved in combat take credit for the same kill—and all may have been part of it. Aircraft that appear to be hit may fly on unscathed. Missile launches are counted and reported by anyone who sees them—and it is difficult to figure out how many were actually fired from all the reports. Electronics intelligence (ELINT) can detect launch signals, but not launches—and many missile launch sequences are initiated and carried through up to the moment of launch during combat, but never completed for a variety of reasons (target masked by jamming or chaff, target out of range, target engaged by another battery, target lost, missile fails to ignite, friendly aircraft in sector, and so on). And there is always the apparent need to exaggerate success in shooting down the enemy or avoiding his ordnance. The Soviets probably have an accurate count on missile expenditure since they had to replace expended missiles, but they are dependent on North Vietnamese counts of downed aircraft.

The Soviet study of the campaign is thorough, usually balanced and detailed. The Soviets were clearly interested in all the details of the campaign since the B-52's primary role was the conduct of nuclear war against the Soviet Union. The Soviets realized that the high-level, mass employment of B-52's against Hanoi in no way replicated their low-level, single-plane nuclear delivery mode.

The USAF planning was thorough, yet highly predictable and followed four operational templates. Spacings, routes, electronic countermeasures, altitudes, timings and targets were predictable. Tactics were set and predictable. American technology provided a degree of difficulty for the North Vietnamese, but its use was predictable and that technology predictability enabled the North Vietnamese to work against it.

The SA-2 system was first fielded in 1957 and was a fairly obsolete and cumbersome system by 1972 standards.<sup>53</sup> USAF loss rates during Operation Linebacker II were considerably below their loss rates during World War II strategic bombing missions. USAF and USN electronic countermeasures seriously degraded the performance of the SA-2 system during Operation Linebacker II. The Soviets had a good understanding of the capabilities and specifications of the various components of the American electronics warfare suite.

The intelligence picture that the Soviets and North Vietnamese had remains an area of conjecture. Linebacker II occurred during a period in which some U.S. citizens felt any means that would lead to a U.S. defeat were justified because, in their opinion, it was “an unjust war”. Numerous leaks of classified information occurred, with the results appearing in newspapers or in the hands of enemies of the United States. Author Drenkowski observed the results of leaked information causing the deaths of U.S. military personnel attempting to do their jobs, while resulting in degraded efforts which killed many civilians unnecessarily. Additionally, at this time a family of spies in the U.S. Navy’s cryptology department was regularly providing the Soviet

Union with information, messages, and codes to break virtually every encoded message sent between U.S. Navy units and the Defense Department--all for money, not ideology.

An example of the need for further research into intelligence emerges from Michel's book, in which he used both U.S. and North Vietnamese sources. During Operation Linebacker, from May-October 1972, U.S. tactical air forces engaged in constant and intense operations in the Red River region of North Vietnam. B-52 bombers only entered this region once, and only bombing from afar on the edges of Haiphong. In mid-October, 1972, all bombing operations halted above the 20<sup>th</sup> Parallel, not to resume until the Linebacker II raids of late December.

However, bombing operations by both fighter planes and B-52s continued in the Southern regions of North Vietnam below the 20<sup>th</sup> Parallel.

In August, according to Michel, SAC directed Eighth Air Force in Guam's Anderson Air Force Base to review a list of targets in the Hanoi area, with instructions to prepare aiming offsets--a clear indication that SAC was ready to strike Hanoi.<sup>54</sup> Michel goes on to say that in September, the North Vietnamese General Staff ordered formation of a special headquarters group to go to the Southern regions of North Vietnam to study the B-52 operations there and return to make recommendations on destroying B-52s, taking advantage of their predictable tactics and procedures.

This alone would not raise eyebrows, as one would expect a military force under attack to take such measures to counter an enemy's tactics and equipment. However, Michel goes on to report that "the North Vietnamese General Staff ordered its Air Defense Command to develop a plan for defending Hanoi and Haiphong against B-52 attack."<sup>55</sup> More ominously, the General Staff projected "five to seven days of night attacks . . ."<sup>56</sup> The plan was presented in early October, calling for an increase in the number of SAM battalions around Hanoi, which, according to Michel, was implemented.<sup>57</sup> It is important to note that this meant that the North Vietnamese were reducing the number of SAMs in the southern zones which were still under attack by U.S. forces, in order to meet what would have been a "hypothetical" series of B-52 attacks against other areas--hypothetical, that is, unless Hanoi was in possession of intelligence about future plans by the U.S. However, in November, the General Staff ordered some of the missile forces around Hanoi sent south to reinforce the on-going fighting in that region.<sup>58</sup>

Perhaps the North Vietnamese General Staff received intelligence warnings about SAC plans for Hanoi-Red River Valley targets, but after a few months of inactivity, their level of concern was reduced. This is only speculation, as North Vietnam has not shared its intelligence reports with the world.

Still, additional actions taken in December again give rise to questions about intelligence operations by America's enemy agents. Michel notes that on December 15, the U.S. Joint Chiefs "sent SAC a list" of targets to be bombed the first night. In what must have been an amazing coincidence, on that same day, Michel notes that North Vietnam's General Staff suddenly canceled

the orders re-deploying SA-2 units to the southern areas still under attack, noting that they “had begun to get intelligence clues” [unnamed] that something was going on.” Two to three days before the attacks started, North Vietnam decided it needs more defenses around Hanoi, in the Red River Valley. Nonetheless, leaves were not canceled for that unit.<sup>59</sup>

The sequence of events was: SAC sends requests for Red River Valley targeting information in August, and very shortly thereafter, North Vietnam orders studies for shooting down B-52s in the Red River Valley area, noting that only night attacks should be planned for (which is what SAC planned), then removes SA-2 missile units from the embattled regions of southern North Vietnam to send to the peaceful Red River Valley region. Hanoi later orders units south again from the Hanoi region, but suddenly cancels those orders the same day the U.S. Joint Chiefs send a list of targets to SAC, suggesting an attack will soon occur.

Not so curious was what happened when the B-52s launched for their first raids of the Linebacker II offensive. Within two hours after takeoff, and while hours away from their targets, Hanoi received intelligence warnings that a huge force of B-52s were airborne from Guam, apparently from the Soviet intelligence trawler stationed perpetually off the end of the runway at Anderson Air Force Base.<sup>60</sup>

The timing of the publication of the Russian articles and the release of Soviet data is interesting. The world is probably eight-ten years out from an air defense revolution. Human pilots will not be able to withstand the G-forces necessary to evade the new generation missiles. The USAF is a major part of US military power, but it is in danger of becoming obsolete or becoming a very different air force. Yet, future technology is only part of the process required for an enemy to deter/offset the USAF. A major part of the process is understanding the command and control process and the campaign planning that the USAF conducts or has conducted. There are several other USAF air campaigns worth careful study by foreign militaries:

Operation Desert Storm where the USAF enjoyed complete air dominance and spent six weeks blasting an exposed Iraqi Army in the open Kuwaiti desert but still did not bring about its collapse.

Operation Southern Watch where the USAF and RAF spent 1991-2003 enforcing the no-fly zone over Iraq.

Operation Allied Force over Kosovo where the USAF and NATO air forces spent 78 days trying to defeat the Serbian Armed Forces and blasting the civilian infrastructure. The Serbian Armed Forces escaped intact, but the civilians were blasted into surrender and the economies of the nations along the Danube were disrupted. This campaign appears to be the sole vindication of the generally discredited works of Giulio Douhet on strategic bombing.

Operation Enduring Freedom in Afghanistan where Special Operating Forces working with the Afghan Northern Alliance conventional force eventually defeated the Taliban/Al Qaeda conventional force using air power to dismantle the linear enemy formations.<sup>61</sup>

Operation Iraqi Freedom where precision strikes destroyed key targets but left so little collateral damage that “shock and awe” did neither.

Clearly, other nations have studied the USAF air campaigns and adapted their air defenses to them (Kuwait, Kosovo, Iraq). The bottom line for the American military is that technology is great but does not solve everything. Thorough, imaginative campaign planning; input from subordinates; tactical adaptation to enemy innovation; and not setting a pattern are important measures when soldiers, sailors, marines and airmen’s lives are on the line.

And, finally, what did the sacrifices of airmen and sailors during Operation Linebacker II achieve? Hanoi was finally bombed, but other cities have learned to survive strategic bombing attacks and Hanoi would also have done so in time. The attacks on the port of Haiphong may have actually been of more concern to the North Vietnamese government. Linebacker II was hardly a major military event in the total Vietnam War but it apparently caused the North Vietnamese to sign a peace treaty and give President his “peace with dignity”. However, North Vietnam subsequently violated all of its agreements—which probably came as no surprise to the US negotiators. What the US got out of Linebacker II was the return of its prisoners of war held in the North—instead of having to ransom them at some later date. The United States saved face, got its prisoners back and got a decent interval before South Vietnam was conquered by the conventional divisions of the North.

ENDNOTES:

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<sup>1</sup> Marshall L. Michel III, The 11 Days of Christmas: America’s Last Vietnam Battle, San Francisco: Encounter Books, 2002, 41. The dates given are the dates the event occurred in Vietnam which is a day ahead of the United States.

<sup>2</sup> Ibid, 66-122. Marshall Michel has written the most comprehensive, even-handed, English language book on Operation Linebacker II and we rely on his research into the American and Vietnamese sources. Brigadier General James R. McCarthy and Lieutenant Colonel George B. Allison produced Linebacker II: A View from the Rock as the official USAF history of the operation. Unfortunately, it whitewashes SAC’s problems and appears to be written to prevent criticism of USAF senior leadership. The Soviet material supports the Michel book.

<sup>3</sup> Ibid, 121-138.

<sup>4</sup> Ibid, 139-166.

<sup>5</sup> Ibid, 167-173.

<sup>6</sup> Ibid, 168-180.

<sup>7</sup> Ibid, 181-183.

<sup>8</sup> Ibid, 183-184.

<sup>9</sup> Ibid, 184-185.

<sup>10</sup> Ibid, 186-203.

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<sup>11</sup> Ibid, 204-206.

<sup>12</sup> Ibid, 207-213.

<sup>13</sup> Ibid, 213.

<sup>14</sup> Ibid, 239.

<sup>15</sup> Dana Drenkowski, "The Tragedy of Operation Linebacker II", Armed Forces Journal, July 1997, 26. Stephen L. "Cookie" Sewell has done major research into the air war during the Korean conflict. The communist goal was to prevent USAF daylight bombing by the B-29s. They succeeded in this and less-accurate USAF bombing was conducted at night. The USAF concentrated on the air superiority battle between the MIG 15 and the F-86. The USAF claimed that ten MIGs were shot down for every lost F-86. Sewell's research shows that the ratio was much lower and may actually be close to one-for-one. The USAF accomplished their count by a variety of means including counting every downed communist aircraft as a MIG and not counting destroyed F-86s that managed to crash land. The reason for this deception was that many of the MIGs with North Korean and Chinese tail markings were piloted by Soviets. Neither the Soviet Union nor the United States wanted to admit to its citizenry that they were involved in a shooting war with a recent war-time ally.

<sup>16</sup> Dana Drenkowski, "Operation Linebacker II" [Part 2], Soldier of Fortune, volume 2, number 4, November 1977, 55. Dana Drenkowski was sent to U Tapao Air Base a little over a month after Linebacker II, where he personally counted nine B-52s on "Wreck Row", where B-52s too badly damaged to fly combat were kept for later disposition (to be dismantled or prepped for a one-time flight to the Davis-Monthan Air Force Base "boneyard"). He was told by B-52 crews that all were hit during the Linebacker II raids. His sources were "unofficial," and hence of "questionable reliability" for purposes of historical analysis, although USAF pilots had little reason for misleading other USAF pilots. It is stories like this that give credence to questions surrounding the official reported losses—not to mention the differing official numbers given at different times to Congress, the press and later historians. During the Vietnam war, it was sometimes politic for commanders to write off combat losses as "maintenance losses" to hide actual casualties, while other times those planes actually lost to real maintenance problems were reported as "combat losses" when a Wing Commander was in trouble with superiors for too many maintenance problems. Then-Captain Drenkowski is personally familiar with incidents of both during his combat tours in the war. Drenkowski's figures comport with those found later by Michel in his book, which listed nine damaged B52s, although Michel's figures showed three with major damage and six with minor damage. [Michel, p. 239]. Drenkowski may have been shown all nine of the damaged B-52s at U-Tapao and understood the description to mean all were examples of major damage. It is not known how many of the "minor" damaged six were ever returned to operational status.

<sup>17</sup> Lester W. Grau, "Soviet Soldier-Internationalists in Support of Communist Revolutions", Mysteries of the Cold War (Stephan J. Cimbala, editor), Aldershot: Ashgate Publishing, 1999, 183-184.

<sup>18</sup> Moscow Russian Television station RTR, 1700 GMT 03 March 2001 in Russian with reporter Natalya Krapivina.

<sup>19</sup> The overall editor was Marshal of the Soviet Union P.G. Batiskogo and the writers collective

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consisted of Khyupenen (the director) and D. K. Bedenko, S. A. Varyukhin, V. G. Manukhin, D. I. Fomin and A. K. Reminnogo. The writers collective was assisted by K. S. Babenko, M. I. Fesenko, S.V. Aleshkin, Yu. S. Garnaev and other Soviet military specialists who were serving in the Democratic Republic of Vietnam at the time. A. I. Khyupenen, “Strategicheskaya aviatsiya SShA v operatsii “Laynbeker-2” [US Strategic Aviation in Operation “Linebacker-2”, Voenno-istoricheskii zhurnal [Military-Historical Journal], February 2005, 30.

<sup>20</sup> The authors find it notable that the Soviet sources do not mention any intelligence of theirs about the launches from U-Tapao and Guam. Though it is not known what ground assets the Soviet intelligence organizations had around U-Tapao, it is assumed they had some, as Thailand was not a closed society. Drenkowski notes that throughout the Vietnam war, Soviet intelligence maintained a “spy trawler” in international waters off the end of the runway at Guam’s Anderson Air Base. This boat was well equipped with the latest in Soviet spy technology and was widely believed to be reporting continuously about the numbers, headings, radio broadcasts (during launch operations, the crews communicated “in the clear”) and other information regarding B-52 launches. Drenkowski flew directly over the trawler every time he took off in his B-52 bomber from Guam. In addition, during this period, it is now well known that all significant U.S. Navy codes were compromised by a ring of American spies working for the Soviets, which enabled the Soviet Union to “read the mail”. The mail probably included all information about Operation Linebacker II that was transmitted to and from Navy units involved in the operation. The Soviet sources do not say whether any such information was passed to their North Vietnamese allies, but it would be likely that at least the broad outlines of pending operations would be forwarded.

<sup>21</sup> All sections in italics are a translation from the Russian. Les Grau is responsible for the quality of this translation. This particular section in italics is a translation of A. I. Khyupenen, “Strategicheskaya aviatsiya SShA v operatsii “Laynbeker-2” [US Strategic Aviation in Operation “Linebacker-2”, Voenno-istoricheskii zhurnal [Military-Historical Journal], February 2005, 30-33. Apparently the Soviet’s are using Dana Drenkowski’s “low-ball” figure of 22 B-52’s lost.

<sup>22</sup> Drenkowski: The basic B-52 attack group was a three-plane element; a single plane would not be sent on a mission. Chaff drops and electronic jamming (ECM—Electronic Counter Measures) were effective against DRVN radar and masked the actual number of aircraft involved in a strike.

<sup>23</sup> Drenkowski: Khyupenen’s accounts of the total numbers of aircraft involved in most missions from this point forward should be taken with a grain of salt. American countermeasures and radar jamming had their effect as indicated by the actual numbers of fighters engaged in each mission were higher than those given in the Soviet sources. Soviet figures are those aircraft that the DRVN detected.

<sup>24</sup> “Elements”, as noted above. More than one element was a “wave” and sometimes multiple waves were called a “stream”. B-52s were never permitted to attack alone, as mutual ECM support was mandated. If an element degraded prior to entering the target area due to maintenance issues such that only one plane were left of the three, it would join with another element.

<sup>25</sup> Although the Soviets use the geographical location of Sam Neua, the USAF habitual use of coordinates that end in 00 [195800 Latitude and 1044100 Longitude] adds predictability to intelligence analysis of USAF planning and execution.

<sup>26</sup> The internal bomb load for B-52Ds, which flew out U-Tapao Royal Thai Air Base on the Gulf of



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Siam, was 84 500-lb bombs in the internal bomb bay. The 24 bombs under the wings of the U-Tapao B-52Ds were 750 lb bombs.

<sup>27</sup> Drenkowski: This was the “straight-in” path from the Initial Point (IP) to the target—no deviation was allowed once the IP was passed, which meant each bomber flew the same heading, altitude and airspeed for a finite period of time until bomb release, making the bombers vulnerable to enemy fire. This method, too, was instituted during operations in WWII for different circumstances, but never altered. There may be valid reasons for maintaining the long “bomb run”, but staying on the same altitude, heading and airspeed for 60-70 kilometers directly to the target does create a significant window of vulnerability for the bombers.

<sup>28</sup> Khyupenen, “Strategicheskaya aviatsiya...”, 30-31. Khyupenen wrote an earlier similar article entitled “Voyny, konflikty. “Stratofortessy” nad severnym V’etnamom” [Wars and Conflicts: “Stratofortresses over North Vietnam”, Vozdushno-kosmicheskaya oborona [Air-space Defense], February 2004, 42-46.

<sup>29</sup> Map 1 developed from map in Khyupenen, “Strategicheskaya aviatsiya...”, 32. All maps are adaptations of the original Soviet maps. Homy Rosado did the conversion map work for the article.

<sup>30</sup> Soviet numbers reflect aircraft detected, so their count is under what was actually employed in the mission. The second night was probably chosen as more instructive as the data collected was more complete than the data from the first night when they were tactically surprised.

<sup>31</sup> Drenkowski: Khyupenen is referring to the F-105 Wild Weasels, which specialized in counter SAM operations. Familiar with the Soviet manner of total control of their pilots’ airborne operations wherein every maneuver is directed by ground control, Khyupenen apparently cannot believe that the Wild Weasels would depart a target area without orders from above, hence his suggestion that they received a special, unheard signal directing them to exit the target area. In fact, the Weasel crews were listening to the B-52s during the missions and made their own decisions when to return upon concluding their job was done—a level of independence and initiative that was unacceptable to the Soviet system of tactical warfare.

<sup>32</sup> Map 2 developed from map in Khyupenen, “Strategicheskaya aviatsiya...”, 33.

<sup>33</sup> Khyupenen, “Strategicheskaya aviatsiya...”, 31-33.

<sup>34</sup> Dr. Clay Mountcastle, who is an US Army air defense major, was kind enough to review this study. He makes an interesting point of the meaning of success. To the DRV air defenders and General Khyupenen, success was shooting down the previously invulnerable B-52s in any number. To B-52 and F-4 pilot Drenkowski, enemy success was shooting down the previously invulnerable B-52s despite the massing of American air might and advanced technology. To Major Mountcastle, “from an [American] air defense standpoint, even a 10%-15% kill rate would not seem significant, particularly because the defended assets were struck with impunity. ‘Success’ for air defense is not measured by percentage of enemy aircraft killed, but by the survival of your protected targets.”

<sup>35</sup> A. I. Khyupenen, “Organizatsiya VVS SSHA radioelektronikoy bor’by v khode operatsii “Laynbeker-2’ [USAF Electronic Warfare During Operation Linebacker II”], Voyenno-istoricheskiy zhurnal [Military-historical journal], July 2005, 36.

<sup>36</sup> Ibid, 32.

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<sup>37</sup> Drenkowski reports his F-4 unit encountered SA-3 “Goa” missiles in the Black and Red River Valleys two months before Linebacker II, but were not allowed to retune their jammers to meet the new threat when USAF intelligence refused to accept the evidence. Later, during the Linebacker II raids, some returning pilots reported they were shot down by missiles exhibiting no warnings on their systems, either confirming the existence of another missile (other than the SA-2 Guidelines)-- or the changing of current missile guidance bands in response to American ECM successes. Michel reports that North Vietnamese missile crews were in the Soviet Union, training to use the SA-3 missile, but that Soviet Prime Minister Brezhnev ordered that those missiles would not be sent to Vietnam just yet. Michel further states later, firmly, that there were no SA-3 missiles in North Vietnam during Linebacker II. [Michel, pp. 29, 244] If Michel is correct, there was some other explanation for the missile shot at one of the planes in his unit and for the lack of electronic warnings during certain guided missile attacks.

<sup>38</sup> Khyupenen, “Organizatsiya VVS....”, 36.

<sup>39</sup> This section from A. I. Khyupenen, “Takticheskaya avianosnaya aviatsiya SShA v Operatsii ‘Laynbeker-2’”, [US Tactical and Carrier Aviation in Operation “Linebacker II”], Voenno-istoricheskii zhurnal [Military-Historical Journal], April 2005, 50-54. A large portion of this article not included for purposes of brevity. Deleted portion deals with an accurate description of US techniques of bombing with laser sights and the “Pave Knife” and “Pave Way” delivery systems.

<sup>40</sup> If true, it is unclear where the Soviets obtained this information about orienting on such objects as the water tower.

<sup>41</sup> Drenkowski: this confirms Drenkowski’s earlier report that virtually all the F-111 missions on the first night missed their targets. The report of many dud bombs would suggest that the standard fusing systems used for dive bombing and horizontal bombing from higher altitudes were not adequate for the newer requirements of the advanced low level bombers. Additionally, Khyupenen’s account confirms what was widely reported in US military circles at the time: that the F-111’s most effective—but unanticipated--contribution was its effect on enemy morale.

<sup>42</sup> Decisions had been made by US politicians not to destroy the entire North Vietnamese air force on the ground early in the war. The fact that one quarter of the strike force always had to be devoted to anti-air defense shows part of the overall cost of that decision. The other cost, of course, was the continuous losses to enemy air forces.

<sup>43</sup> This section from A. I. Khyupenen, “Protivoborstvo zenitnykh raketnikh voysk Demokraticheskoy Respubliki V’etnam s Amerikanskoy Aviatsiey v Dekabre 1972 goda” [Confrontation between the North Vietnamese Air Defense Missile Forces and American Aviation in December 1972], Voenno-istoricheskii zhurnal [Military-Historical Journal], August 2005, 36-41. Technical portions of this section were deleted.

<sup>44</sup> Table 1 from Khyupenen, “Protivoborstvo zenitnykh....”, 37.

<sup>45</sup> According to North Vietnamese sources, they were having major difficulty in assembling enough missiles to replace those fired and, consequently were short missiles on the launchers. Michel, 142.

<sup>46</sup> There were four missile-firing battalions and a technical battalion in a North Vietnamese air defense regiment. It is unclear whether the problem was that the regiment could not control the

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fires of all of its battalions or the air defense division could not control the fires of elements of two regiments. The latter is the more likely option.

<sup>47</sup> A. I. Khyupenen, “Radiotekhnicheskie boyska V”etnamskoy narodnoy armii protiv aviatsii SShA v operatsii ‘Laynbeker-2’ [Peoples Army of Vietnam’s Radar Troops vs U.S. Aviation in Operation Linebacker II.], Voyenno-istoricheski zhurnal [Military-historical journal], 10.

<sup>48</sup> Map 3 from Khyupenen, “Protivoborstvo zenitnykh...”, 39.

<sup>49</sup> Table 2 from Khyupenen, “Protivoborstvo zenitnykh...”, 38.

<sup>50</sup> Map 4 developed from A. I. Khyupenen, “Voyny I konflikty. Vozdushnye boy nad Severnym V”etnamom” [Wars and conflicts. Air war over North Vietnam], Vozdushno-kosmicheskaya oborona [Aerospace defense], April 2004, 37-42.

<sup>51</sup> Map 5, *ibid*, 40.

<sup>52</sup> Map 6, *ibid*.

<sup>53</sup> Steven J. Zaloga, Soviet Air Defense Missiles, Jane’s Information Group, 1989, 37 and 63-65.

<sup>54</sup> Michel, at 35

<sup>55</sup> *Ibid*, at 37.

<sup>56</sup> *Ibid*.

<sup>57</sup> *Ibid*.

<sup>58</sup> *Ibid*, 49-50.

<sup>59</sup> *Ibid*, 50-51.

<sup>60</sup> *Ibid*, 78-79.

<sup>61</sup> This followed the initial feckless air operation focused on the “Taliban integrated air defense system”, the “Taliban command and control system” and the “Taliban tank maintenance facilities”—all of which were non-existent. The initial air operation was conducted to give the appearance of dynamic response while the US government searched for a Pushtun force to dispose the all-Pushtun Taliban. The US was reluctant at first to ally itself with the Northern Alliance, however, there would be no large-scale anti-Taliban Pushtun force and US air power would finally start hitting the Taliban and Al Qaeda forces deployed against the Northern Alliance—the only real target in the country. Then the air operation, in combination with ground attacks by the Northern Alliance and assisted by US Special Operations personnel and air controllers, seriously damaged the Taliban and Al Qaeda force.