The F-111 in Southeast Asia
September 1972 - January 1973

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HQ PACAF
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CHECO/CORONA Harvest Division

Prepared by:
HQ/PACAF/XOAD
The counterinsurgency and unconventional warfare environment of Southeast Asia has resulted in USAF airpower being employed to meet a multitude of requirements. These varied applications have involved the full spectrum of USAF aerospace vehicles, support equipment, and manpower. As a result, operational data and experiences have accumulated which should be collected, documented, and analyzed for current and future impact upon USAF policies, concepts, and doctrine.

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

Project CHECO, an acronym for Contemporary Historical Examination of Current Operations, was established to meet the Air Staff directive. Based on the policy guidance of the Office of Air Force History and managed by Hq PACAF, with elements in Southeast Asia, Project CHECO provides a scholarly “on-going” historical examination, documentation, and reporting on USAF policies, concepts, and doctrine in PACOM. This CHECO report is part of the overall documentation and examination which is being accomplished. It is an authentic source for an assessment of the effectiveness of USAF airpower in PACOM when used in proper context. The reader must view the study in relation to the events and circumstances at the time of its preparation—recognizing that it was prepared on a contemporary basis which restricted perspective and that the author’s research was limited to records available within his local headquarters area.

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# TABLE OF CONTENTS

| LIST OF FIGURES                                | ix  |
| ABOUT THE AUTHORS                             | x   |
| FOREWORD                                      | xi  |
| CHAPTER I. PACAF CONCEPT FOR F-111 OPERATIONS  | 1   |
| CHAPTER II. DEPLOYMENT                        | 5   |
| A. Deployment Preparation                     | 5   |
| 1. Nellis AFB, Nevada                         | 5   |
| 2. Takhli RTAFB, Thailand                     | 7   |
| 3. Target Preparation and Selection           | 11  |
| B. Deployment                                 | 15  |
| CHAPTER III. OPERATIONS                       | 23  |
| A. Initial Operations and First Loss          | 23  |
| B. Suspension of Operations                   | 24  |
| C. Resumption of Operations                   | 26  |
| D. Loss #2                                    | 26  |
| E. Reappraisal of Operations                  | 27  |
| F. Cessation of Strikes in Northern NVN       | 28  |
| 1. Air Defense Activities Preceding the Bombing Halt | 28  |
| 2. Shift to Route Package I and Laos          | 31  |
| G. LINEBACKER II                              | 33  |
| H. Pre-Ceasefire                              | 37  |
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CHAPTER IV. ANALYSIS OF LOSSES
A. Possible Contributing Factors 39
B. Losses 46
C. Conclusion 54

CHAPTER V. EVALUATION OF EFFECTIVENESS
A. Summary of Operations 56
B. Operational Factors 58
C. Destruction, Harassment, Presence 60
D. Logistics and Maintenance 61
E. Ability to Perform in Intended Role 63

APPENDICES
1. North Vietnam Operating Areas 66
2. Laos Operating Areas 67

FOOTNOTES 68
GLOSSARY 76
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure No.</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>F-111 in SEA</td>
<td>xii</td>
</tr>
<tr>
<td>2.</td>
<td>Scheduled Deployment/Redeployment Summary--49th and 474th TFWs</td>
<td>16</td>
</tr>
<tr>
<td>3.</td>
<td>Actual Deployment/Redeployment Summary--49th and 474th TFWs</td>
<td>20</td>
</tr>
<tr>
<td>4.</td>
<td>Reaction Time Remaining If System Failure Occurs During Letdown</td>
<td>45</td>
</tr>
<tr>
<td>5.</td>
<td>Targets of Lost F-111As</td>
<td>48</td>
</tr>
</tbody>
</table>
ABOUT THE AUTHORS

This report was written as a special project by the personnel of the CHIECO/CORONA HARVEST Division, DCS/Plans and Operations, Hq PACAF. The primary authors were Colonel A. A. Picinich, Division Chief (who also initiated the report and supervised its preparation), and Captains J. C. Bethea, R. F. Burnham, Jr., T. D. DesBrisay, and K. C. Simonin. Captain D. T. Radzykewycz served as project coordinator and editor.
FOREWORD

The F-111 saw service twice in Southeast Asia. Its first, limited use in combat occurred in 1968, but the aircraft was withdrawn from SEA that same year. Yet, the F-111 possessed capabilities that were considered significant in the military and political situation which evolved following the massive North Vietnamese invasion of South Vietnam in the Spring of 1972. To capitalize upon these capabilities, the aircraft was reintroduced into the theater of operations. This report discusses the reintroduction of the F-111 into SEA, analyzes its operations and effectiveness, and examines its losses.
CHAPTER I

PACAF CONCEPT FOR F-111 OPERATIONS

(S) The concept of operations developed in 1972 for the combat employment of the F-111 weapon system in Southeast Asia (SEA) was designed to take full advantage of the capabilities of the F-111 in the night, adverse weather strike role. Historically, the North Vietnamese (NVN*) had used the hours of darkness and periods of inclement weather to move units into positions for an attack, to resupply and regroup, and to reinforce their lines of communication (LOCs) because of the limits in tactical air (TAC AIR) capabilities to continuously engage the enemy. Because of its range, weapon load, navigational precision, and weapons delivery accuracy, the F-111 was planned to complement other SEA strike aircraft in providing an expanded spectrum of tactical air capability.

(S) It was envisioned that the F-111 in SEA operations would assist in reducing the NVN war-supporting capability by conducting sustained deep interdiction combat operations. The aircraft's radius of action and terrain following radar (TFR) provided the capability for a low-altitude approach to either a fixed or time-sensitive target.

(S) As delineated in the PACAF concept, the F-111 would be selectively committed against only high priority radar-significant targets.** Its utilization was postulated as an independent weapon system. It would be used at very low altitudes, 200-1,000 feet above ground level (AGL), depending

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*NVN--used for both North Vietnam and North Vietnamese.

**Although included in the concept, the actual early deployment deviated from this plan. See p. 13 ff, below.
on terrain and defenses, on single aircraft penetrations into high threat areas of NVN. Flight profiles were structured to maximize the element of surprise and to ensure the highest possible degree of aircraft and crew survivability. Accordingly, the following factors were to be incorporated in operational planning data:

1. random routes and time-on-targets (TOTs) (night only);
2. final attack headings for repetitive strikes on the same target would be varied to avoid the emergence of discernible patterns;
3. no requirement for support aircraft (unless dictated by mission requirements).

PACAF believed that the pre-positioning of jamming aircraft or pre-TOT overflights of the target area would only degrade the element of surprise desired under the concept. Furthermore, when configured with an optimum weapons load, the F-111 was capable of striking all the target areas in NVN unrefueled, thereby eliminating the need for tanker support.*

3. Normal delivery tactics for the F-111 were to be predicated on the low-altitude surprise-attack role, with the type weapon being delivered determining the selection of the particular weapons release maneuver. For instance, when configured with high-drag munitions, a low-altitude level delivery would be accomplished utilizing TFR at 200-500 feet AGL. Approach speeds were to be the maximum obtainable at full

*(S) Although it was possible to hit all targets in NVN unrefueled, some compromises were required on sorties against targets on the northeast railroad. In many cases, crews remained at medium altitude well past the NVN border, passed closer than desired to SAM defended areas and climbed back to medium altitude while still over NVN in an effort to ensure an adequate amount of fuel for recovery at Takhli RTAFB.
military power except when limited by munitions carriage and release restrictions. (The "military power" setting would be used to avoid the highly visible afterburner plume which resulted when maximum power was used.) Egress from the target area was also to be at full military power and at the selected TFR altitude.

(S) When configured with low-drag weapons, a change in tactics was planned in that a stabilized climb would be used in the weapons release maneuver. This mode of munition delivery was required to ensure safe separation time and clearance from the bomb fragmentation envelope. As in high-drag munition tactics, the approach to the target was to be flown on TFR at 200-500 feet AGL. However, at 15-20 seconds prior to the computed weapons release time the aircraft was maneuvered to a 10-degree stabilized climb with bomb release initiated by the Ballistic Computer Unit. After the aircraft was established on the desired egress track, military power was to be used and the TFR was to be engaged.

(S) The primary weapons load for F-111 operations in SEA was conceived as: (1) 12 MK-82 bombs with either retarded (preferred) or conical fins, or (2) four MK-84 bombs. (The F-111A was certified to carry both the MK-82 and MK-84 bomb.) The maximum load envisioned for combat operations was 24 MK-82s; however, that load seriously degraded aircraft maneuverability and range characteristics due to an increased drag index and a consequent reduction in obtainable military power airspeed. The airspeed limitation could be overcome by the use of the afterburner, but this in turn would reduce the desired element of surprise and would increase
susceptibility to damage or loss from enemy defenses. Incorporating a requirement for afterburner use on a planned basis would also restrict the range capability of the aircraft. Furthermore, in order to carry the maximum bomb load, a reduced initial fuel load would be necessary to meet takeoff gross weight limitations. These factors also impacted on the obtainable unrefueled radius of action.

(S) The mission profiles planned for F-111 use from Takhli Royal Thai Air Force Base (RTAFB) enabled the F-111 to strike all target areas of North Vietnam without air refueling. The profiles were high-low-high with descent to low level TFR timed to permit the aircraft to remain below threat radar coverage and to minimize the risk of encountering airborne enemy interceptors. The low-level portions of the profiles were routed through mountainous areas whenever possible to take advantage of terrain masking to conceal exact flight routing and actual target areas. Sample profiles generally routed the aircraft through northern Laos with planned descent to TFR altitudes varying from the Thailand/Laos border for close targets to the Laos/NVN border for deep targets. Egress routes were generally planned to prevent extensive traversing of the high threat Red River delta area, and terrain masking was to be exploited both prior to and following weapons release. Exceptions to these procedures were limited to those instances in which coastal targets were to be struck and it was deemed advantageous to either enter or exit over the Gulf of Tonkin (GOT).
A. (S)(U) Deployment Preparation

(S) The introduction of the F-111 added a new capability to the USAF air interdiction campaign, night/all-weather operations. Around-the-clock pressure against North Vietnam was now possible. The F-111 had the ability to penetrate to the NVN heartland without using tankers or any other support aircraft. Highly sophisticated avionics packages, such as terrain following radar and terrain mapping attack radar, made low altitude/high speed ingress to the target area possible and provided automatic bomb release without visual acquisition of the target.

(S) Takhli RTAFB was selected as the beddown base for the F-111. The 474th Tactical Fighter Wing (TFW) from Nellis AFB, Nevada, was designated to deploy two squadrons of 24 F-111 aircraft each to Takhli. Coinciding with the arrival of the 474th, the 49th TFW (with its 72 F-4s), then at Takhli, was to return to Holloman AFB, New Mexico. This deployment/redeployment, nicknamed CONSTANT GUARD V, was carried out simultaneously to minimize disruption of combat operations in SEA. To ensure an orderly switchover at Takhli, preparations were initiated well in advance of the move.

1. (S)(U) Nellis AFB, Nevada

(S) Preparation for the CONSTANT GUARD V deployment began at Nellis AFB approximately 30 days prior to the move. For deployment personnel these preparations included indoctrination briefings conducted by PACAF and 474th TFW intelligence personnel on a myriad of subjects. Aircrews were briefed on Rules of Engagement for all countries in SEA with
particular emphasis on NVN, which would be the F-111s' major area of responsibility. Enemy threat and capabilities were also briefed, viz., the NVN Air Order of Battle (AOB), Surface-to-Air Missile (SAM) threat, and Anti-aircraft Artillery (AAA) threat. Enemy AOB briefings included MIG strength and location, air defense ground radar, and MIG warning procedures. Both the SAM and AAA threat briefings covered location, size, and number of weapons.

(S) Since the F-111s were to be used primarily for night, TFR missions, training toward that end was emphasized. Most of the training missions for the two selected squadrons were flown over the mountainous terrain of Nevada. The missions were flown at night using TFR procedures and terminated with weapons delivery practice at the Indian Springs Range 5 bombing complex and the Fallon Naval Air Station EW/bombing range. Emphasis was placed on delivery techniques and escape maneuvers for both high and low drag general purpose bombs delivered from low altitude. *

(S) Training in the use of Radar Homing and Warning (RHAW) devices and Electronic Countermeasures (ECM) equipment was also stressed to ensure that the training environment simulated the actual conditions aircrews would encounter in SEA. RHAW provided the aircrews with visual cockpit

*(S) However, it should be noted that significant differences existed between the training and deployment environments. While training was conducted in the arid and barren southwestern United States where the FAA severely curtailed mission profiles, the deployment environment was hot and humid, and the vegetation in SEA was very dense in many areas. In addition, less than half the crews had previously dropped anything other than practice bombs.

6
presentations indicating tracking or lock-on of various enemy fire control radars, as well as indications of an actual SA-2 SAM launch. The system was designed to provide warning to the aircrews so that evasive action could be taken.*

(S) Maintenance preparation of each aircraft to be deployed was intensified and every system was brought to the peak of efficiency. All phase inspections were performed and outstanding Time Compliance Technical Orders (TCTOs) were accomplished prior to the designated aircraft departing Nellis. In addition, equipment which was to be deployed was also checked and discrepancies were repaired prior to shipment.

(U) Since the F-111 night mission required extensive film processing support for preparation of radar prediction target materials and processing of mission radar scope film, it was decided to deploy part of the ES-85 Mobile Film Processing Facility from Nellis to support the 474th TFW in SEA. The ES-85 is a modular, eight-van, air-transportable complex capable of processing black and white and/or color film. Five vans, providing the black and white capability, were deployed to Takhli.

2. (S)(U) Takhli RTAFB, Thailand

(S) Readying Takhli RTAFB for the arrival of the F-111s was complex since such things as maintenance facilities, ramp space, logistics support, personnel billeting, and equipment requirements, to name but a

* (S) All aircraft were equipped with both the ALQ-94 and the ALQ-87 ECM Pods. In some cases, however, lack of replacement parts degraded the ALQ-94 capability and permitted usage of the aircraft in a low threat environment only.
few, had to be carefully considered. Preparation began in June 1972 with the arrival of a logistics team from PACAF and an F-111 team from Nellis AFB. The teams reviewed all operational, intelligence, and logistics considerations; they identified problem areas and made recommendations for the phase-in of the F-111. Among the problems:

a. (S)(U) **Ramp Space and Revetments**

(S) The ramp space requirement for any jet aircraft is a function of the physical size of the aircraft as well as its exhaust velocity and jet blast temperatures. The characteristics of the F-111's jet blast dictated that no more than two rows of aircraft could be parked at Takhli if they were unrevetted. As a result of its dimensions, the F-111 required more side-by-side parking space and larger revetments than required by the F-4. Several alternatives were proposed which suggested that space could be saved if the F-111s were parked with wings swept. Since most major maintenance on the F-111 in addition to pre- and post-flight inspections must be performed with wings extended, however, these proposals were considered unworkable.

(S) Seventy-seven revetments for F-4 aircraft were in place at Takhli when the USAF vacated that base in 1971. The Royal Thai Air Force had dismantled 33 of these revetments on the north end of the parking ramp prior to the USAF reoccupation of that base in May 1972. With the influx of F-4s from DaNang and the continental U.S. (CONUS), approximately 75 F-4s were parked unrevetted. The risk to the exposed F-4s was considered acceptable in view of the cost of constructing additional revetments;
however, the risk of exposing the more costly F-111s became unacceptable. PACAF therefore allocated resources for the construction of 46 F-111 revetments and the enlargement of existing F-4 revetments.

b. (S)(U) Power Supply

(S) Observations by the teams visiting Takhli disclosed that facilities for F-111 materiel and maintenance were adequate for co-utilization with the F-4, but with some exceptions. One of these exceptions was in the area of 60 cycle AC power. All facilities were operational on an austere basis since only limited 60 HZ* power was available. Additional generation equipment for 60 HZ power was programmed but not fully installed.** (Since the commercial AC power which was available to the base was 50 HZ rather than 60 HZ, it was not useable for F-111 avionics test purposes.) Adequate 400 cycle AC power was available from MD-4 generators which were deployed from Nellis.

c. (S)(U) Avionics Facility Cooling

(S) The existing avionics facility for F-4 operations was considered adequate with the exception of the air conditioning. Although a cursory survey of the facility revealed three 60-ton units permanently installed, they had been partially cannibalized and were not in operation. Rehabilitation of these units (at an estimated cost of $18,000) would provide adequate cooling for both F-4 and F-111 avionics equipment. As an interim fix, portable window units were used for cooling the building below the maximum temperature permitted for operation of F-111 avionics aerospace ground equipment (AGE).

*HZ--formerly referred to as "cycles."
**Documentation about the resolution of this problem was not available as this report was being completed. [Ed.]
d. (S)(U) Arresting Gear

(S) Since the F-111 was substantially heavier than the F-4, its requirement for runway arresting gear was different. The F-4 utilized the standard-runout BAK-12 arresting system, while the only system able to safely decelerate the F-111 was the long-runout BAK-12. On 5 August 1972, well in advance of the deployment, 13AF requested that Tactical Air Command (TAC) supply the necessary equipment to modify the existing BAK-12 systems. Action on this request was postponed, and the necessary equipment did not arrive at Takhli until 2 October 1972. Upon its arrival, it was found that much of the equipment was inoperative and had to be repaired or replaced. Due to these problems, installation and checkout of the barrier systems actually required 25 hours instead of the more typical 12 to 14 hours.

e. (S)(U) Miscellaneous Maintenance and Materiel Problems

(S) There were several other maintenance and materiel problems at Takhli which were minor in nature and easily correctable. Field fabrication shops, i.e., sheet metal and welding shops, were equipped for short-term operation only; to enable them to provide full shop operation for F-111 maintenance required the installation of more standardized shop equipment. Dock space for phase inspections and heavy maintenance was critical at Takhli and could accommodate only 10 F-4 or six F-111 aircraft. Yet another problem was the absence of a Precision Measuring Equipment Laboratory (PMEL) on base. Calibration support for Precision Measuring Equipment (PME) was provided by Transportable Field Calibration Units.
(TFCUs). However, only some 40 percent of PME requirements were supportable within TFCU capability, and the remainder had to be sent to backup PMELs at Korat and other Thailand bases.

f. (S)(U) Housing

(S) Billeting for both officers and airmen at Takhli was inadequate for the number of personnel there. A scant two weeks prior to CONSTANT GUARD V execution, the 366th TFW reported that housing for all personnel was completely inadequate and that approved projects would only partially alleviate the problem. In order to provide some shelter for personnel at Takhli, an extensive tent city was constructed to house up to 1,800 personnel. Support personnel were identified for movement into the tents while those personnel essential for flight operation at night were given priority for more permanent living facilities. The shortage of adequate living quarters was attributed to Thai personnel occupying barracks which had previously been occupied by USAF enlisted personnel. Priority for air conditioned quarters was naturally given to aircrews, with the night flying crews receiving the highest priority.

3. (S)(U) Target Preparation and Selection

(U) Target preparation was an essential part of all F-111 pre-strike planning activities. When new targets were selected, several steps were normally taken to ensure that aircrews had complete knowledge of the target. The first step in this process was a "letter of intent" which was published weekly and outlined targets for each day. Each target was processed to obtain pertinent target data. The data were then analyzed
to determine target compatibility with F-111 capabilities. Once compatibility was established, sufficient target materials (recce photos, charts, etc.) were gathered to support the strike, and radar aim point and axis of attack were selected. A mission profile was then prepared to include ingress and egress routes, altitudes, and update points. The completion of all phases of target analysis normally took from 14 to 24 hours. Targets which had previously been struck required shorter preparation times since materials on these targets were already assembled.

(S) The F-111 was capable of striking any target then on the validated target list. Since planners desired to take advantage of the unique navigational and bombing characteristics of the F-111, PACAF/DOXQ recommended that the targets: (1) be point targets or point elements within an area target; (2) be radar significant targets or be within range of a radar significant offset aiming point (OAP); (3) have target/OAP coordinates which had been precisely mensurated via SENTINEL LOCK/DATE.*

(S) Adhering as much as possible to these characteristics, a joint TAC/PACAF team selected 144 targets. Most were lucrative, point targets located within the high threat area of Route Package (RP) VI A (which included Hanoi). Sixty-four bridges were included. Preparation was begun on target folders and mensuration of target coordinates. A number of targets

*(S) SENTINEL DATE is a non-deployable data base located at DMAAC (St. Louis); it is used for positioning targets and the determination of the geodetic control (i.e., correctly superimposing photography over the map grid) to produce the SENTINEL LOCK data base. The SENTINEL LOCK data base was developed for field use. It provides a method for precisely determining latitude, longitude, and elevation of navigational fix-points, offset aim points, and targets. Two sets of this data base are presently in SEA; one at Takhli, the other at NKP. SENTINEL LOCK/DATE are photo-positioning data bases. [Ed.]
on this list were identified to the 474th TFW prior to their departure from Nellis.

(5) As a direct result of conversations between PACAF and TAC, it was felt that all initial strikes would be flown against targets derived from the "letter of intent" listing of 32 primary targets. This, however, proved not to be the case; only approximately 10 percent of the pre-planned targets were struck during the first month of operation. The first targets were carefully screened to avoid high threat areas and still provide an estimate of the weapon system's combat capability. Seventh Air Force intended for the F-111 crews to shift gradually from targets in relatively low threat areas to those located in higher threat areas as crew confidence and experience increased. To meet the target requirements, 7AF nominated 56 additional targets, which were subsequently approved by TAC/PACAF, in the lower threat areas of the northern route packages. The target folders were passed to the 474th TFW at Nellis. All mission profiles were high-low-high with the descent point being determined by enemy defenses. The low-level route was to be flown at 1,000 feet utilizing TFR procedures, while the attack run-in was to be flown at 500 feet.

(U) Since the preplanning stage for F-111 strikes required time to piece together mission folders, target planners were concerned over frag lead time; that is, how much time was available from frag reception to mission launch. To ensure that target coordinates and other necessary materials were available in time for target planning and aircrew study, frag lead times would have to be at least 24 hours when materials and
coordinates were to be obtained from sources outside SEA. Thorough coordination between the 474th TFW, PACAF, and 7AF alleviated this concern.

(S) Included in mission preparation was "weaponeering."* In order to obtain the maximum benefit from any strike, using any weapon system, the proper weapons must be utilized. This was especially true when attacking point targets, e.g., bridges, dams, and buildings. Targets to be struck by the F-111 were analyzed to determine the most significant and vulnerable element of the target. This analysis led to the best weapon/fuzing combination to provide the desired weapons effect (bearing in mind tactics and delivery parameters and limitations). Predeployment weaponeering was accomplished by Headquarters PACAF. However, after the arrival of the F-111s in SEA, the pre-strike weaponeering responsibility was transferred to 7AF. A Hq PACAF weaponeer was detailed to augment the 7AF Targets Frag Shop beginning in early October 1972. Headquarters PACAF continued to provide supplemental weaponeering support when requested by 7AF.

(S) Problem areas anticipated by the 474th TFW in locating and securing target materials for mission preparation were resolved prior to the deployment. Arrangements were made by Hq PACAF and the Defense Mapping Agency Aerospace Center (DMAAC) Flight Information Office-Pacific to have all required maps and charts of target areas in NVN in place at Takhli.

*Weaponeering--the process whereby targets are examined for their peculiarities and the proper weapon and fuzing combination is selected to inflict maximum damage on the target. For example, the weapon to be used on the target is selected and then the fuzing (instantaneous, delayed) is selected for that weapon.
when the unit deployed. Initial stereo photo coverage of the Hanoi-Haiphong area was completed by the 548th Reconnaissance Tactical Group (RTG) for use in early target planning. Additional coverage was provided by the 12th Reconnaissance Intelligence Technical Squadron (RITS).

(S) Automated Tactical Target Graphics (ATTG) and other miscellaneous materials for NVN targets were provided by PACAF, while 12th RITS furnished a complete set of Master Target Folders to the unit. SENTINEL DATE coordinates for LINEBACKER* targets were obtained from DMAAC by PACAF and provided to the 474th TFW. SENTINEL LOCK coordinates, needed for mensuration of OAPs, were obtained from a DMAAC SENTINEL LOCK support package deployed to Takhli. A problem in the use of the mensurated coordinates resulted when the mensurated aim point was included in the frag but not annotated on the 474th TFW target photography. Crew members had difficulty in plotting the aim point on the photography while preparing for the mission. A partial solution was obtained when an aim point description was added to the frag information.

B. (S)(U) Deployment

(S) The deployment schedule for the 474th TFW and the redeployment schedule for the 49th TFW were outlined in PACAF Programmed Action Directive (PAD) 73-4. This PAD provided for a closely integrated deployment/redeployment which would not hinder operations at Takhli and would also avoid overcrowding. This schedule is reflected in Figure 2.

*LINEBACKER, which started on 10 May 1972, was a coordinated air and naval campaign aimed at the destruction of the enemy's war materiel and the disruption of his logistics system throughout NVN.
## SCHEDULED DEPLOYMENT/REDEPLOYMENT SUMMARY - 49TH AND 474TH TFWs

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<th>2 Oct D+5</th>
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**SOURCE:** Tactical Air Augmentation in Thailand, 13AF Study, December 72.
As indicated in Figure 2, the first squadron of F-111s (429th Tactical Fighter Squadron) was due to arrive at Takhli on 30 Sep 72 (D+3), while the second squadron was to arrive on 2 Oct 72 (D+5). This schedule dovetailed nicely with the scheduled redeployment of the 49th TFW. The first squadron of 18 F-4s was to leave Takhli on 29 Sep 72, one day before the arrival of the 429th Tactical Fighter Squadron (TFS). The 8th TFS was scheduled to depart Takhli on 30 Sep 72. This schedule removed 36 F-4s from Takhli prior to the arrival of the first 24 F-111s. A similar schedule existed for the departure of the 9th and 434th TFSs (F-4) and the arrival of the 430th TFS (F-111).

In actuality, however, the first contingent of 12 F-111s arrived at Takhli on 28 Sep 72, creating an overlap of 12 F-111s and 18 F-4s for a period of 36 hours. This occurred as a result of a last minute change to the F-111 deployment schedule. The first 12 aircraft proceeded directly to Andersen, and, with prepositioned crews, on to Takhli (rather than going via Hickam and Clark as originally scheduled). The 474th Advanced Echelon (ADVON) and parts of the support group also arrived earlier than planned, further adding to the overcrowding at Takhli and causing a corresponding overlap of the inbound and outbound airlift of the two wings. The second half of the 429th TFS (12 F-111s) arrived as scheduled.

All personnel of the 474th ADVON did not arrive as one unit. Some elements were mixed with turnaround crews, which were to fly the first combat sorties, while other elements of the ADVON arrived at a later date. This splitting of the ADVON did have one detrimental effect on the launch
of the first combat sorties: the split ADVON resulted in a reduced number of radar predictors available to aid in pre-planning strikes on completely unfamiliar targets. Although this did increase the workload on the available personnel, ample time existed and was utilized to complete the required target study. Personnel from the 366th TFW, also stationed at Takhli, drew upon their experience and discussed with the F-111 crews matters of operational concern, such as enemy Order of Battle disposition. In addition, the 366th made available to the F-111 crews facilities for target studies and briefs. Earlier, extensive preparatory actions were accomplished by the Wing prior to their deployment. These actions included briefing by both PACAF and Wing intelligence personnel on rules of engagement, the enemy threat, and enemy capabilities. When the advanced crews arrived at Takhli, target materials were in place for the first six targets and route folders and predictions were prepared. Target study was accomplished plus approximately eight hours of briefings on rules of engagement, air order of battle, intelligence, search and rescue, and procedures for command and control.

(U) Deployment/redeployment of later elements in CONSTANT GUARD V also differed from the schedule due to a tropical storm which appeared approximately 600 miles east-northeast of Guam on 1 Oct 72, directly on the flight path between Hickam and Andersen. This storm caused a delay in the departure of the 8th TFW from Andersen, which in turn resulted in ramp parking congestion at that base, forcing postponement of the 9th TFS departure from Takhli which was scheduled for the same day. Adding to the "domino effect," the
430th TFS was at Clark AB waiting for the above movements to take place to free ramp space at Takhli, which could at that time accept no more incoming aircraft without an equivalent outflow. Actual deployment/redeployment times are shown in Figure 3.

(S) Difficulties were also encountered in air-to-air refueling operations during CONSTANT GUARD V. Although these difficulties were not insurmountable, they were matters of concern. The refueling problems included:

1. An unusual number of altitudes required for rendezvous between refueler and receivers.

2. The clearance request for tanker operations was submitted much too late in the mission to allow sufficient time for altitude reservations planning.

3. Tanker coordinators were not properly briefed prior to their arrival at Clark; they did not appear to have a clear idea of their requirements and were unsure of what air traffic control services they would require.

4. There was no single point of contact for coordination for the tanker task force; it was often impossible to locate anyone with decision-making authority.

5. All cells of the first contingent of twelve F-111 aircraft arrived over Jamalig (Philippines) for refueling within five minutes of each other; accomplishing separation for sequencing in the radar and traffic pattern was impossible.

6. The second contingent of F-111 aircraft had been briefed to separate into flights of six fighters and two tankers each under Instrument Flight Rules (IFR) conditions; the first flight complied with the briefing, but the second wave arrived in straggling groups of twos and threes from a variety of directions.

Another fuel-related problem which could have had serious consequences occurred during the recovery of F-111 aircraft at Clark AB. Some aircraft
FIGURE 3
ACTUAL DEPLOYMENT/REDEPLOYMENT SUMMARY - 49TH AND 474TH TFWs

<table>
<thead>
<tr>
<th>Unit Move</th>
<th>27 Sep D-Day</th>
<th>28 Sep D+1</th>
<th>29 Sep D+2</th>
<th>30 Sep D+3</th>
<th>1 Oct D+4</th>
<th>2 Oct D+5</th>
<th>3 Oct D+6</th>
<th>4 Oct D+7</th>
<th>5 Oct D+8</th>
<th>6 Oct D+9</th>
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arrived over the base with low fuel reserves. Fortunately, fair weather permitted expeditious recovery of the fighters. *

(S) Initiation of Military Airlift Command (MAC) airlift for CONSTANT GUARD V coincided with the deployment of the first contingent of F-111 fighters. The first C-141 departed Nellis AFB on 27 Sep 72, and all necessary airlift was completed on 1 Oct 72, shortly after the closure of the 429th TFS. As a consequence, deploying support equipment was in place at Takhli well ahead of the arrival of the second F-111 squadron. Twenty-nine C-141 and six commercial passenger aircraft were employed in CONSTANT GUARD V. These aircraft transported a total of 494.7 tons of cargo and equipment and 1,487 passengers to Takhli. In addition, five C-130 aircraft were used to carry enroute support team equipment and personnel.

(C) All equipment of the 49th TFW which was suitable for F-111 operations and requirements was left in place at Takhli. This procedure prevented shipment of duplicate AGE and kept transportation costs to a minimum. As a result, some 225 tons and 48,744 cubic feet of equipment, which would have required 11 C-141s for transport, was not moved.

(U) One minor problem concerning CONSTANT GUARD V airlift occurred when the Thai government refused to allow MAC commercial contract flights.

*Following their pre-publication review of this report, Hq 474th TFW/DOW noted that: "Hazards related to the arrival at Clark AFB are somewhat under-emphasized. Manila approach control radar was inoperative. The Clark AFB Rapcon was incapable of maintaining an orderly traffic flow. They attempted to vector flights directly into thunderstorms and often refused to communicate, apparently due to traffic saturation. This forced some flights to proceed visually to avoid a minimum fuel situation."
to land at any base other than Don Muang or U-Tapao. Consequently, these flights landed at either U-Tapao or Don Muang, and their loads were transferred to C-141s for the trip to Takhli. However, the C-141s were not equipped to transfer all personal baggage arriving on the contract flights carrying personnel. Thus, men arrived at Takhli ahead of their baggage; when it arrived by later flight, there was confusion in matching men to their belongings.
CHAPTER III
OPERATIONS

A. (S)(U) Initial Operations and First Loss

(S) F-111 operations against North Vietnam began on the evening of 28 September 1972, just hours after the first deploying aircraft landed at Takhli RTAFB. The frag for that evening called for six F-111s to strike six targets in Route Package V.* In accordance with the F-111 employment concept, these initial night sorties were fragged to penetrate NVN as single flights at low altitude** (1,000 feet AGL with TFR engaged) and high speed [480 Knots True Air Speed (KTAS)], utilizing low-altitude (500 feet AGL) radar deliveries to strike the target. The missions were to be flown by aircrews already in place at Takhli, deployed from Nellis on 24 September by C-141, and in place at 2200 local time on 26 September. Prior to the arrival of the aircraft these crews had studied detailed target folders and had been briefed on rules of engagement, intelligence, the air order of battle, search and rescue (SAR), command and control arrangements, and safety aspects of the missions.

(S) Of the six aircraft scheduled to participate in the mission, only five were launched. Of these, one aircraft took off, jettisoned fuel, and returned to base. The first night of combat operations for the F-111 following its redeployment to SEA was marred by the loss of one aircraft. Ranger 23, the second aircraft to depart Takhli RTAFB, was last heard from about 40 minutes after launch. At that time the mission was proceeding normally, although the aircraft was deviating somewhat from its planned course in order to avoid

*See Appendix 1.

**The descent point was determined by the enemy threat.
thunderstorms along the route through Laos. (Such deviations also occurred for other F-111s that night.) Shortly after midnight,* more than two hours after the last radio contact, Ranger 23 was declared missing. Neither the location nor the cause of the loss was known at this writing.

B. (S)(U) Suspension of Operations

(S) Immediately following the loss of Ranger 23, F-111 combat operations were temporarily suspended and a SAR effort was initiated. During the SAR effort, approximately 3,500 square miles of North Vietnamese and Laotian territory was photographed, and another 4,900 square mile area in northern Laos was searched visually. Additionally, all-source intelligence data were carefully screened in the hope that some bit of information might shed light on the location or cause of the loss. By 10 October, however, every available lead had been exhausted, and the search was terminated.

(S) At the time that the search for the missing aircraft was under­way, an intensified orientation program was initiated and a reevaluation of the concept of employment of the F-111 was begun. All aircrews were given ground training briefings reemphasizing those specific areas directly concerned with combat operations in SEA. Area orientation flights were flown to familiarize the aircrews with the terrain that they would be encountering. Missions were flown in Thailand to check out aircraft systems and to give the crews an opportunity to visually orient themselves in their new environment. Subsequent night flights over the same areas were also made to validate the performance of the terrain following radar system.

*Times given hereafter, unless otherwise specified, are local times at Takhli.
Note

For reasons of "National Security," pages 25, 26, 27, 38, 39, 40, and 41 remain classified.
seemed normal. However, at 0153, 17 October, Coach 33 was declared overdue and missing.

(S) Shortly after Coach 33 was declared missing, an infrared-equipped RF-4 was launched to fly the planned profile in an attempt to detect anything that would pinpoint the crash site. As was the case with the loss of Ranger 23, an extensive SAR effort was conducted in the hope that the missing aircraft could be found, the cause of its loss determined, and surviving crewmembers rescued. Unfortunately, visual and photographic searches failed to uncover either the location or the cause of the loss, and no contact was ever made with any survivors. All-source information, however, did offer more clues than had been the case for Ranger 23. There was evidence that Coach 33 might have gone down in, or near, the target. Also, the NVN did claim the shoot-down of the F-111 in the general target area and published photos of the wreckage of an F-111 and identification cards of the two crewmembers. There was, however, no firm evidence as to the cause of the loss.

E. (S)(U) Reappraisal of Operations

(S) Following the loss of the second F-111, the concept of employment was again completely reappraised. Since Coach 33 was probably lost in or near the target area, analysis of the tactics in the target area received particular attention. The missing aircraft had been configured with low drag weapons (four MK-84s) which required a stabilized climb from low level TFR flight to approximately 1,000 feet AGL prior to weapons release. (Conversely, high drag weapons could be delivered at or below 500 feet AGL.) Although the delivery of low drag weapons had been included in the employment concept,
the higher altitudes at which such bombs were released increased the vulnerability of the aircraft to enemy defenses. As a result of this loss, 7AF prohibited the further use of low drag weapons unless specifically fragged on an individual case basis. This impacted on targeting since hard point targets, requiring strike by MK-84 low-drag ordnance, could no longer be fragged because of the release parameters. The standard MK-82 high drag weapons were not effective against hard point targets such as bridges and storage facilities.

(S) Additionally, a change to improve command and control of the F-111 force was implemented as a result of the second loss. To assist 7AF Tactical Air Control Center (TACC), Airborne Battlefield Command and Control Center (ABCCC), and Ground-Controlled Intercept (GCI) controllers, each crew was required to submit a flight plan which included estimated times of arrival (ETAs) at each turn point along the flight route. During the flight, as was the case previously, each aircraft was under positive radar contact until its descent to MEA or TFR altitude. At that point, and at every turn point thereafter, the crew would broadcast position reports to the ABCCC over high frequency (HF) radio. This procedure, while it did not enhance the safety of a particular mission, did provide a means of positive flight monitoring.

F. (S)(U) Cessation of Strikes in Northern NVN

1. (S)(U) Air Defense Activities Preceding the Bombing Halt

(S) Effective 23 October 1972, the President directed a cessation of the bombing above the 20th Parallel in NVN. In the last days
preceding the 23 October bombing halt, however, F-111 strikes in the heavily defended Route Packages V and VI reflected some interesting trends in the enemy's air defense reaction to the strikes. The enemy threat, as manifested during low-level F-111 strikes against targets in these areas, consisted primarily of anti-aircraft artillery and small arms fire, and surface-to-air missile activity. (Of these threats, planners considered AAA the most serious.) MIGs, another potential threat, were not a significant factor during the period of this report. Although MIGs were occasionally airborne at night in the general vicinity of F-111 targets, there was no indication that the flights were anything other than routine training.

(S) The enemy's AAA reactions normally occurred just after weapons release. For the first two or three weeks of F-111 strikes, enemy gunners were apparently unable to determine the correct F-111 altitude. Aircrews believed that barrage AAA fire was directed towards the sound of the aircraft rather than at or ahead of its actual position since detonations were occurring above and behind the aircraft. As F-111 operations continued, however, the AAA worked down to the actual 500-feet AGL altitude of the aircraft, but detonations were still occurring behind the aircraft. The F-111s countered this development by flying at 300 feet or 200 feet AGL during release. On the last night of Route Packages V and VI operations, one F-111 did have barrage fire detonating at his altitude, ahead of his aircraft, at the one and 11 o'clock positions. In the latter days of Route Packages V and VI strikes, the enemy also fired flares to help
mark the flight paths of the aircraft. Although the accuracy of AAA fire was improving, no F-111 aircraft sustained damage due to AAA by the 23 October standdown. It appeared that in addition to the obvious possibility of shooting down an aircraft, however, the enemy employed AAA barrages in an attempt to drive the F-111s up to an altitude where missile sites could acquire and track them.

(S) Despite the low altitudes flown by F-111s, it became apparent that the SAM batteries represented a threat to the aircraft, and, in fact, were in some instances capable of tracking and firing on aircraft as low as 500 feet AGL. By 22 October, F-111s had been illuminated and tracked (i.e., received Radar Homing and Warning [RHAW] indications) on more than 70 occasions; in eight encounters a total of 16 SAMs had been fired. Although there were no known losses, one aircraft had sustained minor damage while others reported near misses.

(S) F-111 anti-SAM tactics employed a combination of chaff, maneuvering, and ECM pod utilization. For example, in one incident two SAMs were launched in rapid succession at an F-111. The first was negated by two bundles of chaff plus a 30 degree banked turn and a descent from 500 to 300 feet AGL; but as soon as the first missile was negated, a second launch occurred. Pods were activated and the bank angle was increased long enough to turn away from the launch area. After the aircraft rolled back out to level flight, the pods appeared to defeat the missile guidance. In view of the ability of SAMs to acquire and track aircraft even at low altitudes, anti-SAM tactics and ECM procedures were subject to continuing review and refinement.
2. (S)(U) Shift to Route Package I and Laos

(S) In the two-month period following cessation of airstrikes above the 20th Parallel and preceding the initiation of LINEBACKER II in late December 1972, F-111 strikes shifted to Route Package I and Laos.

(S) The F-111 tactics employment in RP I remained essentially the same as had been the case for Route Packages V and VI. The F-111 continued to be employed in a night, low altitude, high speed, single-ship penetration, radar delivery role. Throughout late October and the first half of November at least 20 F-111 sorties per night were routinely fragged against logistics and air defense targets throughout RP I. During November the preponderance of the effort (nearly 70 percent of total F-111 RP I sorties) was directed against truck park/supply/storage area type targets. A sizeable number of sorties struck enemy defenses and troop concentrations, while a smaller number struck roads, fords, and interdiction points.

(S) During the latter half of November there was a shift of F-111 sorties from the interdiction role in Route Package I to support of friendly forces in Northern Laos. Despite the shift, however, a sizeable strike effort did continue in RP I, with an average of 10 F-111 sorties scheduled there per day. During the month of November F-111s flew a total of 402 combat sorties in RP I.

(S) During these RP I strikes in November the third and fourth F-111 losses occurred, both due to unknown causes. Loss number three occurred on 7 November during a mission against the Luat Son Highway.
Ferry/Ford Complex on Route 101B, some 6.5 NM southeast of Bat Lake. The aircraft last made radio contact with the ABCCC approximately 45 minutes after takeoff. The second loss occurred on 20 November, on a mission against Co Giang Transshipment Point on Route 101, about 8.5 NM southwest of Quang Khe. Again, no information was uncovered revealing the exact location or cause of the loss. In the case of this loss, however, pieces of wreckage from the aircraft were later discovered washed ashore north of Da Nang, indicating that the crash probably occurred during egress over the Gulf of Tonkin.

(S) In November, a new dimension was added to F-111 operations. The use of the F-111 with a radar beacon for offset bombing from medium altitudes\(^\ast\) in support of friendly forces in Laos represented a major departure from the initial concept of employment for the aircraft. The beacon bombing program was conceived as the optimum employment of the F-111 weapons system in the defense of Long Tieng, an area of critical importance to the war in Laos. Radar beacons deployed at key locations on the ground were used as offset aiming points for medium altitude radar bombing by the F-111s. This technique, which could be employed within a 30-mile radius\(^\ast\ast\) of a given beacon, enabled the F-111 to strike time-sensitive targets developed by Raven Forward Air Controllers (FACs), Laotian Forward Air Guides (FAGs), or ground commanders. Of particular importance was the fact that these strikes were carried out regardless of weather conditions.

\(^\ast\)(U) Above 13,000 feet AGL.
\(^\ast\ast\)(S) It should be noted that while the beacon's effective range was approximately 30 miles, the F-111 system had a 16 NM (99,999 feet) ranging limitation with offset beacons.
(S) Two distinct types of targets were struck during the F-111 beacon bombing program—preplanned targets and targets of opportunity. In the case of preplanned targets, the beacon position and target coordinates were known and fragged in advance. Flexibility was provided by the practice of diverting aircraft from preplanned targets to time-sensitive targets, when such diversions were requested by a FAG. In the case of targets of opportunity, the offset distance, bearing, and target elevation from a particular beacon were provided by the ground controller (FAG). For both types of targets the axis of attack was normally planned to vary from 10 to 40 degrees from the offset bearing. Also in both cases, until accurate Circular Error Probable (CEP) data could be determined for the F-111 beacon bombing technique, only targets more than three kilometers from friendly positions were struck.

(S) The first successful F-111 beacon bombing mission in support of friendly Laotian forces was flown on 11 November 1972. By 30 November, 221 such missions had successfully delivered ordnance against targets in northern Laos. During the month of November, F-111s flew 455 combat sorties in Laos, all but 84 of these in the northern part of that country. As confidence in, and experience with, the radar beacon bombing program grew, the number of F-111 sorties in Laos steadily increased, with more than 500 sorties flown there during December.

G. (S)(U) LINEBACKER II

(S) Beginning on 18 December 1972 and continuing through 29 December, a maximum tactical air (TAC AIR) and B-52 air strike effort was directed against selected targets in Route Packages VI A and VI B, with the greatest
emphasis placed on targets in the vicinity of Hanoi and Haiphong. This concentrated bombing program, known as LINEBACKER II, included by far the heaviest B-52 strikes ever directed against targets in NVN, and a TAC AIR effort which easily surpassed the level of strikes directed against the northern RPs in the earlier LINEBACKER I program. F-111s represented a significant element of the strike effort, providing the USAF with the capability to strike targets 24 hours a day in all weather conditions and with minimal support requirements. During LINEBACKER II operations, 154 F-111 strike sorties were directed against a wide variety of enemy targets including airfields, SAM sites, rail targets, storage areas, and communications facilities.

(S) During the initial days of LINEBACKER II, some 50 percent of F-111 sorties (i.e., about seven per day) were directed against enemy airfields. In many cases the strikes were scheduled to precede B-52 arrivals over NVN and were designed to reduce the MIG threat to the subsequent B-52 strikes. While the number of sorties involved was modest, the strikes were a definite harassment to the enemy. In fact, considering the small number of sorties employed, the F-111 showed promise against the radar-significant, large-area targets provided by airfields. Perhaps the best example of F-111 potential was provided when a single F-111 sortie succeeded in temporarily placing Yen Bai airfield in a non-operational status after 44 A-7/F-4s striking under LORAN* conditions had been unable to inflict any serious damage. This was the only period

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*LORAN—long range aerial navigation.*
in LINEBACKER II during which Yen Bai was considered to be in a non-
operational status.

(S) During the last days of LINEBACKER II, a small number of F-111
sorties were targeted against SAM sites which would be a threat to ensuing
attacks by high altitude B-52s. While some secondary explosions were
reported, the impact of these and other strikes against SAM sites was
not fully known due to the small number of strikes involved and the lack
of complete and accurate information. A sudden reduction in SAM launches
prompted the Strategic Air Command to specifically request F-111 prestrikes.
However, a PACAF analysis did indicate that scheduling F-111 strikes against
airfields and SAM defenses in advance of B-52 strikes should be done with
cautionsince stereotyping of F-111 operations could result in a subse-
quent increase in the threat to these operations.

(S) Storage areas and rail facilities were two other types of tar-
gets struck by F-111s during LINEBACKER II. With a limited number of
sorties, F-111s achieved significant damage against large-area storage
targets and were successful in keeping pressure on the enemy in areas
where significant damage had already been inflicted by other weapons
systems. With regard to rail yards, the F-111 strike effort was light.
Nevertheless, Bomb Damage Assessment (BDA) revealed that damage was
inflicted on all of the F-111 targets, establishing a definite military
impact in addition to the obvious psychological/harassment effect.

(S) In some cases, F-111 sorties were also used to strike pinpoint
targets such as radio communications facilities and bridges. Such strikes
were generally in the target area, but, due to the nature of the targets and unsuitable high drag ordnance, only limited damage was attained. For example, radio communications facilities had a single essential element, the transmitter/receiver control building, generally protected by a concrete blast wall requiring a direct hit to ensure destruction. Guided ordnance, when weather conditions permitted its employment, offered by far the most efficient means of destroying such targets.

(5) During LINEBACKER II operations, enemy reactions against F-111s consisted primarily of moderate AAA firings, with very few pilots reporting accurate fire. Four aircraft were known to have sustained minor battle damage due to ground fire. Also, at least six SAMs were fired at the F-111s, all observed on the first two nights of the operation. Whether or not these AAA or SAM defenses directly caused the loss of F-111 aircraft is not known; however, two F-111s were lost due to unspecified causes during LINEBACKER II operations.

(5) The first LINEBACKER II F-111 loss occurred on the first night of operations, 18 December. The second loss occurred on 22 December. In both instances, last contact was made with the aircraft while it was egressing the target area. On 23 December, the day after the second loss, contact was made with the two crewmembers who were down in an area approximately 53 NM west of Hanoi. Contact with the aircraft commander ceased on 24 December. An attempt to pick up the Weapons System Officer (WSO) on 27 December was unsuccessful due to heavy ground fire. The following day, survival supplies were dropped and the WSO was told to
move west to a less hostile area. Last radio contact was made with him on 29 December. (Both crew members were among the prisoners of war returned from NVN following the Vietnam ceasefire.)

H. (S)(U) Pre-Ceasefire

(S) With the termination of LINERACKER II on 29 December, F-111 strikes again shifted to Route Package I and Laos, where on 3 January 1973 they were first fragged to serve as PATHFINDER for A-7 strikes in BARREL ROLL. During the first two weeks of January, F-111s flew 126 sorties in southern NVN. Then, on 15 January 1973, all U.S. offensive operations and tactical reconnaissance over NVN ceased. For the remainder of the month all F-111 combat sorties were flown in Laos. By the end of January that month's total of F-111 sorties flown in Laos stood at 698.