air operations to eliminate sea imports. Strike planning was to place primary emphasis on the NE rail/road with secondary emphasis on the NW rail line. Strikes against the NW line would prevent NVN from concentrating reconstruction efforts on the NE rail line and would also split the defense effort. The objective was to keep two or three points on the NE rail line and on the parallel road routes interdicted at all times, primarily through destruction of key bridges.

With respect to fixed POL targets, it was estimated that about 90,000 metric tons capacity existed in tank complexes with perhaps as much as 5 - 10,000 additional metric tons stored in semi-permanent drum storage areas. Of the tank storage, an estimated 71,000 MT was contained in JCS numbered targets. All of these JCS targets had been struck (except Phuc Yen - 14,000 MT and Kep - 800 MT) which left approximately 57,000 tons (or about 50 percent of the total known POL) as residual in previously struck JCS targets. Strikes were programmed against nine targets with residual POL value.

Destruction of transitory targets, such as watercraft, rolling stock, trucks, transshipment points, and temporary storage areas would also help suppress POL distribution.

POL reconnaissance requirements would be met largely through regularly scheduled recce flights into areas of major interest, rather than specific point targets. Intelligence was needed on the extent to which route, rails and waterways in the north and northeast were being used to move POL. Known POL targets of value would be scheduled for coverage to update residual
While extent to which POL had been dispersed was not exactly known, it was certain that Hanoi had given this project a high priority. It was necessary to prevent new POL supplies from entering the country and to find and destroy dispersed stock. The latter task, although time-consuming, would assure gradual attrition if replenishment was kept to a minimum.

The 7AF recommended restrikes of priority one POL targets interspersed with strikes on the NE and NW rail lines to maintain interdiction. These priority one POL targets would be restruck every other day to allow for BDA. Task forces would penetrate NVN defenses in the morning and again in the afternoon. For tactical deception, an occasional 24-aircraft force would be massed to strike hard targets within 30 miles of Hanoi. Night armed reconnaissance would generally be scheduled before midnight to take best advantage of weather forecast for this season. TOT's for any particular strike would span 20-30 minutes. Small targets would be hit by one flight of four aircraft and large targets by flights of four, with a TOT spread of approximately five minutes between flights. Multiple attack headings would be used where feasible.

High-level concern was expressed over the bombing of two unauthorized JCS targets - the Thai Nguyen Thermal Power Plant (JCS 82.16) and the Viet Tri Thermal Power Plant (JCS 82.17) - during July. Analysis of BLUE TREE photography (8 July) revealed damage to JCS 82.16 and photography of 19 July showed that the transformer of the Viet Tri Power Plant had been
damaged. Aircrew debriefings of flights which had struck targets in the vicinity of JCS 82.16 and 82.17 indicated that accidental bombing could have occurred during attacks on nearby targets. The inadvertent strikes appeared to be the result of intensive enemy ground fire and not poor mission preparation, lack of professional skill or carelessness. The 7AF Commander re-emphasized, to all wing commanders concerned, the importance of target study, accurate reporting, and the absolute necessity of avoiding attacks on unauthorized targets.

The possibility of moving the Dixie Station carrier north to support out-of-country air efforts in ROLLING THUNDER Route Packages II, III and IV was under study in July. The Commander, 7AF, informed CINCPAC that the study would include an analysis of the present sorties effort by the Dixie Carrier, the effects on in-country coverage, effects of U.S. capabilities in SVN, sortie efforts out-of-country and other factors. He brought out one point which implied the F-105's would have to be moved from II CTZ to III CTZ to help make up the loss of sorties currently being run by Dixie in III and IV CTZ. No definite conclusions were reached during the briefing on the feasibility and plausibility of moving the Dixie Station. The 7th AF stated that contingency plans depended at that time on the assistance offered by the CVA. Additional squadrons, which were to arrive in South Vietnam during August, would offset the loss of the CVA in the southern area. Seventh Air Force presented CINCPAC with the out-of-country sorties for April and June as follows:
Out-of-country sorties requirements, as of mid-year, were 16,200 per month, a shortfall of around 3,400 sorties per month.

Subsequently CINCPAC informed COMUSMACV that an increased sortie capability was required in North Vietnam which could best be accomplished by moving the Dixie CVA to Yankee Station on 1 August. He stated that this decision had been reached after analyzing the increased requirements in ROLLING THUNDER, including the effort that COMUSMACV had requested south of Vinh. At the current rate, they would fall considerably short of the 10,000 sorties authorized for Laos and North Vietnam. He said these sorties were needed, not only to meet the interdiction program COMUSMACV had requested, but also to make more rapid progress in the POL campaign.

COMUSMACV requested a delay in moving the Dixie CVA until 4 August. CINCPAC agreed and instructed CINCPACFLT to support COMUSMACV from Dixie Station and, commencing 6 August, to maintain three CVA's in the vicinity of Point Yankee.

The intensive air effort against the POL storage capability of North Vietnam, which started at the end of June, continued during August. By the end of the month, the USAF had destroyed 68 percent of the identified
oil storage capacity authorized for attack in RP's I, V, and VI-A. However, new dispersed storage capacity was being discovered at a rate which approximated the rate of destruction. An intensive effort was made during the month to destroy a large amount of dispersed POL located near the infiltration routes into South Vietnam and Laos. This POL was stored in 55-gallon drums and five-gallon cans which were kept in truck parks, old bomb craters, caves, rice paddies and river banks which made it extremely difficult to locate and destroy. The number of POL-type secondary fires and explosions obtained during these attacks indicated the program was moderately successful. 18/

Interdiction of LOC's, including the northeast and northwest rail lines, was also moderately successful. However, adverse weather conditions made it impossible to maintain the desired level of interdiction against these lines. Although July and August were supposedly the months of best flying weather in North Vietnam, 81 percent of the sorties scheduled into RP's V and VI were cancelled or diverted because of weather. The poor weather in this area created an "overload" in RP I and resulted in CINCPAC authorizing 7AF to attack the LOC's inland of the coastal highway, Route 1A, in RP's II, III and IV. 19/

During COMUSMACV's visit to the CINCPAC, 13-14 August, the latter queried him as to the effect of POL bombings. COMUSMACV replied that it was too early to judge the full impact of the program, but there were indications the enemy had been hurt and that there would probably be stronger signs of this in the near future. COMUSMACV explained the peak air losses 79
during the previous week as being due to a combination of bad luck and increased Russian technical assistance to North Vietnam. CINCPAC discussed the possibility of another standdown of the air campaign and COMUSMACV urged him not to consider any cessation of the full bombing program in the North. COMUSMACV pointed out that few industrial targets existed in the extended battle area, the southern NVN Panhandle south of Vinh, and it was important that allied fire power be brought to bear on troops, supplies, and material en route to the South. An NVA division had already crossed the DMZ, emphasizing the importance of an air interdiction program to SVN ground warfare. CINCPAC listened carefully to COMUSMACV's views but was non-committal.

Early in August CINCPAC recommended strikes against Phuc Yen (JCS Target 51.1) and Kep (51.18) POL Storage which had a capacity of 9,910 and 1,210 MT, respectively. This represented nearly one-third of the current estimated national capacity remaining. Since both of these targets were isolated and completely separated from nearby airfields, CINCPAC said it would be possible to execute strikes against the POL storage area without collateral damage to the airfields. These facilities were not only the primary fuel source for the NVN MIG's, but were also suspected of supporting military vehicles.

CINCPAC pointed out that the cumulative effects of RT operations against land LOC's had forced the enemy to increase its use of the inland water system to transport essential military supplies, including POL. According to DIA, many of these waterways were not related to irrigation-agrarian
functions but were used primarily for waterborne transportation. He cited, as an example, the Thanh Hoa Lock (JCS 71.11), which controlled the water level on the Song Chu Canal and was used extensively to move military supplies. CINCPAC stated that the destruction of Thanh Hoa Lock and Xom Trung Hoa Lock and Dam would seriously impede and disrupt the movement of essential military supplies and further compound the problems that currently existed in the NVN land LOC's. He estimated that destruction of these locks would deny approximately 200 miles of inland waterway to the enemy. CINCPAC, therefore, requested authorization to strike these targets and also to strike dredges in the Haiphong restricted zone, but located away from populated areas. He stated that the approaches to Haiphong required considerable dredging to permit passage of ocean vessels to the harbor. Even with dredging, during certain seasons all vessels with over 19 feet draft required partial off-loading by lighter prior to proceeding up the channel to Haiphong. He pointed out that by preventing dredging, it was probable that the majority of foreign ocean-going vessels, including tankers and cargo ships carrying packaged POL, would be prevented from entering Haiphong harbor. CINCPAC said that strikes on a fairly frequent basis against carefully selected targets within or reasonably close to Haiphong, Hong Gay, and Cam Pha port facilities should result in making foreign ships, including POL carrier, reluctant to frequent these ports. He believed a precision strike against Hong Gay Railroad Shops, warehouses, and Cam Pha POL Storage would be effective for this purpose.

In May, COMUSMACV had recommended that the Thai Nguyen Steel Plant be struck in retaliation for Viet Cong attacks against South Vietnamese industries.
Although concurring with the basic intent of COMUSMACV's suggestion, CINCPAC at that time advocated strikes against POL facilities instead. However, since POL strikes had been in progress since June, CINCPAC requested authorization in August to strike the Thai Nguyen Steel Plant (JCS Target 76) and the Haiphong Thermal Power Plant (JCS 80 and 82.12). He pointed out that the Thai Nguyen Steel Combine was fabricating tanks, barges and other products directly related to the priority effort against POL. CINCPAC said that some 2,000 tanks of this type had been identified at dispersed POL facilities. When these tanks were buried and revetted, the sorties and bomb cost to achieve 50 percent probability of destruction became extremely high. In addition to fabricating tanks, the plant was also producing bridge components, including trusses, steel and pontoon sections, which were used to repair damaged LOC's and the construction of by-passes. Also, steel barges of the type being used to move POL had been identified near the plant.

CINCPAC stated that destruction of the Haiphong Thermal Power Plant would add to the problems already created in the Haiphong/Hon Gay area due to the destruction of the Uong Bi Thermal Power Plant in December 1965. Destruction of the plant would reduce the amount of power available in the Hanoi and Hon Gay area and slow-down the handling and distribution of supplies, including POL, which arrived at these ports. In addition to the important effect on NVN's war-making potential, it might deter Hanoi from further mining of ships in the approaches to Saigon. However, it was not deemed advisable to label these strikes as being in retaliation for the
successful Viet Cong mining of the freighter "Baton Rouge Victory" in the river channel to Saigon.

Meanwhile, the Commander, 7AF, had proposed that F-105's strike a selected target in the Hanoi Delta by utilizing the cover of darkness en-route and striking the target at first light. After careful consideration of this proposal, the Commander, 388th TFW, Korat, said that the launching, formation and refueling of flights of F-105 aircraft under night-time conditions was feasible and acceptable only under ideal weather conditions. External aircraft lighting and the current camouflage finish created unacceptable visual distortion. He believed that navigation and formation difficulties under black-out conditions would adversely affect flight integrity, flexibility, and maneuverability; and that minimum conditions for employing F-105 night formation were clear weather and some moonlight illumination. The 388th TFW Commander, therefore, recommended that the above tactic be employed, utilizing F-4C type aircraft to provide radar separation and thus insure mission success under less than perfect conditions. He added that missile warning should be provided by one F-105F Wild Weasel aircraft until this capability was available in the F-4C.

The Commander, 388TFW, also informed the Commander, 7AF, that most of the flight commanders were somewhat skeptical and apprehensive about a recommended ingress routing through the delta to JCS Target 51 (Nguyen Khe Petroleum). However, after examining the EOB (electronic order of battle) and noting the proposed orbit points of the EB-66's, a few of the most experienced pilots conceded that the corridor through the delta offered two
advantages: (1) It should offer minimal exposure to both flak and SA-2 threat; and (2) it was a different approach. However, a launch against Nguyen Khe on 16 August revealed that the delta corridor was more heavily defended than the EOB had indicated. Flight leaders were then unanimous in their preference for alternate routes to the target. They believed that more terrain masking was necessary, although this would require better weather in the mountains. For the present, they suggested refueling on "Brown Track" and continuing to investigate approaches through RP's III and IV, if the weather remained poor in the mountains east of Hanoi. If southern approaches did not prove feasible, then they would request that air-to-air refueling be accomplished on inland tracks and that approaches be attempted from the northeast and southwest.

Air strikes in September were confined largely to armed reconnaissance or attacking previously designated JCS targets in the authorized armed reconnaissance areas. The Air Force felt that POL attacks were becoming less productive as POL was dispersed. For the most part, attacking residual POL storage capability in highly defended areas was not worth the limited gain. No new target system had been authorized for attack in North Vietnam since July.

According to CINCPAC, there were indications that the JCS was not likely to expand the North Vietnam target base significantly until RT 51 objectives had been substantially fulfilled. This meant reducing POL capacity to the point where further priority effort was not warranted and backing up the recommendation with convincing BDA. DIA believed that
residual POL capacity at Viet Tri (JCS 51.14) and Nguyen Khe (JCS 51.00) remained at significant levels. Both DIA and JCS viewed capacity, rather than POL residual, as essential POL measurement. Based on photography of 21 September, PACAF estimated that 325 of the original 1,400 MT remained at Viet Tri, but DIA still carried 1,320 MT; a revaluation was requested to correct this disparity. PACAF estimated that 6,680 of an original 7,500 MT remained at Nguyen Khe. The problem remained essentially one of destroying POL capacity or giving convincing proof of the lack of POL residual. PACAF, therefore, directed 7th AF, on 27 September, to obtain high resolution photography of these targets so that their true residual value could be assessed. Seventh AF was further advised to be prepared to strike both targets if BDA indicated sufficient value remaining or if there was insufficient evidence that the facility had been abandoned.

At a meeting between PACAF and DIA representatives on 7 October it was agreed that the residual capacity at Viet Tri was 43 MT and the target was downgraded to Category C on the POL list. Surveillance was to continue and if the installation again became an active POL strike facility, it would be incorporated into the POL strike program. The Nguyen Khe POL Facility was also downgraded to Category C.

PACAF Views of the POL Campaign

At CINCPAC meetings, PACAF representatives emphasized three important points regarding the POL campaign:

1. Many agencies, working somewhat independently, had expanded
POL target data bases resulting in several large, poorly coordinated and conflicting data bases.

2. The Air Force was being accused of non-performance since it was executing relatively few strikes against a very large list of POL's.

3. The POL campaign was only part of a balanced program against NVN.

A conference was scheduled in Honolulu during October at which CINCPAC and components were to agree on a master list which would identify major POL installations warranting strikes on a priority basis. Minor facilities should be considered as part of the balanced overall program of interdiction and reduction of war waging capability. To this end, CINCPAC urged all reporting agencies to avoid identifying targets as POL storage when they were only marginally POL and belonged primarily in some other target category such as truck park, military storage, etc. They were asked to avoid indiscriminate reporting of suspect POL or references to POL when strikes resulted in fires and smoke which could be attributed to some other source, and to develop rigid criteria for identifying facilities as being predominately POL. PACAF had identified 20 lucrative targets which contained approximately 82 percent of residual capacity in Air Force area.

Subordinate commands were again directed in November to give emphasis, on a selective basis to POL targets. Fifteen POL storage areas had been designated as priority targets within RF I, II, III and IV. However, as of 16 December, CINCPAC stated that no strikes had been executed against any of those targets which had been selected from the CINCPAC list and were considered the most lucrative POL targets within these route packages. The
residual capacity of nine of the 15 targets had increased. Action was required since destruction of the enemy's POL system continued to be a primary objective of ROLLING THUNDER.

During October, air operations continued at the controlled pace established in July. The prevailing target restrictions, combined with the weather limitations of the northeast monsoon, reduced the impact of air strikes on North Vietnam. In addition to the decreasing effectiveness of ROLLING THUNDER operations, CINCPAC was concerned by reports of another possible standdown of air strikes against North Vietnam. In a lengthy message to JCS, on 26 October, he emphasized the importance of continuing the air campaign against the North and pointed out the danger involved in reducing or suspending operations before Hanoi stopped infiltrating men and materials into the South.

CINCPAC stated that self-imposed controls had adversely affected the effectiveness of airpower in reducing North Vietnam's capacity to direct and support the insurgency. Nevertheless, it had had a significant impact upon the enemy's military capabilities. Bombing had caused disruption and destruction of enemy material to such an extent as "to represent the probable balance of power which to date had denied the enemy a capability for seizing significant portions of I and II Corps." Another source stated, "The failure of the NVA forces to launch a major campaign in I Corps was attributable, in the main, to successful USMC spoiling operations. However, Operation TALLY HO significantly reduced the southward flow of material and seriously compounded the logistics problems of the NVN forces."

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North Vietnam had been unable to move enough military personnel into South Vietnam to accomplish this task without suffering unacceptable losses from air attacks. Enemy tactics and the terrain in South Vietnam made it inadvisable to withhold airpower until U.S. forces were engaged in close ground combat. CINCPAC believed we should begin to disrupt, harass and reduce enemy forces as far back as possible and thus "degrade his capability, quantitatively, before he reached the battlefield." He was particularly concerned with the enemy concentrations known to exist in and near the DMZ; an area from which an attack could be launched with little warning. Since the U.S. was outnumbered in this area, the security of our forces depended largely on the ability of our airpower to deny the enemy freedom of movement. Even a short standdown of air operations against enemy forces in or near the DMZ would pose grave security risks for our forces in that area.

CINCPAC pointed out that our air campaign was a major military activity where we had the initiative and control over the intensity of combat whereas the reverse was true in the South. Any form of a partial standdown, whether it meant reducing the targeting base or restricting air operations to small geographic areas, carried grave risks. In the past, the enemy had taken advantage of such reductions by readjusting his air defense and thus increasing our attrition. CINCPAC reiterated that our "primary objective in the air campaign against North Vietnam is to make it as difficult and costly as possible for North Vietnam to continue effective support of the VC and to cause Hanoi to cease controlling and directing the insurgency in South Vietnam." To this end, CINCPAC believed it necessary to steadily
increase pressure against the enemy until he reconsidered his support of the aggression. CINCPAC noted that increased pressure was recently applied by destruction of the NVN POL system. That program had resulted in destroying, greatly reducing the capacity or forcing the abandonment of all major POL targets authorized for attack. But, CINCPAC pointed out, in recent weeks our pressure on the enemy had not continued to increase but, in fact, had decreased. He stated that airpower was not being used to maximum effectiveness and there were many lucrative targets which should be attacked to increase pressure on the enemy.

Broadening the Target Base

CINCPAC recommended a "broadened target base, designed to lead Hanoi to expect attacks anywhere, at any time, against any type of military target or activity that supports their aims." He noted that JCS plans for RT 52 were a first step toward this broadened target base and would increase pressure on NVN but would still not use airpower to its maximum effectiveness. CINCPAC felt this was the time to "tell Hanoi that no military target, no activity that helps sustain the NVN effort to prosecute the war, is free from attack." He believed that any continued relaxation of air pressure would cause North Vietnam to increase its support of the insurgency in SVN and cause our allies to consider us irresolute in our determination to force Hanoi to stop its aggression. Thus, the Communists would be encouraged to increase their disruptive efforts throughout Southeast Asia. CINCPAC believed we had to convince Hanoi that the negotiating table was its best hope. This could be best achieved by broadening the target base.
CINCPAC recommended that RT 52 be implemented immediately and that further broadening of the target base be authorized at an early date.

A briefing delivered by the J-2, CINCPAC, to the Secretary of Defense in October, reiterated many of the points made by CINCPAC in his message to the JCS. The J-2 emphasized the need for attacking a broadly-based target system which would deny sanctuary to the enemy.

He believed that targeting without stereotyped pattern and with flexible tactics was essential to productive operations. He stated that continuous interdiction should not be attempted on logistic facilities, but that they should be attacked on a carefully preplanned basis. In the northeast the U.S. had been losing aircraft at about eight times the average rate of all other areas, per 1,000 sorties, but he did not recommend reducing operations to reduce losses. He believed that the costs to the enemy could be increased, while decreasing our loss rate, by striking 14 JCS target nominations for RT 52 which were located in the northeast. The J-2 strongly supported this recommendation as the core of operations in that area. Eighty-seven additional targets had been carefully selected to round out this concept. The categories of targets included 22 additional JCS-numbered targets, most of which were key military training, supply and ammunition sites, whose destruction or disruption would further complicate military functions. The list also included the remaining significant POL targets. Some of the targets selected, located in currently prohibited areas, formed functional groupings for greater total effect when they were brought under attack. Targets were isolated from surrounding built-up areas.
civilian areas and it was believed that those situated in currently restricted areas could be hit without fanfare.

It was planned to continue emphasizing disruption and attrition on a selective and concentrated basis with fleeting targets of all types remaining prime objectives. However, large-scale operations would be concentrated against carefully selected enemy centers of activity. This program had already produced highly significant results, such as the recent operations against the Thanh Hoa and Ninh Binh logistics centers which had revealed a major enemy defense deficiency that could be exploited. It was found that continuous attack against confined areas soon caused the obviously limited enemy antiaircraft munitions to become exhausted, thus permitting operations to proceed against very lucrative targets with little enemy fire. The J-2 believed these concentrated operations would not only have an important psychological impact on urban areas, but also the cumulative impact would have interacting effects. It was his opinion that attacks of this type would do much more to disrupt and harass movement than the previous effort expended on "bridge busting and road cratering."

COMUSMACV said that the cessation of bombing would have an adverse psychological effect on our allies fighting in Vietnam as well as permitting the enemy to move men, material and supplies into the South with impunity. He believed it was time for a change in strategy and gave two possible courses of action: (1) moving to shock action by striking, over a short period of time, lucrative targets that would hurt the enemy and convince him that U.S. power did not have to be restrained; and
(2) elimination of these same targets on a well-programmed but graduated campaign - as opposed to shock action - to be followed by a level of operations that the U.S. could sustain. He stated that, even with elimination of any initial group of lucrative targets, it was doubtful whether the required effort could be supported without greater flexibility in target selection. COMUSMACV recommended the following targets, in the general priority listed:

1. Large motor maintenance facilities which supported enemy's transportation system regardless of their location. A particularly lucrative installation existed inside the Hanoi ring.

2. The SA-2 missile assembly area, also inside the Hanoi ring.

3. The Haiphong port with emphasis on the dock area. He believed this target could be destroyed without jeopardizing foreign bottoms in major degree.

4. Thermal power plants complex - approximately 12 installations.

5. The MIG air bases, to include supporting facilities and fighter craft.

COMUSMACV recommended that the above targets be hit before any consideration be given to a bombing cessation. He also stated that any change in the bombing program should avoid restrictions on strikes in the extended battle area; i.e., the area from Quang Tri Province north to Vinh.

Despite authorization for expanded targeting, air activity in North Vietnam during November declined markedly due to adverse weather. The JCS authorized 13 additional targets for strike in conjunction with ROLLING

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THUNDER 52, which started 12 November, but only two of the authorized USAF and two Navy JCS targets were struck. Efforts to strike other targets were frustrated by intensification of the northeast monsoon which affected all route packages in North Vietnam.

During the northeast monsoon, the STEEL TIGER (SL) area enjoyed relatively good weather while Route Packages I, II, III, and IV of ROLLING THUNDER were usually marginal for air operations. The reverse was true during the southwest monsoon period. CINCPAC provided for these contingencies by allowing weather diverts to be conducted into other areas of responsibility. CINCPACFLT informed COMSEVENTHFLT, on 11 November, that since TF 77 forces probably would not be able to utilize their full capability in North Vietnam, they could be expected to divert increased numbers of flights into the ROLLING THUNDER area during the southwest monsoon period. As this had been the practice in the past, 7AF redirected about 1,500 sorties per month from RP I into II, III, and IV. Scheduled operations would be coordinated by CINCPACFLT, or his designated representative, so as to avoid interference of forces in the conduct of their missions. It was realized that intermixing of TF 77 and 7AF sorties, within the limited route package area, would require close coordination by both forces. It was, therefore, necessary to insure that 7th AF was apprised of and could operate within established TF 77 procedural rules.

Further details of coordination were worked out at a meeting, on 24 November, attended by CTF 77 and the Vice Commander 7AF with their respective staffs. The 7AF was to select target nominations in Navy Route
Packages from a mutually agreed list and submit them to CTF 77. After review, CTF 77 would compile and dispatch an approved target list. The AF wanted at least 120 targets to allow some flexibility in planning one month's operations. It would then request periodic target list updating, depending upon strike results and newly developed targets. Details were also clarified with respect to reporting, TOI's and exchange of BDA photography. The Commander, 7AF, retained the prerogative of diverting all or any part of his force into Air Force assigned areas of responsibility.

"Combat Beaver"

In November, JCS proposed a concept of air operations against North Vietnam to be known as COMBAT BEAVER and requested CINCPAC's evaluation of its feasibility and effectiveness. CINCPAC agreed with the need for an intensive air campaign against the North which carried operations into all areas against the most important military and military support facilities and activities. The COMBAT BEAVER concept called for selective interdiction of key logistic hubs as a means of providing opportunities for follow-on aircraft to strike enemy material and equipment. The CINCPAC pointed out that, in these respects, the concept was basically the same as the current ROLLING THUNDER operations, but that it departed substantially from the CINCPAC concept in its emphasis on route interdiction and surveillance in RP's II, III, and IV. He pointed out that a tight interdiction program well north in North Vietnam would be too costly in sorties and the predictable pattern of operations would generate a high loss rate.
CINCPAC believed that the greatest direct or indirect impact upon the enemy could be had from constant and unpredictable attacks upon known and suspected enemy military facilities and activities. Such attacks would provide the greatest assistance to the barrier and proven FAC and CRICKET operations in Laos. He felt that placing emphasis on interdiction in NVN, as visualized in the COMBAT BEAVER concept, would upset the currently well-balanced program. With the implementation of the barrier, changes in weight of effort for particular areas would be required depending on enemy reaction. CINCPAC felt that the feasibility of utilizing FAC and ABCCC aircraft north of RP I was highly questionable. Their survivability in primary target areas such as Vinh, Thanh Hoa, Phy Ly and Nam Dinh was questionable at any time; their use might be feasible in remote areas only until the enemy counteracted.

CINCPAC stated that the B-52 concept of continuous interdiction of key passes was considered feasible with current assets, but would probably result in a decrease of strike effort against normal ARC LIGHT targets. He pointed out that the enemy could be expected to deploy SAMS to cover these areas in a very short time. COMBAT BEAVER stressed the "need for an integrated, closely-controlled program of surveillance and interdiction." CINCPAC noted that our current interdiction program was a well thought out, critically supervised and balanced program which got closest attention at all levels of command. He pointed out that control and coordination procedures were adequate and closely supervised by CINCPAC.

Under the ROLLING THUNDER balanced concept, in addition to stressing interdiction, emphasis has been placed on the need for a broadened target.
base on the theory that the most efficient way to interdict is to strike at the source. He pointed out that the best method available for increasing effectiveness was not intensifying the interdiction program but striking highly lucrative source targets. While the target base had been broadened, the lucrative targets of war-making potential and support were still off-limits. He concurred in the need for new, improved munitions and an improved night and all-weather capability as essential to greater effectiveness. He concluded that the COMBAT BEAVER program, with few exceptions, closely paralleled what was currently being done, and did not feel it would increase the overall effective use of U.S. forces in SEA.

Psywar and "Fast Buck"

Operation FAST BUCK, another operation proposed by JCS in November, was for the purpose of inducing the defection of North Vietnamese pilots. It was to be patterned after Operation NOLAH used during the Korean War when the U.S. offered $50,000 to any Communist pilot who would deliver a MIG to UN forces plus a $50,000 bonus for the first pilot to do so. The program also offered the pilot political asylum. As a result of the offer, all Communist MIG aircraft were grounded for eight days, ostensibly to verify pilot reliability. After the grounding, fewer MIG aircraft took to the air and engaged in air operations against our aircraft. JCS suggested a similar program for North Vietnamese pilots for the purposes of:

1. Securing aircraft, particularly the MIG-21 and the "Hook" helicopter.
2. Acquiring pilots for intelligence exploitation.
3. Causing North Vietnam air force to evaluate loyalty of pilots.

4. Reducing MIG radius of operations and number of sorties.

5. Psychological exploitation of pilots in Vietnam and other countries.

In order not to alert the Soviets to the priority of our requirements, the leaflets were to emphasize "defection" rather than "aircraft."

In evaluating Operation FAST BUCK, CINCPAC considered it both feasible and desirable and suggested the offer be a combined US/GVN undertaking to include other free world countries, if they so desired. No difficulties were expected from Thailand in carrying out the program. In-flight and landing procedures had to be uncomplicated and coordinated by all air traffic control agencies involved. CINCPAC suggested that all available media be employed to disseminate the information overtly and that covert means also be used. He felt the offer should include all aircraft, without distinction, to conceal priority of U.S. requirements for specific aircraft. He realized this might result in our paying for a low-performance aircraft, rather than the desired MIG-21, but felt the publicity would warrant overpayment. Subsequent offers could then be modified to stipulate MIG-21's. CINCPAC recommended offering $100,000, plus a $50,000 bonus, for the first aircraft and $25,000 for the second. The suggestion was based on a study of the DIA Registry of Foreign Material Requirement List. He also recommended offering a reward of $25,000 to pilots who defected by parachuting at sea and who were rescued by our forces.

He cited two possible disadvantages to such a program:
1. Overt bribery might give the U.S. a poor image since we were operating on the principle that our fighting in Vietnam was solely to repel aggression.

2. If North Vietnamese pilots succumbed to our offer, Hanoi might take out its resentment on FWMAF or GVN pilots they were holding.

CINCPAC believed the advantages outweighed the disadvantages, although the results would likely be limited and temporary. He recommended that Operation FAST BUCK be initiated as soon as possible.

Public Opinion and Civilian Casualties

In the public mind, the "flap" over the alleged bombing of civilians in the Hanoi area overshadowed all other air activities during December. Actually, authorization to strike Yen Vien (JCS Target 19) and the Van Dien Vehicle Depot (63.11) had been given in November. At that time, PACAF expressed concern that the strike on Target 63.11 would result in excessive civilian casualties and stressed that extraordinary precautions should be taken to insure accuracy. The 7AF was directed to use only experienced, carefully pre-briefed pilots and to attack only in weather permitting positive visual acquisition of target and delivery of ordnance.

Seven attempts to strike the target in November were cancelled because of adverse weather. It was finally struck by 20 sorties on 4 December. Pilots dropped 96/750-lb. bombs and reported that ordnance impacted throughout the target area causing secondary explosions resulting in a 30-foot fireball and a tall column of black smoke. The target was struck again on 13 December, with 91/750-lb. bombs, and on 14 December with 92/750-lb. and 12/1,000-lb.
bombs. Pilots reported that the rail yard was "ripped apart" and at least four buildings, plus rolling stock, were damaged or destroyed. Photography revealed that the Hanoi Railroad Car Repair Shop (JCS 20) had also been struck, probably on the same dates as JCS 19.

Navy planes struck the Van Dien Vehicle Depot (63.11), on 2 December, in conjunction with the strikes against the Can Thon Petroleum Products Storage Area. Initial reports indicated that nine of the approximately 175 buildings in the complex were destroyed but much of the area was obscured by smoke. The three CVA attack against the Van Dien Vehicle Depot was coordinated with the 7AF attack against JCS 19 on 14 December. Moderate damage was reported to the target complex.

A re-debriefing of the seven flight crews involved in the 13 December and 14 December strikes on JCS Target 19 confirmed that five flights had placed ordnance on target. However, one flight stated they were unable to acquire the target due to clouds and MIG attack. They were uncertain of exact release coordinates, but judged they were in the immediate target vicinity. They conceded that bomb trail distance might have caused ordnance to impact slightly southwest of the bridge located immediately south of the target. Another flight crew stated that, due to poor weather, they had difficulty seeing the marshalling yards. They believed ordnance hit rolling stock on tracks but the impact of some bombs was not observed because of jinking after release.

On 16 December, JCS Target 19 was suspended until further notice.
CINCPAC advised subordinate commands, on 23 December, that no air operations involving attacks against targets within ten NM of the center of Hanoi would be conducted until further notice. The center of Hanoi was defined as 21-19-37N 105-51-21E. Although the restriction applied only to operations involving the expenditure of ordnance, the transit of the ten-mile Hanoi area by strike aircraft was to be avoided. Reconnaissance operations within the ten-mile area were not restricted. This information was disseminated on a "need-to-know" basis and was not releasable to news media.

The 13-14 December raids caused an international furor. The Communist press claimed the U.S. had "bombed residential areas within the Hanoi city limits" and North Vietnam said that more than 100 civilians were killed. A series of articles by a New York Times correspondent, giving an eyewitness account of the alleged Hanoi damage, added to the public reaction.

A State Department spokesman stated, on 23 December, that it was American policy to strike only those targets contributing to Hanoi's effort to send men and materiel into South Vietnam. He stated that:

"...No information has been obtained ... to support allegations that US aircraft struck targets in Hanoi proper. We know a great deal of damage was caused by Hanoi's own surface-to-air missiles and anti-aircraft fire. If, in fact, any of our ordnance has caused injury or damage we regret it. Accidents do accompany conflict. They are a by-product of fighting Hanoi started and insists on continuing despite our efforts to achieve peaceful settlement."

With respect to the bombing of Nam Dinh, 60 miles south of Hanoi, a Defense Department official stated, on December 29th, that military targets...
COMPARISON OF MONTHLY COMBAT LOSS RATES IN NORTH VIETNAM

--- Air Force
--- Navy

Fig. 19
### Comparative Summary by Target Category

(USAF——USN)

#### ROLLING THUNDER

<table>
<thead>
<tr>
<th>Target Category</th>
<th>Mar 65-Dec 66</th>
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<td>Radar Sites</td>
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</table>

**Fig. 20**
in the town had been struck 64 times by U.S. aircraft since mid-1965. The military targets attacked in Nam Dinh were the railroad yards, a warehouse and dock area on the river used as a transshipment center, petroleum storage depots and a terminal power plant. The Defense Department declined to say whether the evidence confirmed or denied reports carried by the New York Times that 89 civilians had been killed in Nam Dinh.

CINCPAC had previously pointed out to JCS the inevitability of collateral damage in view of the enemy's improving defenses and his practice of locating lucrative military type targets in civilian areas. In September, he had told JCS that BDA photography revealed inadvertent collateral damage during the execution of attacks on POL and large open military supply storage areas located in and near Duc Tho. He said it was extremely difficult to avoid collateral damage in this heavily defended area since pilots were forced to jink, reducing the time to execute precise bombing runs to a minimum. During strikes against Dong Giap POL and Badon military supplies, 40 to 50 civilian houses were inadvertently destroyed at Badon and a cemetery adjacent to Dong Giap was also hit. CINCPAC had pointed out, at the time, that pilots were adequately briefed as to the necessity for avoiding collateral damage but that this was sometimes difficult under the pressure of combat.

The 48-hour truces over Christmas and the Solar New Year gave the enemy an opportunity to resupply and reassign their troop positions. During the New Year's standdown, CINCPAC directed that the reconnaissance effort be concentrated on the location of logistic movement, particularly terminal
areas. He wanted maximum use to be made of reconnaissance intelligence by air, ground and sea action. Also, he wanted forces to be ready for action, immediately after the cessation of the standdown, to strike vehicles and key area targets.
CHAPTER IV - NORTH VIETNAM GROUND/AIR DEFENSES

During 1966, ROLLING THUNDER air operations were conducted in an increasingly sophisticated defense environment. U.S. aircraft faced an effectively integrated system of radar-controlled antiaircraft weapons, surface-to-air missiles (SAMS) and air intercept. This presented a growing threat to the use of our tactical airpower, particularly in areas well-known by the enemy to be sanctuaries.

SAM'S

The U.S. lost its first aircraft to a guided missile on July 26, 1965, when a USAF F-4C was destroyed near Hanoi. By the end of 1965, North Vietnam was estimated to have 15 SAM firing battalions. During the bombing pause of December 24, 1965 - January 31, 1966, three additional battalions were added and many new sites constructed. At that time, one battalion consisted of the standard Soviet configuration with six launchers and all associated equipment for a firing unit. With the entire Red River Delta well defended by the SA-2 system, Hanoi deployed firing battalions southward from Thanh Hoa. In order to accomplish this and maintain SA-2 defense in the delta, some of the battalions were organized with three to four launchers rather than the standard six launcher battalion. The limited firepower of these "short" battalions was offset by tactical advantages of increased mobility and easy concealment.

The SAM system began to expand to the south, below Thanh Hoa, in mid-February and by mid-May had reached as far as Mu Gia Pass, the Ron
area and possibly as far south as Dong Hoi. Each of the progressively southern moves had been preceded or accompanied by the introduction of low-level acquisition radar capability (FLAT FACE) into the new area, with SAM primary acquisition radar (SPOON REST) noted in ELINT shortly after. With few exceptions each new firing location remained dormant of FAN SONG ELINT intercepts until a launch was made. By June, 106 SAM sites had been photographed and an additional 29 sites located on the basis of ELINT data.

A trend toward SAM firings at night or afternoon to allow the site to move during the cover of darkness, or to camouflage to avoid a retaliatory strike, was noted by mid-year. Another apparent trend was toward tail shots from the rear quarter to minimize the possibility of the aircrew observing the missile in flight. Although a tail-quarter shot was theoretically not as accurate as a beam-short or head-on collision course, the possibility of surprise negating the use of evasive action by the flight could have been a predominant factor. CINCPAC noted that U.S. successes in avoiding SAM's was due almost entirely to the rapid evasive action taken by the highly maneuverable tactical aircraft after ELINT warning or the visual observation of the SAM. He stated that the B-52's, of course, were not capable of making such a violent maneuver and for this reason he considered them very vulnerable to SA-2 shoot-down. He said that, in consideration of the limited return that could be expected from this attack and the risks involved, he believed that the use of B-52's should not be authorized, and added that JCS also disapproved.

However, B-52's were used briefly in an effort to seal off Mu Gia Pass,
but the raids were terminated after Hanoi ringed the Pass with SAM units. Although B-52's could operate high above weather that washed out tactical missions, they were considerably slower and made more inviting targets for missiles than the supersonic tactical fighter-bombers. Also, it was feared that Hanoi might be willing to make a special effort to bring down a B-52 because the feat would obviously boost morale in North Vietnam.

After the U.S. attacked the Hanoi/Haiphong POL Complex, beginning on 29 June, most of the North Vietnamese SAM battalions south of Thanh Hoa were redeployed north into the Hanoi complex. The battalion structure in Hanoi thus became very compressed, with firing units located five to seven miles apart. Barrier defense, using temporary field sites, were set up along the northwest railroad in an effort to prevent or deter penetration of the Hanoi complex.

CINCPAC pointed out that aircraft losses were increasing and that strike tactics and results were being adversely affected in areas of heavy SA-2 and AA concentrations. If the enemy should be able to extend these areas, the overall loss rate could be expected to increase. CINCPAC, therefore, believed that this would be an appropriate time to review all aspects of the SA-2 threat. The review should attempt to determine what could be done to counter the threat with present equipment and what additional equipment was required, particularly if the threat became more sophisticated or increased in scope. The CINCPAC recognized that improved equipment and tactics had already done much to counter the threat but, nevertheless, had not been able to overcome the missile's main accomplishment, i.e.,
acquisition and destruction required a marked improvement in equipment. The primary need was for an improved Shrike that could find a target using a short emission and then lead the flight to it. Also needed were ample quantities of area weapons, such as CBU-24's or other effective weapons, to complete the destruction. However, this method of nullifying the threat could never be completely successful if villages or restricted areas were allowed to provide a sanctuary for sites or control centers.

With respect to nullification of the threat by tactics, this had proven to be a fairly effective interim measure. However, it required trial and error methods and frequent changes to counter new enemy tactics. Carefully chosen altitudes, attack corridors, delivery techniques, and evasive maneuvers had allowed aircraft to continue to the target. The RHAW (radar homing and warning) was the greatest improvement in this area and full RHAW equipping of the force was an urgent requirement. Also, fusion and immediate transmittal of real time intelligence and warning was an urgent, near-future need. Tactics would remain a necessary and important area of defense, but every effort must be made to free USAF forces from interference with the primary job of getting to the target.

Until very recently, the nullification of the threat by passive means had been only partially successful. The ECM B-66's had certainly degraded the enemy defenses and assisted our forces, but they had not achieved the full degradation desired. However, the recent introduction of the QRC 160-1 ECM Pod was apparently highly effective. If this effectiveness continued and the air fleet was completely equipped, nullification of the SA-2 threat
(also radar-controlled AAA) would have been achieved. 11/

Since the enemy's most probable reaction would be continued and increased MIG defense, CINCPACAF suggested urgent use of ECM jamming of VHF communications as a method of negating the enemy's GCI control. As a complimentary action, it was recommended that complete IRON HAND/WILD WEASEL efforts be continued with the objective of destroying the SA-2 threat before effective countermeasures could be undertaken by the enemy. This would require the improved Shrike previously mentioned. It would also be necessary to continue development of tactics and RHAW to counter the next step-up in the enemy SA-2 threat. CINCPACAF recommended that a program be established to destroy SA-2 support facilities, control centers (GCI) and EW sites. This would require a Shrike that could find and mark EW radar plus ample CBU-24's to complete destruction.

As a result of the CINCPAC S-2 Threat Conference (24-26 October), CINCPACAF advised 7AF to immediately implement the recommendation that when an occupied SA-2 site was located by IRON HAND or any other means, sufficient numbers of available strike aircraft in the area should be diverted to this target to insure complete destruction before the enemy had the opportunity to move undamaged components from the area. The recommendation was based on the demonstrated fact that an adequate quantity of munitions were available in a single IH flight to effect complete destruction. Also, North Vietnam had demonstrated outstanding ability to rapidly move components, after our detection, with the result that only partial destruction of installation was achieved. In a few days the
installation was again operating against our forces from the new location.

CINCPACAF emphasized that all tactical commanders should be aware that a primary objective in our operations in North Vietnam was the destruction and harassment of the SA-2 system. CINCPACAF recognized that it was the prerogative of the 7th AF Commander to divert strike aircraft from the primary target to opportune SA-2 sites, based on the target and the tactical situation. The authority to divert aircraft within these parameters was contained in the ROLLING THUNDER 51 Basic Operations Order of 1 April.

CINCPAC advised subordinate commands on 19 November of other recommendations proposed by the CINCPAC SA-2 threat conference. At this time they were not to launch an all-out campaign against the SAM sites but to continue the present policy of diverting all available strike forces to attack an occupied SA-2 site as soon as it was detected. High priority targets were to be attacked, by type, in random fashion in order to avoid predictable strike patterns. Preferably the strikes should be large attacks, with strike timing closely coordinated by PACAF/PACFLT. In the SA-2 environment, aircraft equipped with ECM and missile warning equipment might be able to use the altitude region between 10-20,000 feet, consistent with the tactical situation. High-G maneuvers would continue to be required if engaged by the SA-2 system. Although there was no evidence, to date, of the enemy exploiting electro-magnetic radiation from U.S. aircraft, this possibility had to be guarded against with regard to IFF, TACAN, airborne radars, etc.

In reply to a query from the Air Force Command Post (AFCP), as to the...
number of aircraft which had jettisoned ordnance because of the SAM threat, PACAF Command Center (PACAFCC) replied that the number was insignificant. In the few cases involved, the jettisons had taken place not as a result of the SAM threat but, rather, low fuel conditions resulting from evasive tactics or inability to acquire the target. The SAM threat had had no effect on sortie scheduling in RP I. However, there would have been more sorties scheduled in RP V and IV if there had been no SAM threat. The ordnance jettison procedures followed the instructions in 7AF Operations Order 1-67 dated 31 August 1966.

By November, there were 30 possible, operational firing units in NVN. The majority of the active battalions remained deployed in the Red River Delta area, with the point defense system still existing around Hanoi, Haiphong, Hai Doung, Nam Dinh, Thai Nguyen and Kep. There was also a possible site in Route Package I, three to five battalions south of the Red River Delta, one to two battalions near Thanh Hoa, and two or three in the Vinh area.

In December, most of the NVN battalions were in a SAM triangle from Hanoi to Haiphong to Nam Dinh. Eight to nine battalions were deployed within a 12-14 mile radius of Hanoi, with another two battalions operating north of Hanoi to Thai Nguyen, with a battalion occasionally moving from Hanoi into this area. One battalion appeared to remain in an area 35 to 45 miles southwest of Hanoi, providing some defense of this approach to the city. Five battalions provided relatively stable defense of Haiphong and were usually deployed five to ten miles apart near the city. One battalion
normally deployed toward Hai Duong where one to two more active sites provided
continuity in the coverage between Hanoi and Haiphong. One of the Hai
Duong battalions frequently deployed toward Kep Airfield where at least one
active site provided point defense. Completing the triangle, Nam Dinh ap-
peared to be the base of five to six battalions which defended the southern
Red River Delta area and the southeastern approaches to Hanoi. One of these
battalions deployed south to the Thanh Hoa area for extended periods, while
one frequently moved toward or into the Hai Duong area.

Below Thanh Hoa, at least two and possibly three battalions operated
between Vinh and a point 35 miles north of the city. During December these
battalions had deployed so as to provide mutual protection to their sites.
Despite the destruction of SA-2 equipment in September and October, continued
ELINT intercepts of FAN SONG tracking and guidance signals in December
indicated at least one SA-2 battalion was still in the northern part of RP I
or the southern part of RP II. The most likely locations were around Dong
Hoi or along Route 1A just north of Cape Mui Ron.

SAM firings against U.S. aircraft increased substantially in December
to a total of 212; the previous high had been in August when 186 SAM firings
had taken place. The greatest number of firings (72) on a single day occurred
on 2 December. On that day, five USAF and three Navy aircraft were
downed; five of the losses were attributed to SA-2 missiles. This represented
approximately one-seventh of the total number of losses to SA-2 missiles
to that date.

During the year, SAMS accounted for 5.4 percent of U.S. aircraft losses.
Although this percentage was a relatively small portion of aircraft losses, the SA-2 system forced attacking aircraft to utilize lower altitudes where antiaircraft artillery (AAA) and automatic weapon (AW) fire was more effective. SAM firings, by month, are shown below:

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<tr>
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(1966) TOTAL: 908

During the year, the press frequently quoted official sources on the poor performance record achieved by the Russian SAM's against U.S. planes. North Vietnam's unsatisfactory score with missiles was attributed to their comparatively poor quality (the SA-2's were not the latest or best in the Soviet arsenal), the ineffective training of the crews, and the various evasive tactics and electronic countermeasures worked out by the U.S. The SA-2 was comparable to the old American Nike-Ajax, now obsolete, phased out and replaced by the much improved Nike-Hercules. The Russians had developed improved missiles but had not yet supplied them to Hanoi.

Humidity and other climatic factors were, to some extent, responsible for the inaccuracy of Russian missiles, according to the Soviet Military Attache. He stated, early in 1966, that more missiles would be sent to...
North Vietnam but he did not believe that any large commitment of Soviet personnel would be necessary since Hanoi had more than enough men to escalate the war to any degree required.

The publicity concerning the SA-2's poor performance record was a matter of concern to the JCS. They pointed out to CINCPAC that Soviet officers, in conversations with Western military personnel, had stressed the Soviet intention to supply North Vietnam with more and improved equipment. In particular, the Soviets mentioned providing Hanoi with more modern SAM's of increased effectiveness. The JCS believed we had been indiscreet in making public the numbers of SA-2 missiles launched versus aircraft downed by NVN and our cleverness in devising effective countermeasures. They believed this would result in greater hazards to our aircrews and increase our aircraft losses to SAM's. It was also believed it might goad the Soviets into providing Hanoi with more advanced equipment. They suggested a review of policies on press releases with a view to eliminating any information beneficial to the enemy defense effort. They further recommended adoption of a policy of caution in discussing military operations or techniques with other than those persons who had positive need-to-know.

Air Intercept

Communist China provided North Vietnam with its initial 36-44 MIG-15: 17's in the period from August 1964 until the summer of 1965 when Soviet aircraft shipments began. Approximately 65 MIG's were received by Hanoi in addition to eight IL-28 light jet bombers. In December 1965, 11 MIG-21's
were seen at Phuc Yen. In March 1966 photography, 15 Fishbed's were counted along with 53 aircraft crates, 25 of which were large enough to contain additional MIG-21's. The USSR reportedly promised North Vietnam 60 Fishbed fighters during 1966.

During the first quarter of the year the North Vietnamese Air Force continued previously established air tactics of committing fighters to combat when the tactical advantage was with the MIG's. There was an increase in the frequency of MIG activity against U.S. aircraft, especially against unarmed reconnaissance types. Most of the MIG activity over the Gulf of Tonkin was also noted. MIG-21's were active against high altitude reconnaissance aircraft over northwestern North Vietnam. Other activity involved MIG use of surprise tactics against strike aircraft or making long-range, non-firing passes before breaking off and returning to the protection of the SAM envelope.

As a result of the continuing increase in the MIG inventory and an anticipated expansion of the GCI system, U.S. air operations were expected to face a more formidable threat in the future. However, the vulnerability of the limited number of jet airfields implied some restriction on the employment of enemy air forces. The extensive airfield improvement and construction program, begun last year, continued to make good progress. Activity had been noted at eight airfields and possibly one or two other major fields may also have been under construction. In the past, NVN's fighter aircraft had been staged out of two bases, Phuc Yen and Kep, but it appeared likely that some fighters might be dispersed to other fields in
the near future.

An analysis made by 7AF, early in the year, of the enemy air defense system revealed an increasingly sophisticated system employing early warning, gun-laying radar, SA-2 missile battalions, and MIG air-intercept. In nearly every case where U.S. aircraft had been forced to descend to lower altitudes because of the SA-2 threat, the planes had met intense AW/AAA fire. Likewise, night engagements by AAA/AW had increased. This included the use of weapons without gun-laying radar, which 7AF believed indicated a possible link-up between GCI/EW installations and AAA/AW units. As far as air defenses were concerned, 7AF felt we were in the same position in March 1966 as we had been at the time of the initial development of SA-2 defenses in North Vietnam. This was because the enemy had increased the activity of later model MIG aircraft and, also, additional enemy airfields were becoming operational to accommodate these later model aircraft. The Commander, 7AF, felt the U.S. should not stand by to see the development of a fully integrated and operational air-missile and AAA/AW defense system in NVN, since it would pose an unacceptable threat to the strike forces. He, therefore, recommended that he be granted immediate authority to strike all airfields in North Vietnam capable of supporting jet operations and that he be allowed to restrike to keep the fields non-operational. He wanted the EW/GCI complex at Kep to be considered a high priority target and neutralized immediately. He recommended that IRON HAND forces be authorized to destroy all of the SA-2 sites that posed a threat to, or fired upon U.S. aircraft striking the above targets. He believed that it was better not to have a
time limit for strikes against JCS targets and recommended that a target be struck until the desired damage level was attained. This procedure would allow more flexibility in the utilization of the strike force and also preclude the one-shot attack, which required a large strike force. A greater degree of suppression and reduced vulnerability could be attained by the use of a smaller force.

In April, CINCPAC directed CINCPACFLT and CINCPACAF to provide him with their plans to counter the MIG threat. He gave them two options: Option 1 would be coordinated daylight strike in which CINCPACFLT would be assigned the Kep Airfield and CINCPACAF the Phuc Yen Airfield. They would both provide the required strike and support aircraft, the route planning, and tactics. Option 2 would be under the assumption that SAC B-52 strikes would be made against Kep and Phuc Yen during hours of darkness. Under this option, both CINCPACFLT and CINCPACAF would provide follow-on strikes during the first daylight hours. The objective of these follow-on strikes would be to destroy MIG's which might have escaped destruction at Kep and Phuc Yen or which might have dispersed to other fields. CINCPACAF was assigned the following airfields: Hanoi/Bac Mai, Hanoi/Gia Lam and Phuc Yen. Kep, Haiphong/Cat Bi and Haiphong/Kien were assigned to CINCPACFLT. Under this option, CINCPACFLT and CINCPACAF would jointly provide the required strike and support aircraft, tactics, and route planning. CINCSAC was to provide CINCPAC with his plan of attack on Phuc Yen and Kep airfields with B-52 resources and such support as required from PACOM forces.

As a result of increased MIG activity, the requirements for strikes
against jet capable airfields were reviewed by CINCPAC in April. CINCPAC concluded that the MIG threat could be countered without striking their bases. He stated that his thinking was based on recent events. If the situation were to change, he would then recommend that all jet capable bases be struck simultaneously in order to gain maximum surprise and results.

Until April 1966, MIG aircraft did not pose a serious threat to U.S. forces and appeared content to train. The first clash between U.S. aircraft and the new high-performance MIG-21's took place on 23 April and raised the prospect of an intensified air war. From 23 April through 12 May the MIG force actively and aggressively engaged U.S. forces. Their tactics suggested that support aircraft were their prime targets. All engagements took place at altitudes of 10,000 feet and above. The support forces, primarily ELINT/ECM aircraft, were well protected by F-4C MIGCAP aircraft, however, and the MIG tactics resulted in USAF destroying five MIG-17's and one MIG-21. No aggressive enemy air action was encountered for about a month, with Hanoi apparently using this period to continue extensive GCI training when no U.S. aircraft were in the area.

Beginning 12 June, North Vietnam again began scrambling MIG interceptors in defense of the Red River Delta area. A change in tactics became apparent. Intercepts were attempted against strike forces, rather than support aircraft, and were conducted at low-level between 1,500 and 3,500 feet AGL. These aggressive tactics continued until 22 July when the MIG force again stood down.

When North Vietnam suffered losses in air-to-air combat, it customarily
suspended operations and intensified training for a short period. By mid-August, however, Hanoi apparently felt that its aircrews were ready to operate multiple flights against U.S. strike aircraft. The new aggressiveness of enemy forces may have signalled the completion of Soviet training of MIG-17 and MIG-21 pilots, which probably included complete all-weather GCI instruction. MIG aircraft were active almost every time strike forces penetrated to within 30nm of Hanoi. However, their tactics were no longer standard and MIG's might now be expected to approach either from low-level or from 15,000 to 20,000 feet, but invariably from the rear quarter. Intercepts against strike aircraft were more difficult than those against support forces because of the lower altitudes at which these strike forces penetrated. However, results outweighed the extra effort since strike aircraft were heavily laden and lacked maneuverability. Also, under attack the strike aircraft had to jettison ordnance to conduct effective evasive action and thus reduce the impact of the interdiction effort.

During the period 1 Jan - 17 October 66, the MIG threat resulted in 77 aircraft being forced to jettison. The marked increase in MIG aggressiveness during September required 56 aircraft to jettison ordnance in that period. The MIG's were still careful to avoid prolonged combat, but a single feint or firing pass caused U.S. aircraft to jettison ordnance, which neutralized the sortie.

MIG activity reached a record high during December. Air Force aircraft had 35 encounters and 16 engagements, involving 118 enemy aircraft. The previous highest level of MIG activity had been in September, when 71
enemy aircraft were reported. From April to December 1966, there were 108 encounters and 72 engagements between the MIG's and Air Force/Navy forces. Ninety-two percent of the encounters and 80 percent of the engagements involved Air Force aircraft only. A total of 20 enemy aircraft were shot down by all Services during these engagements; 15 of them by Air Force pilots.

In December, the JCS asked CINCPAC for his recommendations on the measures that could be taken to neutralize the MIG threat. JCS stated it had already submitted several recommendations to the Secretary of Defense for eliminating the threat through attacks on NVN airfields. However, all of these recommendations were disapproved on the basis that military advantages of the proposed strikes did not outweigh the military and political risks. However, the increasing boldness of the MIG's and their impact on U.S. air operations were matters of deep concern to the JCS. Therefore, they requested recommendations to be incorporated into a study which would give additional reasons why the MIG threat should be neutralized in the air or on the ground without delay. The JCS study would point out that the entry of North Korean pilots and the first successful employment of an air-to-air missile were evidence of the enemy's determination to improve his MIG capability. The MIG threat, in addition to AAA and SAMS, was an important factor contributing to inaccurate bombing. It forced U.S. aircraft to jettison ordnance in order to defend themselves, thus forcing the mission to abort and contribute to damage of non-military targets and non-combatants. MIG airfields were well-defined military targets, and the fields
and the command and control targets located on them were the most lucrative and vulnerable elements of the enemy air defense system. Neutralization of the MIG's would greatly reduce MIGCAP and improve the effectiveness of the total air effort and probably contribute to lowering enemy morale.  

The increasing enemy air challenge to U.S. operations also renewed public discussion of the bombing limitations against airfields and harbors. It was well known that military authorities had asked permission to destroy the MIG fighter bases but had been overruled. The reasoning behind the civilian decision not to permit bombing of the airfields at this time was reported as follows:

1. The U.S. aircraft loss rate to MIG's was not serious but heavy losses might be sustained in an attack on the well-protected airfields.

2. Communist China or the Soviet Union might replace the MIG's destroyed, perhaps even with more and better planes.

3. Communist China might offer Hanoi bases inside its borders and thus create a serious dilemma for the U.S.

Antiaircraft Artillery

The number of automatic antiaircraft artillery weapons also increased substantially during 1966. As of January 1966, North Vietnam was estimated to have 5,000 weapons; this estimate had risen to 7,400 by the end of the year. The inventory included the .50-cal. machine gun of U.S. design, which had been modified by the Chinese and North Vietnamese for antiaircraft use. Hanoi had also taken measures to increase weapon accuracy through tracking radar and saturation deployment and to employ heavier weapons where
increased kill probability was most desired.

During the latter part of 1966, pilots operating in RP V and VI-A reported far more instances of 100mm AAA than in previous months. The buildup in defenses included RP II, III and IV, but no apparent AW/AAA trends or developments were noted in these areas. RP I reflected a greater weapons increase than any of the other route packages. The majority of the newly-delivered guns were placed along the major LOC's, and in the three major coastal city areas of Ron, Quang Khe and Dong Hoi. Barrage fire in RP I increased steadily during the last six months of 1966.

The following figures attest to the effectiveness of AW/AAA against high performance type aircraft. From January 1965 to 31 December 1966, 384 U.S. aircraft were known to have been shot down by ground fire in NVN. For every aircraft shot down, approximately three suffered battle damage due to ground fire. Of all the aircraft lost to ground fire, 53.5 percent sustained their initial hit below 4,500 feet; 6.3 percent were hit between 4,500 and 5,000 feet; and 12.8 percent above 5,000 feet. The remaining 27.4 percent were lost at unknown altitudes. The overall percentages were as follows: 55 percent were hit by light AAA, 17 percent by AW, 4 percent by medium AAA and an additional 4 percent by unknown type ground fire.

NVN Radar

The radar defense net continued to show improved coordination between its various entities through the year so that by the end of the year MIG activity, SAM launches, and AAA fire were noted as organized reactions.
against U.S. air strikes.

The relatively sophisticated multifrequency GCI associated radars of the TOKEN family, which included the BARLOCK and BIG BAR B, increased from six sites in 1965 to eight in 1966. ROCK/STONE CAKE height finders were deployed as far south as Ma Tinh and could provide limited GCI coverage to the Dong Hoi area. Numerous intercepts of CROSS UP IFF transponder emissions and the detection of a probable SPIN SCAN B occurred during the latter half of 1966. Both systems were associated with the MIG-21/Fishbed and the presence of the SPIN SCAN could add an all-weather and beam-rider missile-carrying capability to the NVN fighter force. In addition to IFF responses, the CROSS UP also may have possibly provided landing and air navigation aid. FLAT FACE and CROSS SLOT radars were deployed throughout NVN providing low-level and gap filler functions. There were indications they may have acted as acquisition for AAA batteries by furnishing azimuth and range. Primary deployment of the CROSS SLOT was along the coastal regions.

Emitter control (EMCON) was used rather effectively with the FAN SONG radar during 1966. Transmission was kept to a minimum but provided enough information to intercept a target and guide the missile. This shortened the warning time to aircraft and limited the ability of ELINT collectors to DF the source of emission. The primary GCI sites in NVN appeared to be at Bac Mai Airfield, another near Ha Dong, and two more near Phuc Yen Airfield. These sites, equipped with BARLOCK/BIG BAR B surveillance radars and either ROCK/STONE CAKE or SIDE NET height finders, were almost always
noted operating when NVN fighters were airborne and usually secured trans-
mission immediately when fighter activity ended.

With Soviet and Chinese Communist technical and material aid, North
Vietnam, by 1966, had established a complex defense system which many military
authorities described as the most formidable one ever faced by U.S. air-
craft. The enemy's defensive environment was immeasurably aided by
sanctuaries provided by U.S. political restraints on bombing. These
facts belied the claims made by some critics that U.S. air operations in
North Vietnam were directed against a helpless and unsophisticated opponent.