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PROJECT
CHECO
SOUTHEAST ASIA
REPORT

OV-1/AC-119
HUNTER-KILLER TEAM

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

OV-1/AC-119 HUNTER-KILLER TEAM

10 OCTOBER 1972

HQ PACAF

Directorate of Operations Analysis
CHECO/CORONA HARVEST DIVISION

Prepared by:
Maj Richard R. Sexton
Capt William M. Hodgson
Project CHECO 7th AF, DOAC

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PROJECT CHECO REPORTS

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

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

Project CHECO, an acronym for Contemporary Historical Examination of Current Operations, was established to meet this Air Staff requirement. Managed by Hq PACAF, with elements at Hq 7AF and 7/13AF, 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.

A handwritten signature in cursive script, reading "Robert E. Hiller", is positioned above the typed name.

ROBERT E. HILLER
Director of Operations Analysis
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FOR THE COMMANDER IN CHIEF

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ALFRED A. PICINICH, Lt Colonel, USAF
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The Sting of the Stinger

Frontispiece

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FOREWORD

Hunter-Killer operations were but a logical extension of the resourceful thinking behind the development of gunships as a solution to some of the tactical problems of the unique war in Southeast Asia. It is possible to view the teaming of the AC-119K, "Stinger", and the OV-1, "Mohawk", in complementary roles as a significant effort at increasing the effectiveness of less than ideal resources. Understanding of the origin of this operational expedience rests with the historical development of the gunship itself. The history of the gunship in Southeast Asia is a well documented, continuing effort of Project CHECO.^{1/}

The term, "Hunter-Killer", is not completely accurate, since there was never a formal program. However the term was commonly used in message traffic, and has been used in this report to avoid confusion. The designations Hunter-Killer I and II are inventions of the author referring to two separated periods of interservice cooperation, one in 1970 and the other in 1971.

This report will explore the background of Hunter-Killer, relate the results of operations, and finally, attempt to point out some of the less obvious factors influencing the outcome of the project. Many questions arose during the course of the study. Can Hunter-Killer be judged an overall success, and is the idea worth pursuing in a more direct fashion? If the operation did fall short of success, what factors

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contributed to its failure? In any case, has the concept received an objective evaluation, or is such an evaluation even possible? Finally, what could be done to improve the effectiveness of future operations of this type?

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CHAPTER I

INTRODUCTION AND OVERVIEW

"Puff", the original gunship, underwent combat evaluation beginning in December, 1964.^{2/} This was the first in a series of experiments, the latest (at the time of this writing) involving the Pave Aegis 105mm howitzer configured AC-130.^{3/} There is evidence that initial objectives were as limited as Puff in scope. What was needed was a weapon capable of sustaining enormous fire power on a target with an, until then, unheard degree of precision.

The firepower was supplied by three 7.62mm mini-guns, each capable of delivering ordnance at a maximum rate of 6000 rounds per minute. Target acquisition was entirely visual, and precision was attained through the pilot's use of a fixed reticle gunsight. Precision did not always imply accuracy, since, although the pilot was required to see a target, target identification and verification was difficult in all but ideal conditions.

Puff, however, proved very successful performing its assigned missions which consisted, in the main, of area defense and support of troops in contact (TIC). The gunship was limited to operations in a low threat environment, attacking visually acquired, clearly defined targets. Its slow speed, 3000 foot optimum operating altitude, and predictable pattern of attack (left hand orbit) made it vulnerable to even light antiaircraft artillery (AAA). (The reader is referred to Appendix I for complete specifications on each of the airplanes discussed.)

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Then, too, there were situations in which the gunship's firepower was needed, but conditions of weather or lack of communication made target acquisition virtually impossible. The danger of hitting friendlies was a primary consideration in clearing any gunship attack.^{4/} If the target could not be seen and was not clearly identified, it could not be attacked no matter how lucrative it might have seemed.

Clearly, continued refinement was indicated in the two major areas of weakness; vulnerability, and limited target acquisition capability. As a first order, low cost solution, skillful airplane tactics and judicious choice of engagement environment did much to enhance the survivability of the AC-47. Indeed, the AC-47 has persisted in essentially original form to this writing, and has continued to be an effective weapon.^{5/}

Nevertheless, innovation on the part of a clever enemy progressively limited the scope of AC-47 operations. Pressure was also applied by gunship planners who continually came up with new ways to use the inherent advantages of a gunship, and, in so doing, projected situations for which the AC-47 was not equipped.

In 1967 a second generation gunship, the AC-130A, began evaluation missions in Southeast Asia.^{6/} With its greater power and load carrying capacity it offered several advantages over its predecessor. Heavier armament (four 20mm cannon in addition to four 7.62mm miniguns) permitted higher operating altitudes which reduced the AAA threat. It proved extremely useful for attacking trucks or semi-hardened emplacements.

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Thus, the role of "truck killer" was added to the repertoire of useful functions performed by the gunship.

Possibly a more significant advance was the introduction of a computerized fire control system and electronic target acquisition devices.^{7/} The "Black Crow" ignition detecting sensor afforded intermediate range (up to six miles) detection of motorized vehicles. An infrared sensor provided short range detection with relatively good resolution. A night observation device (NOD) supplemented the infrared detector in the visible range.^{8/} Electronic sensors provided many obvious immediate benefits and expanded the horizon of the gunship innovators. Tactics broadened rapidly to take advantage of the new devices.

Also during 1967 the AC-119G was recommended as a replacement for the AC-47, the rationale being that an increased load carrying capability and performance would be realized for a low cost with the readily available C-119.^{9/} Conversion of the C-119 would have a minimum impact on the airlift mission. Armament was increased slightly to four 7.62mm miniguns, and a computerized fire control system was incorporated, but advanced electronic sensing equipment was limited to a night observation sight (NOS). Nicknamed "Shadow," the AC-119G was first operational in Southeast Asia in December, 1968. Its advantages over the AC-47 were greater ordnance and a slightly greater fire power. No new mission was envisioned for it.

A further experiment in laterally firing gunships involved the AC-119K "Stinger." The C-119K, a modification of the C-119G, had two

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auxiliary J-85 jet engines which burned aviation gasoline. Each jet was rated at 2050 pounds thrust, and lifted the operational gross take-off weight of the Stinger to 80,400 pounds versus the 64,000 gross take-off weight of the Shadow.^{10/} The additional lift was exploited to the fullest to improve target acquisition capability, upgrade the armament, and provide an additional margin of safety. Stinger carried two 20mm cannons along with four 7.62mm miniguns. A forward looking infrared sensor (FLIR) increased observational capability.

The extra equipment thrust Stinger into a multiple-role mission for which the price was paid in continued marginal performance. Potential for killing trucks along with an ability to operate in a moderate flak environment accompanied the 20mm cannon. FLIR provided short range target detection with high reliability. A truck "fixed" by the FLIR was seldom lost. The AC-119K gained a certain preeminence in supporting TICs, and was certainly useful for performing armed reconnaissance (armed recce).^{11/}

In many respects, however, the AC-119K was still first generation. There was no room for much of the second generation electronics found in the more sophisticated AC-130. Stinger had no potential for carrying the heavier weapons which might permit it to operate above an increasingly prevalent and ever more effective flak environment. With its relatively short range sensors, Stinger was restricted in its role of truck-killer to observation of a small section of one road or line of communication (LOC) at a time. A strictly theoretical analysis found Stinger lacking.

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Its justification, an empirical one, rested on the fact that it proved quite effective in both its missions.^{12/} Despite obvious inadequacies the AC-119K performed assigned tasks with resourcefulness, overcoming equipment limitations through operator skill.

For reasons to be discussed in depth, the Army OV-1 "Mohawk" had been assigned night reconnaissance missions in the Barrel Roll region of Laos since May, 1969.^{13/} Two basic models were employed, one relying on an infrared detector, and a second gathering data with a radar based moving target detector. Both IR and radar traces were recorded photographically. The OV-1 IR detector enjoyed many of the same advantages and disadvantages as the IR used on the AC-119K. It provided exhaustive but limited range detection. Radar equipped Mohawks, on the other hand, ostensibly were capable of surveying a broad area covering several lines of communication simultaneously. Moving targets (movers) were detected in an almost real time scheme, the radar trace being photographed and a developed negative produced in less than a minute. A typical mission for a radar equipped plane consisted of patrolling a thirty by thirty mile area, covering the same ground several times in the course of a two hour mission.^{14/} The result was a continuously filmed record of activity within the area, lagging the actual events by about 30 seconds.

A theoretical Hunter-Killer concept envisioned complimentary roles for the radar-equipped OV-1 and the AC-119K gunship. The advantage of long range radar reconnaissance would be added to the target acquisition

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and destruction abilities of the Stinger. It was hoped that such a combination would enhance the effect of each participant.

From April, 1970, to November, 1971, several activities were pursued that tested the Hunter-Killer theory. Results can best be described as mixed. Hunter-Killer operations were alluded to at one point as a highly successful operation.^{15/} In a later analysis it was stated, "... the gunships definitely achieved better results working on their own."^{16/}

Each analysis was accurate in its own context. For although on paper Hunter-Killer was a shrewd tactic capable of reaping excellent results, its implementation under the actual conditions of the war in Laos presented many problems. In addition, objective analysis of the results was difficult if not impossible.

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OV-1 in IR Config

FIGURE 2

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CHAPTER II

BACKGROUND

THE CAPABILITY

OV-1 "Mohawk"

The Grumman Mohawk, introduced in 1959, was originally designed for the Navy as a submarine detection system using IR sensors. Because of limited range the Navy did not pursue the plane after development, and "Spud," as it was christened, was adopted by the Army. Prior to 1972 the Army used the OV-1 in three basic configurations: the OV-1A equipped for visual (VFR) photo reconnaissance; the OV-1B carrying an AN/APS-94 side-looking airborne radar (SLAR); and the OV-1C mounting an AN/ASU-4 infra-red (IR) detector. For all models the crew included a pilot and technical observer seated side by side within a slightly bulbous cockpit. The original concept was that all three models operate together, but only the B and C models were employed in the Hunter-Killer operations described in this report.

The AN/APS-94, a dual channel side-looking radar, measured reflected energy of microwave (radar) pulses returned by terrain features as well as reflective objects upon the terrain. One channel collected data at a slightly later time than the other. Output consisted of two radar traces recorded side by side on a nine and one-half inch film strip. The first trace contained information from channel one while the second trace was the superposition of channels one and two. Any moving object appeared on trace two as a black spot, or smear, depending on the size and speed

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of the mover. (See Figure 3A). The operator, then, was presented with a radar signature of the topography (trace one), and the same radar picture with spots (trace two). Intensity of all but the mover spots could be reduced on trace two.^{17/}

It was the technical observer's (TO) job to read and interpret the radar film after it had gone through a rapid development processor. Such development required about 30 seconds. A certain amount of skill was necessary to interpret the photographs because all objects larger than a bicycle and moving faster than two miles per hour were identified as movers. This might include waterfalls or other objects which would have to be distinguished from valid targets. Occluded features of the terrain reflected nothing to the airplane, and could be identified as blanks on the photographs. With the exception of these "radar shadows" the photo was quite similar to a visual photograph, and prominent geographical features were easily recognized.

Ideally, the SLAR equipped Spud operated at an altitude of 7000 feet AGL. At that altitude the radar trace was the scale of a 1:250000 tactical map. The TO, identifying any black spots on the photo as possible movers, transferred them directly to a topographical map. The coordinates of the target were then read directly from the map. An experienced TO could frequently locate a target in less than two minutes with an accuracy of 100 meters.^{18/}

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SLAR scanned a strip a maximum of 50 kilometers wide out to a maximum range of 90 kilometers; e.g., a band 40 to 90 kilometers distant from the airplane could be examined. A "dead spot" six kilometers wide existed directly below the airplane. Operating at less than maximum specifications resulted in better resolution and faster data analysis. A normal procedure was to cover a strip 25 kilometers wide beginning as close to the airplane as possible. (See Figures 3A and 3B.)

The design parameters were a product of the Army's original plans for the plane. The radar Mohawk was conceived as a device to patrol safely behind a fixed line of contact with the SLAR directed into hostile territory analyzing enemy vehicle movement.^{19/}

The AN/ASU-4, a passive detector, measured the inherent infrared radiation given off by all material objects. The intensity of this radiation was a function of the temperature and composition of each object, and Spud's detector could distinguish between objects with temperature differences of less than one degree. An IR image was both presented to the technical observer on a scope and photographed for permanent record. The information could also be transmitted directly to a ground station via data link.

The OV-1 was introduced into Vietnam with the first Army units for use in its primary role of intelligence collection, although strike aircraft were occasionally able to act on its "near real time" information. On May 20, 1969, the first of two OV-1s from the 131st Aviation Company

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arrived at Udorn at the request of the American Ambassador in Vientiane. Ostensibly, the aircraft were to remain for a 10-day feasibility test. The request had been made at the initiative of the Army Attache (ARMA) in Vientiane, who felt that the Army should make a more visible contribution to operations in Laos. He convinced the Ambassador that the OV-1 could fill a definite need in intelligence collection, and a detachment of four aircraft and 21 men was subsequently authorized to be attached to Hq 7/13th AF.^{20/} A shortage of aircraft resulted in only two OV-1s, one SLAR and one IR, being assigned initially, and, thereafter, the detachment rarely had its full complement of planes. Capt Darryl Billings was appointed ARMA Liaison Officer to coordinate the operations of the detachment.

At the end of the original test period, the Ambassador felt that results warranted an extension for an additional 10 days. Subsequent extensions kept the detachment at Udorn indefinitely, despite persistent efforts to have the resources recalled to Vietnam.

Throughout their stay at Udorn, the Mohawks were plagued by a series of maintenance problems. Equipment and aircraft failures were frequent, and the 432d TRW's base support group lacked the facilities and specialists to do any more than service the Spuds with gas and oil. Minor maintenance and periodic inspections had to be performed at the home base of Phu Bai. When an aircraft could not be flown back to Phu Bai, specialists and equipment had to be flown into Udorn to effect the repairs.

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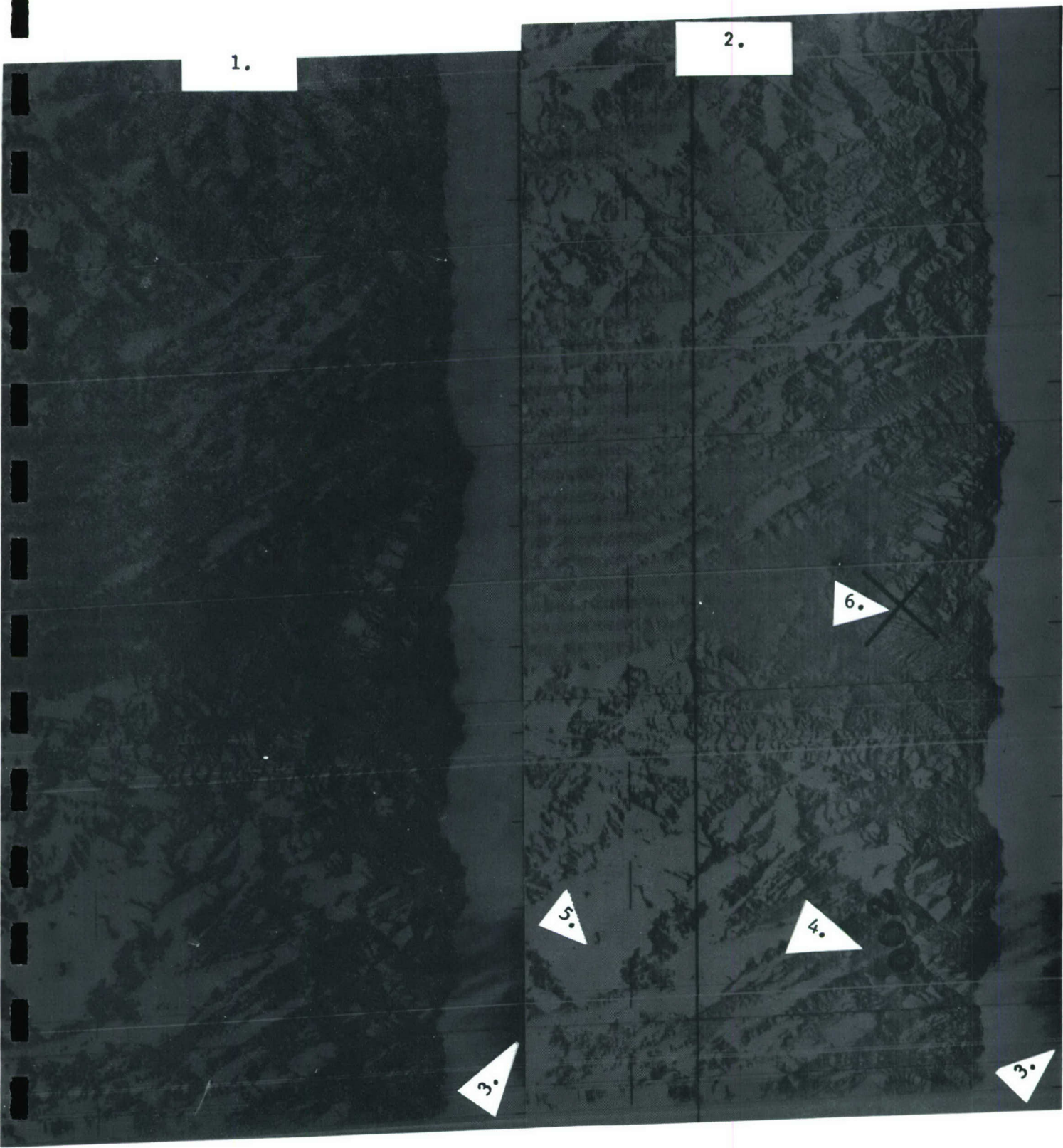
OV-1B "Mohawk"

Note large SLAR boom below fuselage

FIGURE 3

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- SLAR Trace
- | | |
|-----------------------------|----------------------------|
| 1. Channel 1 | 4. Movers (Two) |
| 2. Channel 1 plus Channel 2 | 5. UTM Coordinate UG000300 |
| 3. OV-1 Ground Track | 6. Radar Shadow |

FIGURE 3A

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Despite these problems, the OV-1 did provide much useful information on enemy activities in Barrel Roll. In addition to monitoring traffic, it located truck parks, storage areas, and other installations which could then be confirmed by photo reconnaissance and targeted for strike aircraft.^{21/}

AC-119K "Stinger"

As has been pointed out, the AC-119K assumed an historical role as a compromise replacement for the original AC-47. Based on the Fairchild C-119 "Flying Boxcar," the Stinger weapons system included the airplane, a night observation sight, the AAD-4 forward looking infrared detector (FLIR), beacon homing radar, two 20mm M-61 cannons, four 7.62mm miniguns, and a computerized fire control system.

The normal crew of 10 consisted of a pilot, co-pilot, flight engineer, a table navigator, a FLIR operator (navigator), a NOS operator (navigator), three gunners, and an illuminator operator. The three navigators were each trained in all the navigator positions. If a mission was scheduled for heavy flak environment areas, one or two extra gunners were carried along to look for upcoming AAA. Called Scanners, they hung out the back parachute door watching for the AAA tracer rounds. Upon spotting one they directed the pilot to swerve. There was usually a grace period of three or four seconds in which to elude an accurate round.^{22/}

All armament protruded from the left side of the aircraft, and attack geometry was the standard left-hand orbit about the target. (See figures

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4 and 5.) Stinger proved itself effective both against personnel and vehicles. Normally, the miniguns were used against personnel from 3500 feet AGL while the 20mm cannons were fired at vehicles from an altitude of 7800 feet AGL.^{23/}

A typical armed reconnaissance mission involved the Stinger's flying along a LOC offset to the right about half a kilometer. The FLIR scanned the road for a range of three kilometers at best, slewing slowly through a maximum azimuth of 198 degrees, and a maximum variation of elevation of 95 degrees. Resolution was quite good immediately adjacent to the airplane, but deteriorated markedly as a function of range. (See figure 6.) Since IR radiation (8-14 microns) is absorbed by water molecules in the air, any cloud cover or rain rendered the AAD-4 ineffective. The quality of the IR image could also be compromised by smoke or dust, either of which dispersed the radiation.^{24/} Qualitatively, the FLIR examined a field of view slightly less than that of the human eye, and the data trace was similar to, but not as clear as, a black and white TV image. Depending on atmospheric conditions, operators could observe an object as small as a person running away from a truck. It should be noted that the more advanced AAD-7, used on the AC-130, exceeded the specifications of the AAD-4 in both resolution and range.

Directly complementing the FLIR was the night observation sight (NOS), a device capable of amplifying very low intensity light to a distinguishable level. Moonlight was generally sufficient to make the NOS effective. On

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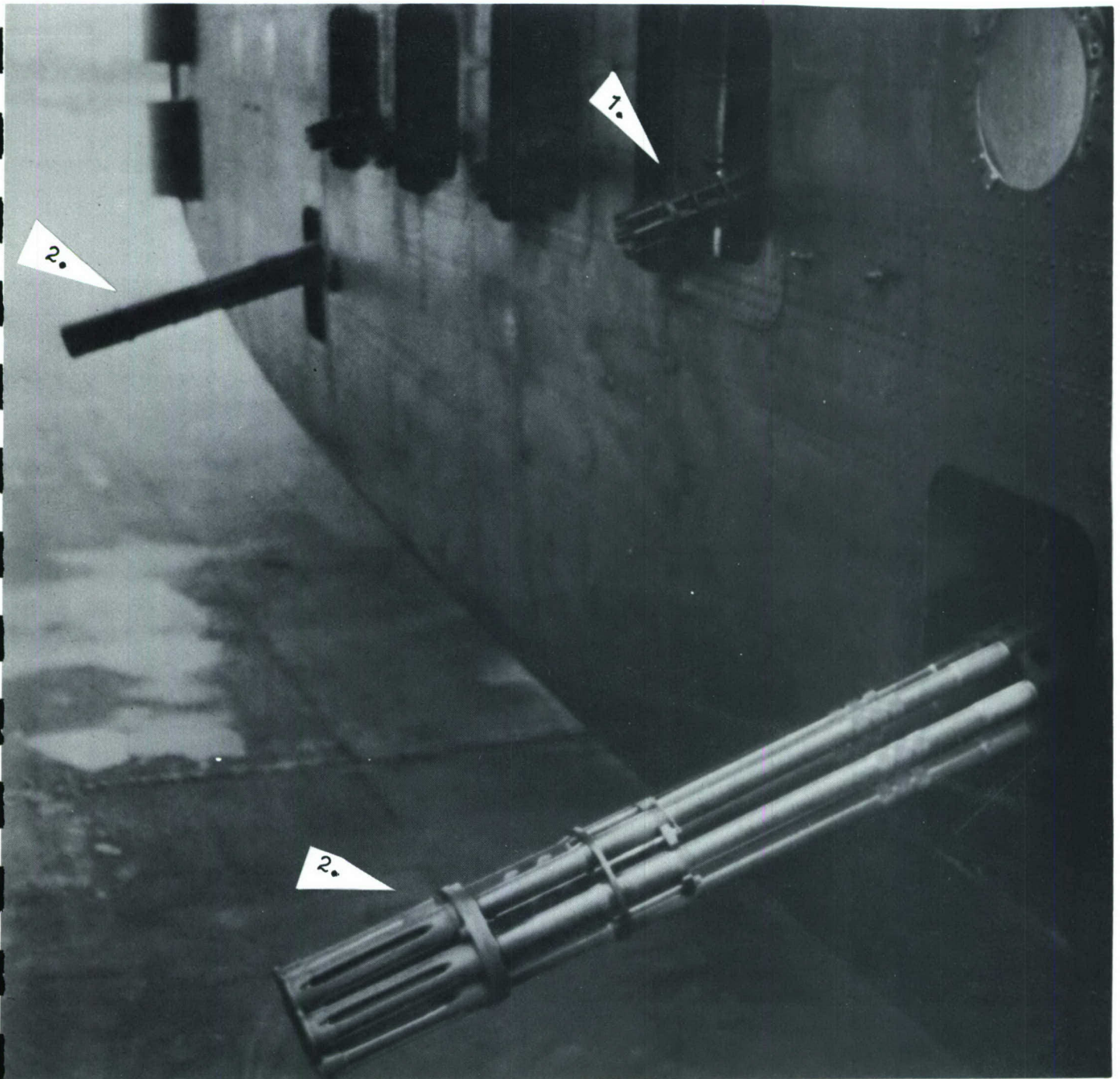
AC-119K "Stinger"

- | | |
|---------|------------------------|
| 1. FLIR | 3. Beacon Homing Radar |
| 2. NOS | 4. Illuminator |

FIGURE 4

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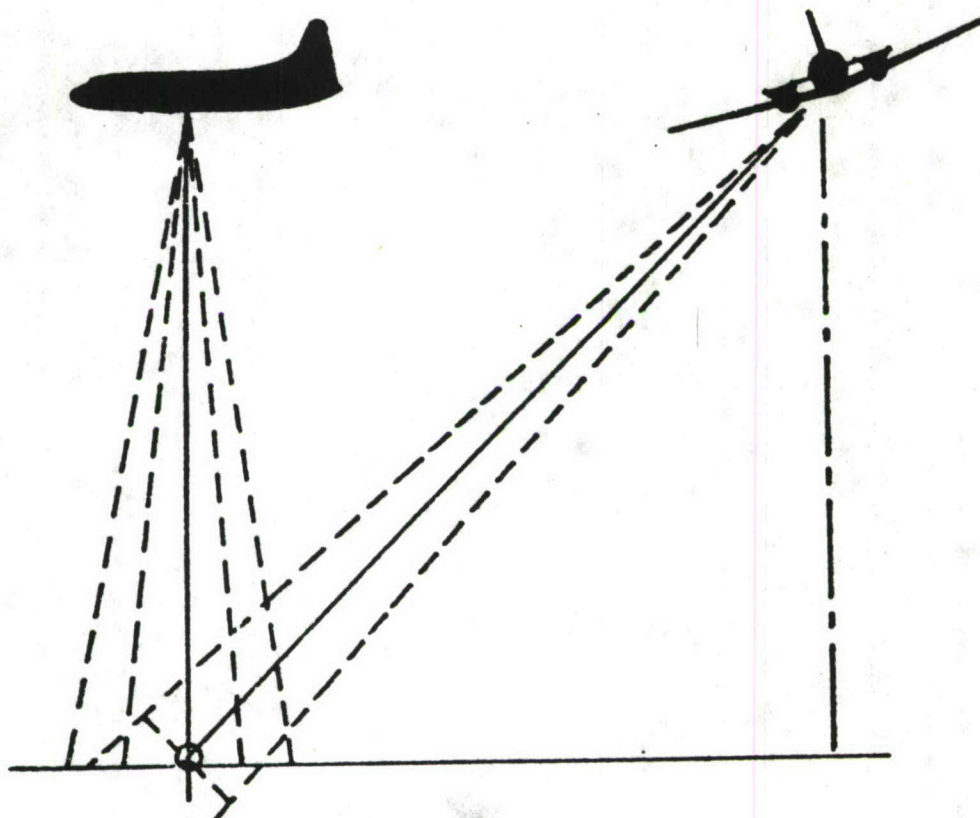
AC-119K Armament

1. MXU-470/A 7.62mm Minigun
2. M-61 20mm Cannon

FIGURE 5

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——— BORESIGHT
- - - FIELD OF VIEW
- - - ALTITUDE

AAD-4 Forward Looking Infrared Sensor

FIGURE 6

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the other hand, on moonless nights the trucks were forced to use their headlights, and there was no way that the headlights could be shielded from NOS detection. With proper filtering the NOS could be made sensitive to either visible (.4-.7 microns) or infrared radiation. Correspondingly, the illuminator, located in the left rear door, could illuminate the terrain below with either visible or infrared radiation. Thus, the passive NOS could be linked to the active illuminator to form a coordinated team.

The illuminator, however, proved a dangerous tool to use for armed reconnaissance, in either the visible or the invisible infrared modes. A visible beacon presented a perfect target to even the least opportunistic gunner, and a resourceful enemy soon had the necessary gear to "see" IR. The high airplane visibility resulting from a lighted illuminator was later exploited by using Stinger as a decoy.^{25/} The illuminator was perhaps most effective in area defense missions where the AAA threat was minimal. A light shown on enemy positions not only marked the target, but reaped an added benefit by capitalizing on a native superstition. Frequently, the enemy would be afraid of the light, and, if illuminated, would not move.

A second reconnaissance tactic, the orbit method, proved the most efficient, although most dangerous, way to cover an assigned area. The technique involved using either the NOS or the FLIR to hold a fixed reference point and, while the airplane orbited around this point, the other sensor would look for targets.^{26/} For variety the sensor roles could be alternated.

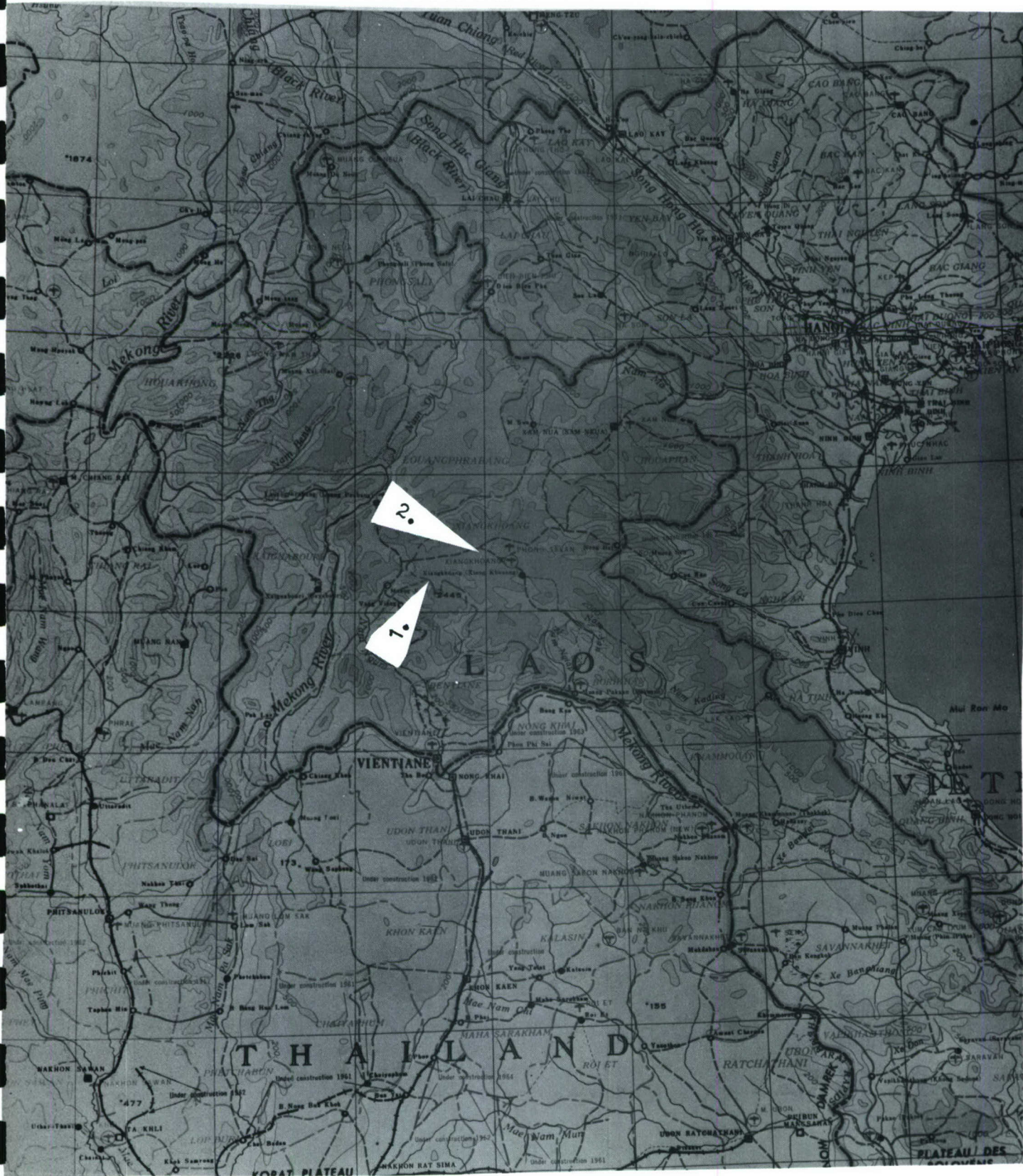
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The APQ-133 beacon homing radar was intended as a fire control device. A transponder, ideally in the possession of a forward air guide (FAG) on the ground, transmitted an x-band signal to the AC-119. PACAF approved a 7AF request to remove the APQ-133 radar in order to provide additional time on target for interdiction missions.^{27/}

Southeast Asia combat testing of the AC-119K was conducted from 3 November 1969 through 28 February 1970 by the 18th SOS at Phan Rang AB, RVN.^{28/} The aircraft were initially distributed between Phan Rang, Phu Cat, and Danang in order to provide best coverage of the Vietnamese conflict.^{29/} On 16 February 1970, three AC-119Ks and 70 personnel were sent to Udorn for a 14-day feasibility test.^{30/} At that time, the ground situation in Barrel Roll had deteriorated seriously, and General Vang Pao was backed up against his main base at Long Tieng. (See figure 7A.) AC-47s and A-1s had been providing the principle night support for the guerrillas, but on 21 January 1970 the A-1 sorties had been reduced from eight to two. Since the situation required continued night support, the AC-119K was selected to replace the A-1 sorties, and, after considerable discussion, it was decided to operate them out of Udorn in order to increase their time on target (TOT).^{31/} As the ground situation continued serious, the detachment was extended, then increased to five gunships, and finally permanently assigned to Udorn. Because Vang Pao's forces remained heavily engaged, the Stingers were used almost exclusively in support of troops-in-contact, and had very little opportunity to exploit their truck killing capability.

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Barrel Roll (Northern Laos)
1. Lima Site 20A (Long Tieng)
2. Plaines des Jarres (PDJ)

FIGURE 7

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5.



SOUTHEAST ASIA

- | | |
|--------------|------------------|
| 1. Phan Rang | 4. Phu Bai |
| 2. Phu Cat | 5. Nakhon Phanom |
| 3. Danang | 6. Udorn |

FIGURE 7A

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Throughout the period, they were also hampered by maintenance problems and equipment malfunctions which limited their effectiveness.^{32/}

THE CONCEPT

By the end of March, 1970, the enemy drive on Long Tieng had been blunted, and friendly forces were able to make limited counter attacks. As the ground situation eased, the gunships were occasionally able to turn to truck traffic, although restrictions of the rules of engagement (ROE) prevented their full employment in a truck killing role. Nevertheless, during the first two weeks of April, seven of 34 sorties did engage trucks, destroying 19 and damaging nine.^{33/}

With the approach of the wet season, the traditional period of offensive operations by the guerrillas, 7AF began to make plans for the best use of its resources. The primary consideration in this plan was the reduction in sortie allocation, a fact that precluded any large-scale offensive such as 1969's "About Face." From a peak of 211 on 19 October 1969, strike sorties were reduced to an average of 122 per day during the week of 15-21 April 1970, and were forecast to drop to 32 per day by June 10.^{34/} The 7/13th AF staffs felt that the best way to utilize these limited resources was through an interdiction and armed reconnaissance program. On 2 April the Air Force began an intensive 10-day program to close two interdiction points (IDP) along Route 7, the principal enemy supply route into the Plaine des Jarres (PDJ). (See figure 8.) A total of 489 sorties were flown against these points using bombs, mines, and area denial munitions

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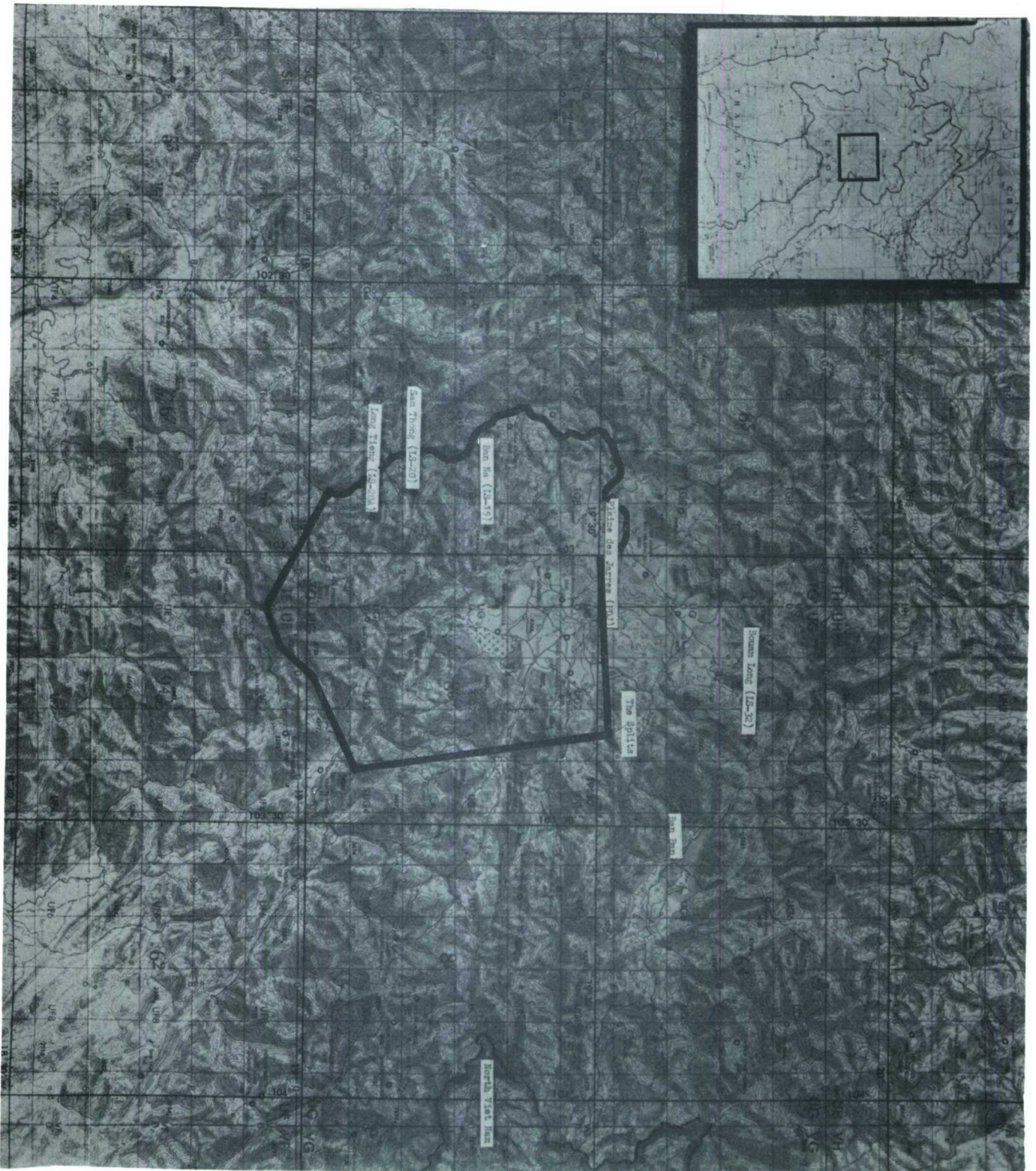
with the result that the road was closed for seven of the 10 days. However, the enemy was able to portage around these points, and truck movement actually increased during the month. Five hundred seventy-four trucks were reported destroyed in March, 742 in April, and 615 in May.^{35/} In addition, the program was consuming sorties at an alarming rate.

At the Barrel Roll Working Group (BRWG) meeting of 15 and 22 April, representatives from 7AF, 7/13AF, Controlled American Source (CAS), and Air Attache, Vientiane (AIRA) discussed proposals, and finally agreed on a five-point package based on 150 sorties per day. This plan called for: increased ground patrols; reduction of gunship diversions to troops in contact (TICs); a twilight hunter-killer team, consisting of an OV-10 equipped with a starlight scope and four A-1s, to operate from 1730 to 1930 each evening; two AC-119Ks to operate between 2000 and 2300; and a continuation of the IDP program on a reduced scale.^{36/}

Against this background the ARMA liaison officer, in conjunction with the OV-1 detachment commander, developed the idea of using the OV-1 and the AC-119K as a hunter-killer team. Since their arrival at Udorn, the OV-1s had been flying nightly missions over the PDJ. Their box-like pattern permitted complete coverage of the Plaine with some overlap on each leg. (See figure 9.) Two complete circuits were made on each mission. When available, the aircraft operated in pairs so that their sensors could complement one another. The IR could not only differentiate between "live" and "dead" trucks, but would also detect camp fires and other heat sources.

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"Raven Box" May, 1970

FIGURE 8

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SLAR Orbit Ground Track
Special Night Operating Area (Black)

FIGURE 9

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It was, however, severely limited by weather or foliage, which would block IR radiation.

The SLAR, on the other hand, was capable of all-weather operation, except in heavy thunderstorms, and could penetrate through foliage. However, it could only detect moving objects; thus, a truck park would go undetected by SLAR, but might be picked on IR. Because there was some overlap on each leg and two circuits were flown, multiple counting sometimes occurred. An experienced photo interpreter could resolve some of the redundancies, but "detections" could not be equated to "movers" or "trucks."

Because the Mohawk normally had a time-over-target of about two hours, and only one or two aircraft were available, continuous night coverage of the LOCs was not possible. As a result, TOTs were varied to determine during which periods the enemy did most of his moving. As in Steel Tiger and South Vietnam, it was soon apparent that most traffic occurred between dusk and 2230 local, peaking at about 2030. Consequently, the OV-1 developed a pattern of taking off just before sunset in order to be in position to monitor this peak period of activity.^{37/}

At the completion of the mission, the film was returned to the ground for photo interpretation. The information was passed by Immediate Photographic Interpretation Report (IPIR) to various intelligence agencies where it was used in studies to determine enemy patterns and develop long range programs. It was somewhat frustrating for the crews, however, to be

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observing enemy activity on their display panel, knowing that if action was not taken immediately, the opportunity would be lost. At the same time, the OV-1 crews could occasionally hear gunships or A-1s operating in the same general area, searching for the same targets. Gradually, the idea of combining the two aircraft into a Hunter-Killer team evolved.

The 1st Cavalry Division had successfully employed a hunter-killer program in Vietnam for some time. Their program used an unarmed helicopter to conduct visual reconnaissance and draw enemy fire. The reconnaissance "hunter" was followed by helicopter gunships and troop carrying helicopters to engage the enemy. The OV-1s had occasionally formed ad hoc hunter-killer teams when strike aircraft or helicopters were diverted to act on information produced by their sensors. These early operations, plus their own personal experience, convinced the ARMA liaison officer and his pilots that the AC-119K, with its proven truck killing ability, could effectively exploit the "near real time" intelligence obtained by the OV-1.

Capt Billings initially approached the AC-119 detachment on an informal basis, but the idea did not meet with much enthusiasm. Neither party really understood the capabilities and limitations of the other's system. After consulting ARMA in Vientiane, Capt Billings decided to make a formal proposal to 7/13AF on 20 April 1970.^{38/} Lt Col Homer F. Fraily, the Deputy Director of Operations, immediately saw the potential of the program. In Steel Tiger (Southern Laos) "Igloo White" air-seeded sensors were already being used to provide intelligence to gunships and other strike aircraft.

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However, a shortage of sensors and the low priority given to Barrel Roll (BR) had prevented any sensor string's being placed in Northern Laos. Col Frailey felt that the Mohawk could be used to provide the same kind of intelligence to the gunships as the Igloo White sensors or road watch teams. A nighttime hunter-killer program would also supplement the twilight program already in progress.

Working together, Col Frailey and Capt Billings were able to develop and win approval for a concept of operations that neither could have achieved by himself. Detailed briefings were arranged for the 7/13th staff, the Airborne Battlefield Command and Control Center (ABCCC), and the AC-119 crews. Air Force crews were shown through the OV-1 (mission requirements of a two-man crew precluded familiarization flights) and had an opportunity to look at the SLAR and IR film. The Army pilots and technical observers were likewise shown through the AC-119, and many of them were able to ride on combat missions to get a first-hand idea of gunship operations. Since all of the units involved were stationed at Udorn, this orientation program was easily accomplished and developed a great deal of enthusiasm.^{39/}

Because everyone realized that techniques and procedures would have to be worked out by trial and error, no formal plan was written before the program was begun on 27 April. If the operation proved to be useful, and if procedures could be developed, the Air Force and the Army each planned to go forward through its own channels to have the program placed on a more formal basis.

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CHAPTER III

EMPLOYMENT

Hunter-Killer I, 27 April-23 May 1970

Initial coordination of times on target for each member of the Hunter-Killer team was achieved in an informal but effective way. The 7/13th Operation section would pass the nightly gunship fragmentary order (frag), normally one aircraft from 2000 to 2130 and a second from 2130 through 2300, to the ARMA liaison section, which then scheduled the Mohawk to arrive in the appropriate area about 15 minutes before the earlier gunship. The single available Mohawk was fragged to coincide with the first gunship because of the expected heavier traffic in that time period. The late gunship acted as its own hunter.

A comparison of the statistics of the two sorties was not attempted for several reasons. Traffic during the earlier period did in fact prove to be heavier, and both gunships responded to TIC requests, their own sensors, and a variety of directives from the ABCCC in addition to Mohawk advisories. The AC-119Ks were simply too flexible, too few, and too much in demand to limit them to any one mission.

Upon detecting a target, the OV-1 passed the information to "Alleycat," the night ABCCC in Barrel Roll. Provided that the gunship was not otherwise engaged, and that validation of the target could be obtained within a reasonable length of time, Alleycat relayed the information to the gunship. Stinger then proceeded to the advertised area and attempted to "fix" the

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target with its FLIR or NOS. Normally, Mohawk had continued on with its intelligence gathering mission well before Stinger arrived at the sight of the mover. Occasionally, though, if a target appeared particularly lucrative, Mohawk would maintain a fix on it until the gunship appeared in the vicinity.^{40/}

The program immediately encountered a number of serious problems, and the results, while significant, were less than had been hoped for. This created a certain amount of disillusionment but the general feeling among the operators was that the problems could either be overcome or tolerated.

Maintenance of the OV-1 was a primary problem. Between 27 April and 23 May eight missions were lost due to SLAR malfunctions. The difficulty arose in trying to conduct the entire program with a single aircraft, without complete maintenance support, removed from its main support base. An ARMA liaison study concluded that: "This problem could be reduced if not eliminated by assigning a second SLAR ship to the Udorn detachment. One ship cannot operate seven days a week without a break for maintenance."^{41/} The only result of this message was the fragging to Steel Tiger after 27 May of one SLAR aircraft from Phu Bai. A second OV-1B was not deployed to Udorn until well into the wet season, after the Hunter-Killer program had been temporarily shelved.

The Stingers were also confronted with maintenance difficulties, experiencing the problems normally associated with operating a 20-year-old airframe. As a result, the Udorn Forward Operating Location (FOL) of

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three aircraft was hard pressed to meet its fraged requirement of two sorties per night. Even though no missions were canceled due to maintenance causes, frequent in-flight malfunctions of armament or avionics equipment limited their effectiveness.^{42/}

Weather was another problem to be dealt with during Hunter-Killer I. April and May were transitional months between the wet and dry seasons in the Barrel Roll area, and weather conditions began to deteriorate during that period. Although the SLAR could detect movers in moderately difficult weather, moisture in the air precluded the Stinger's finding the movers with its FLIR. Consequently, an additional six missions were lost due to poor weather. Thus, 14 of 27 days were lost due to difficulties with maintenance and weather, and only 13 of 26 gunship sorties flown on the remaining 13 days actually worked with the OV-1s.

The most serious problem, however, involved the Rules of Engagement, a set of rules designed for entirely different operations, and unsuited to exploiting real time intelligence in night interdiction. In August, 1969, after several accidental bombings (Short Rounds) of friendly positions, areas known as "Raven Boxes" were established around principle positions.^{43/} Within these areas all visual air strikes during the day had to be under the control of a Forward Air Controller (Raven FAC), and, at night, under the control of a Forward Air Guide (FAG), an English-speaking Laotian ground observer trained to direct USAF air strikes. All other targets had to be reviewed and validated by the American Embassy in Vientiane on an individual

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basis. It was not until September, 1971, that modifications to these rules were made to exploit the advantages offered by a gunship sortie. ^{44/}

Initially, two Raven Boxes were established, one around Long Tieng (Lima Site 20A), and the other around Bouam Long (LS 32). (See figure 8.) In 1969, as Maj Gen Vang Pao executed his highly successful operation "About Face," the box around Long Tieng was gradually expanded until it merged with the one around Bouam Long. The composite at one time extended nearly to the North Vietnamese border. Then, in early 1970, as the guerrillas gradually fell back, the box progressively shrunk until, during the period of Hunter-Killer I, it encompassed the area shown in figure 8. Unfortunately, this box included much of the route structure along the principle lines of communication into the Plaine des Jarres, the area of greatest interest to the Hunter-Killer team.

Within the Raven Box all nighttime detections, whether by SLAR or gunship, had to be reported to Alleycat. Alleycat would relay the prospective target position to the Embassy where it would be plotted, evaluated, and, in almost every case, validated. Due to the danger of hitting friendly forces, however, validation was given only to strike a specific target at the coordinates where it was originally reported. In the case of moving trucks, the principle target of Hunter-Killer, the target could have moved several miles by the time validation was received by Alleycat and passed to the gunship. Such a target was no longer "valid," and a new request had to be made. This procedure severely limited Hunter-Killer operations,

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and was a continual source of frustration for Stinger, Mohawk, and Alleycat crews alike.^{45/} On the other hand, no record was found of any request for a modification of the ROE. Presumably it was decided to await the outcome of the operation, and then submit a "package" if the concept was deemed feasible.

A second problem with the ROE stemmed from 7th AF Operation Order (OPORD) 538-69 which established TICs as first priority targets for the AC-119K. This position was strongly supported by CAS and the Embassy. Some Air Force planners had serious reservations, contending that, except for serious TICs, the limited air resources could be more profitably employed against targets or LOCs.*

While everyone involved in operation Hunter-Killer agreed that, due to the peculiar nature of the war in Barrel Roll, first priority had to be given to serious TICs, it soon became apparent that the enemy was engaged in a good deal of spoofing to draw aircraft away from the LOCs. During periods of truck activity the enemy would launch numerous small attacks by fire (ABFs), knowing that the gunship would have to react to these diversions. Often these ABFs consisted of a single shiper's fire or a few rockets, artillery, or mortar rounds lobbed into friendly positions.^{46/}

*U.S. Strategic Bombing Survey of WW II had concluded that disruption of Germany's transportation system had been the most effective phase of the Combined Bomber Offensive. However, the report also concluded that no single target system had been decisive by itself, and that final results were achieved only through the cumulative effect of repeated bombings of all target systems.

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Despite all of these handicaps, the operation did achieve significant, if limited, results. Prior to Hunter-Killer, between 1 April and 26 April, there were 40 trucks destroyed and 28 trucks damaged in the PDJ. During Hunter-Killer I, 27 April through 23 May, 47 trucks were destroyed and 28 damaged by gunships operating independently. In the same period an additional 31 trucks were destroyed and 17 damaged as a direct result of OV-1, AC-119K cooperative effort.^{47/} Superficial examination reveals a statistical "proof" that Hunter-Killer produces a 70 percent increase in gunship effectiveness. Such an analysis is, of course, artificial, since some of the team effort kills might well have been located without SLAR assistance. On the other side of the ledger, had more SLAR ships been available there might have been even more trucks detected.

Meanwhile, the twilight hunter-killer team composed of the OV-10 and the A-1 had encountered difficulties of its own, and was discontinued on 10 May. A 56th Special Operations Wing report concluded:^{48/}

If the objective is truck kills, then results are negligible. If the objective is harassment and keeping movers off the road then the program is successful. Problems pertain to twilight visibility. Before actual darkness the scope (the Night Observation Device on the OV-10) is ineffective and the naked eye extremely limited. After darkness the scope provides workable visibility. Continuance of the program should depend on the objective. If the program is to continue recommend that Intel on fixed targets in area be provided and recommend that time period at area be approx 1145Z to 1300Z for best use of resources. For more specific info refer to 23 TASS Pilot critiques of first five missions previously forwarded to 7/13th AF. If this program is continued without reduction in other commitments the 23 TASS resources will be overtaxed.

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Similarly, the AC-119K, OV-1 team could hardly be called a success in terms of halting enemy truck traffic during the period of Hunter-Killer I. The 123 trucks destroyed or damaged represented only 18 percent of the 678 trucks sighted during the period. However, they did represent 53 percent of the 232 trucks destroyed or damaged by all means, and these results had been achieved with only two gunships whose primary mission was TIC support and whose operations had been limited by adverse weather, unusual maintenance problems, and unfavorable ROE. Of these gunship successes, 40 percent were achieved in the 13 sorties in which gunships worked with OV-1s.

It is perhaps interesting but not completely valid to compare Barrel Roll statistics with those for Steel Tiger. During the same 27-day period, 27 April through 23 May, 5,215 vehicles were detected in Steel Tiger of which 1,368 or 26 percent were destroyed or damaged.^{49/} Many of these detections were made with air-seeded "Igloo White" sensors.^{50/}

The successes of Hunter-Killer I must be attributed, in large part, to four factors. Most important was the initiative shown by Col Frailey and Capt Billings, the organizers. Their rapport and mutual confidence provided an unusually good example of inter-service cooperation, enabling them to overcome many obstacles.

A second factor was the coordination and familiarity that existed between Mohawk, Alleycat, and the gunship crews. During the evaluation month each of these mission elements was stationed at Udorn, RTAB, and

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the crews took advantage of the opportunity to hash over coordination problems face to face.

The third factor was the experience level of each of the participating crews. The gunships had been operating in the PDJ continually since February, and had become highly skilled by 27 April. Then, too, the Mohawk crews had almost six months experience, and had techniques well sorted out.

Finally, the enemy had little experience in coping with the Stinger, and lacked the counter-measures necessary to mitigate its effect. AC-47s and an occasional AC-119G had been operating in the Barrel Roll for some time, but these were equipped only with 7.62mm miniguns, and were not particularly effective against trucks. The AC-119K, on the other hand, proved to be a devastating truck killer with its 20mm cannon and improved sensors. At first, the enemy depended entirely on spoofing to draw the gunships away from the LOCs, and made no effort to disguise or otherwise protect his trucks. By the time Hunter-Killer was tried for a second time in September, 1971, the enemy had learned his lesson well, and had developed fairly effective counter-measures against the gunship.

After considering all of these factors, both 7/13th AF and ARMA liaison concluded that the concept held considerable potential, and warranted a more formal program. Unfortunately, as so often happens in war, the men were overtaken by events, and on 24 May a realignment of gunship resources effectively killed the operation. As indicated earlier, Operation Hunter-Killer was an ad hoc arrangement which had no definite conceptual framework

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or formal plan. This was at once its greatest strength and greatest weakness. While it permitted maximum flexibility in developing procedures and tactics, it also meant that the program never had a formal place in the air campaign and never developed into a definite concept of operations. At the critical moment it was too dependent upon individuals who did not control the overall air operation.

Through the spring of 1970 both 7th AF and 7/13th AF were engaged in a number of experimental programs with constantly shifting emphasis. Because they were forced to respond to enemy initiatives with fewer and fewer resources, a comprehensive campaign plan was never developed. Strike sorties in Barrel Roll averaged 120 per day in April, were cut to 73 in May, and went down to 43 in June. Against this steadily decreasing airpower there was a constant demand for support and no lessening of overall objectives. Ground action continued at a relatively high level. In Barrel Roll, unlike Steel Tiger, enemy truck traffic continued well into the wet season.^{51/} At the regular Barrel Roll Working Group Meetings at Tan Son Nhut new proposals were constantly advanced to shift resources to this or that program. Without a comprehensive campaign plan, resources tended to go to whoever was the most persuasive at that moment.

On 24 May, and for the remainder of the wet season, the early gunship was fragged to armed reconnaissance in the Special Operating Areas (SOAs) east of Ban Ban as part of a renewed interdiction point program.^{52/} Intentions were to use this gunship to attack trucks backed up behind the

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IDP and to harass road repair crews. This program was unpopular with the gunship crews because of the heavier AAA encountered in the SOAs compared to the PDJ.

The late gunship continued to work TICs in the PDJ. Spud, whose primary mission was collecting intelligence on traffic in the PDJ area, continued to fly early in the evening, the period of peak traffic. Thus, the Hunter-Killer program was stillborn just as it had completed its gestation period, and just as 7/13th was preparing to put forward a formal proposal.

The Interregnum, 24 May 1970-18 September 1971

At the 1 June BRWG conference at Tan Son Nhut, 7/13th AF belatedly briefed its OV-1, AC-119K Hunter-Killer proposal to Maj Gen Hardin, the 7th AF Director of Operations. This proposal recommended that the AC-119K FOL at Udorn be increased from three to five aircraft in order to cover both the PDJ and the SOAs east of Ban Ban. It also recommended changes in the ROE to permit direct coordination between the OV-1 and AC-119.

The proposal went on to state: ^{53/}

Gunships working the PDJ would work in conjunction with OV-1 SLAR which has proven extremely successful. Four aircraft would be fragged to insure a total of six hours coverage and, supplemented with A-1 aircraft at twilight and dawn, would give good coverage. Action is presently being taken to acquire one more OV-1 SLAR aircraft which, if we had more AC-119s, would greatly increase capabilities. Not only has the AC-119 proven itself as the number 1 truck killer in the Barrel Roll, it has also aided in our successful IDP program by harassing enemy road repair crews.

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When no action was taken on this proposal, Maj Gen Kirkendall, Deputy Commander for 7/13th AF, threw his weight behind the proposal with a personal message to Gen Hardin on 14 June in which he stated: ^{54/}

The AC-119 has been the number one truck killer in Barrel Roll accounting for 70% of all trucks destroyed and damaged in May. This high rate can be attributed partly to the OV-1 SLAR/AC-119 Hunter-Killer operation. To pursue this capability further we have already initiated action to obtain an additional OV-1 to expand coverage both geographically and timewise.

The only result of these proposals was a supplement to the monthly frag which authorized Alleycat to coordinate the operations of the gunships and the OV-1s. However, since validation authority was retained by the Embassy, and since gunships were not available to work with the OV-1, it was a meaningless gesture. Undaunted by these setbacks, 7/13th AF (or Col Frailey) put forward a modified proposal which it (he) hoped would satisfy everyone. This was probably the most comprehensive proposal ever put forth on behalf of the Hunter-Killer concept. It stated: ^{55/}

At its inception the OV-1 and AC-119 were fragged for a nightly Hunter-Killer role with outstanding results. Since the reduction of AC-119 resources the early Stinger has been fragged with escort to work the Route 7/61 area while the unescorted late AC-119 has been working in the PDJ area. This change in operational concept has reduced our truck kill capability and is supported in documented BDA on a prorata basis. In view of the above recommend the following:

A. For a ten-day period frag the early AC-119 to work the PDJ with the Army OV-1. The Spud aircraft will take off approximately fifteen minutes

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prior to the AC-119, locate and follow the movers until arrival of the AC-119. This will allow maximum utilization of the short on-station time of the AC-119, particularly when they begin operating from NKP.

B. If escort aircraft are available frag the late AC-119 to work Route 7/61 or areas as required.

C. At the end of the first ten-day period frag the early AC-119 to work Route 7 and the late AC-119 to work the PDJ with the OV-1. At the end of the twenty-day period we will conduct an analysis to determine best concept and forward for your consideration.

Our rationale for the above is as follows:

A. The OV-1/AC-119 combination provides the capability to destroy only moving vehicles as opposed to dead trucks.

B. A persistent PDJ truck killing program will greatly hinder the enemy transportation base which will be difficult to replace with the closure of Route 7 west of Ban Ban. I.E. SC900.

C. From 1 May to 21 June the OV-1 detected 390 moving vehicles in the PDJ and 183 on Route 7 east of Ban Ban. Recommend the above program be implemented soon.

General Hardin referred the proposal to his staff which, on 27 June, recommended that no change in the existing arrangement be made at that time. This action effectively killed the Hunter-Killer program for the remainder of the wet season.

The Mohawks went back to their primary mission of collecting intelligence for long-range studies, while the AC-119 provided valuable support to Maj Gen Vang Pao during Operation Leap Frog (2 through 23 August) and Counterpunch II (31 August through 23 October). But if Operation Hunter-Killer

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was dead, interdiction was not. Despite the restrictive rules under which they operated, the Air Force destroyed or damaged 299 trucks out of 806 detected and the majority of these were victims of the AC-119K Stinger.^{56/} What results could have been achieved by a more aggressive interdiction program and a continuation of the Hunter-Killer operation must remain a matter of conjecture. Occasionally, gunships were able to act on Mohawk advisories, but not on any systematic basis that would permit an evaluation of the statistics.

Nevertheless, the program had generated some high level interest, and the Air Force Chief of Staff (CSAF) queried PACAF for details.^{57/} On 8 August, 7th AF replied:^{58/}

1. (C) *Coordination between OV-1 and AC-119K's is based on both types of aircraft's operating simultaneously in the same area. The use of complementary systems results in effective use of firepower in the area.*
2. (S) *Procedurally, the OV-1 searches the target area prior to the arrival of the AC-119K. The SLAR OV-1 rapidly develops and plots movers and advises the gunship. This allows discrimination between active trucks and derelicts, thus reducing the probability of wasting ordnance or flying into a flak trap. OV-1 operations have produced valuable intelligence data for both real time attacks and long range targeting. Although presently operating as a Hunter for the AC-119K, potential exists for teaming with other strike aircraft.*

This reply would have been valid 10 weeks earlier, but at the time it was written, it was in error since the operation had been terminated on 24 May.

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The Ambassador in Vientiane maintained a persistent interest in the program, and sought to protect the assets necessary for Hunter-Killer operations.^{59/} General Kirkendall also hoped to see the program revived, and in his End of Tour Report he stated (somewhat incorrectly):^{60/}

(S) A highly successful combination of the OV-1 and the AC-119 for hunting and killing trucks was fashioned in April. The Army's OV-1, equipped with side-looking airborne radar (SLAR) and infrared (IR) target detection devices, was used to patrol areas searching for trucks. When one or more trucks were discovered, a call was made for an AC-119 to deliver its lethal stream of automatic weapons fire. In the period 27 April to 19 May, 31 trucks were destroyed and 17 were damaged by this Hunter-Killer team, an increase of over 60% above normal truck destroyed/damaged rates.

(S) As the rainy season progressed, the effectiveness of the Hunter-Killer teams declined. This was due mainly to the reduced number of trucks moving. The reduced opportunity to exercise the system also resulted in lowered crew effectiveness as the two aircraft had fewer opportunities to work together. The return of the dry season should again allow the OV-1/AC-119 combination to resume its effective, truck killing role.

Again, however, events were to work out otherwise.

With the arrival of the dry season the Air Force decided to throw the preponderance of its effort into Steel Tiger in an attempt to stem the flow of supplies into South Vietnam and permit the continued withdrawal of American ground forces. As part of this plan, strike sorties for Barrel Roll were reduced to 24 per day, and, on 15 October, the AC-119s were moved from Udorn to Nakhon Phanom (NKP) where they could strike

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either Barrel Roll or Steel Tiger. The enemy took advantage of this reduced airpower in BR, and moved to the attack as soon as the roads dried out enough to permit resupply. By February Vang Pao was once again backed up against Long Tieng and all available sorties had to be used to halt the enemy's advance.

As enemy pressure eased towards the end of February, attention again turned to interdiction, just as it had a year earlier. However, virtually everyone who had been connected with the original Hunter-Killer program had departed from Southeast Asia, taking with them their knowledge of Hunter-Killer operations. Capt Billings, the ARMA liaison officer, did remain and did bring up the subject from time to time, but inspired very little interest on the part of the Air Force.^{61/} In addition, Vang Pao, CAS, and the Embassy had been thoroughly shaken by the events in February and wanted every airplane flying directly over the troops. Even when there were no TICs the mere presence of aircraft, the sound of their engines, was reassuring to the ground forces. This arrangement was very unpopular with both the aircrews and 7/13th AF. A compromise was achieved on 15 March when 7/13th AF proposed a package that called for five AC-119s to provide all-night coverage of the PDJ. If they were not needed for TICs, Alleycat could release them for armed reconnaissance, as long as they stayed on a "tether" within 25 nautical miles of Channel 108 Tacan and used only 20mm against trucks, reserving their 7.62mm for TICs.^{62/}

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Actually, 7th AF planners had already gone farther than this proposal in 7th AF Oplan 730 (Southwest Monsoon Campaign) issued on 5 May 1971. This plan stated that: "This season, with enemy activity anticipated to be high, priority will be LOCs, trucks, and storage areas in that order." The plan also modified the ROE so that the ABCCC could validate fleeting targets while the Embassy retained validation authority for fixed targets.^{63/} In practice, this rather ambitious plan was never implemented and a typical daily frag called for four AC-119Ks in BR with target priorities: (1) TICs; (2) troop concentrations; (3) armed reconnaissance.^{64/} Also, the Embassy retained validation authority on all targets within the Raven Box. AIRA attempted to resolve this problem by suggesting that AC-119s be fragged for TICs and troop concentration points, adding two AC-130s for armed reconnaissance.

Hunter-Killer II, 19 September through 19 November 1971

The Hunter-Killer situation remained unchanged through the summer of 1971. The gunships performed their mission unassisted, and Spud continued to patrol the lines of communication in Eastern Laos. Vang Pao controlled the south and west rims of the PDJ, and, in addition, held most of the Plaine itself. The enemy was entrenched on the northern and eastern rims immediately above Vang Pao's position. (See figure 9.)^{65/}

Through the wet season neither the AC-119s nor the OV-1s had detected significant truck traffic. However, about mid-September, the roads began drying out and observers expected the traditional migration westward of

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North Vietnamese Army (NVA) men and supplies. They knew that main force units had spent the wet season in North Vietnam awaiting the next dry season.

During this period nightly OV-1 reports were being presented at the daily staff briefing at 7/13th AF. Following months of insignificant data it was reported on the morning of 19 September that Spud 24, a SLAR bird, had detected 36 movers the previous evening. This information elicited from Maj Gen DeWitt Searles a simple but emphatic response: "Get with 7th AF and get something on it."^{66/} Thus, the Hunter-Killer concept was reborn.

Although the Intelligence Directorate had been receiving and analyzing the OV-1 advisories to this point, the Operations Directorate immediately recognized Hunter-Killer as an operational exercise, and assumed responsibility for coordinating all efforts from then on. Because nothing had ever been written down of previous experiences with the Hunter-Killer concept, the sum of accumulated knowledge consisted of rumors and second-hand hear-say. Nevertheless, the problem was attacked in a systematic fashion, and it was decided to make every effort to conduct an objective evaluation.^{67/}

Capt Billings was the lone remaining team member from the first Hunter-Killer operation. A detachment of the 131st Military Intelligence Company, stationed at Udorn, operated two OV-1C IR aircraft and one OV-1B SLAR equipped plane through the wet season of 1971.^{68/} This number fluctuated as aircraft were rotated back and forth to their main support base at Phu

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Bai for maintenance. One IR bird, call sign Phantom Hawk 22, and one SLAR bird, Phantom Hawk 24, were fragged to the Barrel Roll together each evening between 1900 and 2100, approximately.^{69/} One flight per night was easily maintained by the two IR planes, but accomplishing a one per night frag rate with the one SLAR aircraft proved more difficult. Phantom Hawk 24 suffered from small problems such as developer malfunction.^{70/}

Early in 1971 the AC-119K main support base (MSB) had been Phang Rang with forward operating locations at Nakhon Phanom (NKP) and DaNang. On 25 July the long anticipated move of the MSB to NKP was made. DaNang for a time was the only FOL until, on 1 October, a second FOL was established at Long Thanh North (nine miles east of Tan Son Nhut). Stinger distribution was five at NKP, three at DaNang, and one at Long Thanh North. Commitments in Barrel Roll (including Hunter-Killer) required three AC-119K flights per night, and the five aircraft at NKP were having difficulties meeting that rate. Because NKP had become the main support base its allotment of five aircraft included those undergoing IRAN (inspection and repair as necessary) and corrosion control.^{71/}

On 1 October gunship frags into Barrel Roll were the three above mentioned Stingers plus two AC-130 Spectres. Col Charles F. Loyd, the Director of Operations for 7/13th AF suggested that, because of Stinger's difficulties in meeting the frag rate, 7th AF either: (1) relocate two AC-119s to NKP to meet the current frag rate; (2) reduce their frag to two per night substituting an additional AC-130; or (3) increase NKP's allotment of AC-119s

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to eight or nine so that Stingers could handle the entire five sorties required.^{72/} Apparently the last alternative was adopted by 7th Air Force because Col Loyd noted on 16 October that no more AC-130 gunships were being fragged into Barrel Roll, and that AC-119Ks were flying five sorties per night.^{73/}

Operational environment in the Plaine des Jarres had changed in a number of ways compared to the spring of 1970. For one thing, the weather was more favorable in late September, and continued to improve throughout the evaluation period with the exception of the week of 24 through 29 October when Typhoon "Hester" effectively shut down gunship operations.^{74/}

Temperate weather offered both advantages and disadvantages for friendly air activities. Target acquisition was much easier in the absence of rain, but good weather meant better conditions on the ground also. As the roads dried out the enemy was able to reactivate his AAA forces which, in turn, provided protection for his trucks. On the nights of 5, 8, and 13 November, gunships (AC-119s) were driven off their targets by heavy and accurate gunfire.^{75/} On 23 September a Mohawk returned to base because of a Mig threat, and on another occasion, 3 October, both the gunship and the OV-1 returned to base for the same reason.^{76/} The environment had definitely become more hostile.

Early in the test period at least one of the two nightly AC-130s was directed to respond when possible to the OV-1 advisories. At the request of the Air Attache, Vientiane, first priority for all gunships in BR was

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always TICs, but Spectre, being the most effective truck killer was invariably the last ship diverted to TICs.^{77/} Consequently, in the early going the AC-130 provided the "Killer" part of the team and responded to 35 of 45 advisories received from the OV-1.^{78/} Unfortunately, the Spectres were able to find only eight movers in response to their advisories while finding 26 movers on their own.^{79/} The eight movers found were a result of only three of the 35 OV-1 advisories.

In late September and the first part of October the Stingers were occupied, for the most part, with providing cover for TICs. Because the friendlies under Vang Pao were out-manned and out-gunned they again required the reassuring presence of a gunship overhead in even the lightest engagements.^{80/} Again this arrangement was not always popular with the Stinger crews who were fond of using every opportunity to prove their truck killing capability.^{81/} Seventh AF was under a great deal of pressure to provide this continuous on-call TIC coverage, and felt compelled to reaffirm a Barrel Roll gunship priority list ranking TIC coverage first, enemy troop concentrations second, and armed reconnaissance last.^{82/}

It was not until 16 October that any overt cooperation between Spud and the AC-119s was noted. Successes of the OV-1/AC-119 team between mid-October and 19 November were no more numerous than of the Spectre/Spud team had been previously. The Stingers received 33 OV-1 advisories, investigated nine of them, and found, as a direct result, three movers.^{83/}

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On 23 Nov 1971, in the face of such mediocre results, Col Loyd made the following recommendation in which Maj Gen Searles concurred: ^{84/}

Recommend that the gunships continue to work independently of OV-1 aircraft due to the limited effectiveness of the OV-1 advisories. Because of the marginal effectiveness of this program, suggest the OV-1s be fragged for other areas where their capabilities may be better utilized.

This signaled the end of Hunter-Killer operations to this writing. Hunter-Killer II had proven a cumbersome concept yielding results that were not worth the effort. On the other hand, Hunter-Killer I had been adjudged by some very knowledgeable experts as a complete success. Both analyses were well supported and suggest that more than the statistics should be presented.

Coordination was even more difficult during the second evaluation. The OV-1s and the ABCCC were stationed at Udorn, the Stingers at Nakhon Phanom, and the Spectres at Ubon. The many small problems in coordination which had been solved through face to face conversation in Hunter-Killer I remained unresolved during the fall of 1971. According to Capt Wylon Fulk, an AC-130 aircraft commander with the 16th Special Operations Squadron (SOS) at Ubon: ^{85/}

The operation was never coordinated well enough to keep air traffic separation in a blacked out situation. Spud would just not talk to us. Alleycat would notify us that Spud was in the area, and then Spud would fly wherever he chose without advising us of his position. He seemed to operate at an altitude slightly below ours, and we were very much afraid of hitting him with our guns or running into him.

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The chain of coordination for air operations over Laos was tenuous at best. It involved aircraft based in Thailand, under the control of a command center in Vietnam (7th AF), responding to the requirements of a Meo ground commander (Maj Gen Vang Pao), who in turn was advised by and responsive to CAS, which was directed by the American Ambassador to Laos, who made known his air requirements to 7/13th AF (a nonoperational command), which then requested the air assets from 7th AF. Hunter-Killer operations introduced the added complication of coordinating with an organization (131st Military Intelligence Co. Detachment) receiving its operational frag from Army Attache, Vientiane, who in turn was responding to American Embassy requirements for broad intelligence coverage of Laos. Headquarters 7/13th AF had risen to the challenge in 1970, but, having suffered a 46 percent cutback in manning on 1 July 1971, could no longer spare the managerial talent needed to make Hunter-Killer effective.^{86/} There remained the question of whether such a small part of the overall effort was even worth the headaches involved.

Technically speaking, the OV-1 extended the detection capability of the AC-130 very little, and fell far short of Spectre in navigational gear. AC-130 crewmen correctly assumed that no one could navigate more accurately than they with equipment precise to eight UTM coordinate digits, and tended to distrust the accuracy of the cruder six digit precision of the OV-1.^{87/} Again Capt Fulk on the reliability of Mohawk target advisories:^{88/}

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I was involved in investigating about a dozen advisories, and never found a truck. At times we were fragged to be in an area shortly after Spud so that we would have the opportunity to investigate some fairly fresh (about five minutes old) advisories. I think his (Spud's) navigation was too inexact. He appeared not to know exactly where he was.

Conversely, the Mohawk detachment was committed to more of a general area type navigation, and did not see the necessity for complete precision in locating targets. According to Capt Chip Adam, Commander of the 131st Military Intelligence Co. Detachment: ^{89/}

Our responsibility was to locate the movers within a couple of square klics (kilometers), and note the direction of movement. Spectre could then go to that area and find the targets. Exact precision was a waste of time because the target was moving anyway.

There was evidently some disagreement as to the definition of a viable target.

The Spectre suffered none of the short range detector limitation inherent in Stinger. Qualitatively the Black Crow ignition sensing detector could detect to a maximum slant range of 10 miles, the AAD-7 side looking infrared detector picked up emissions to about seven miles slant range, and the Low Light Level TV (LLLTv) could "see" to five mile slant ranges. ^{90/} Inclement weather and haze made its sensors less effective, but it could fire through weather with the aid of its beacon seeking APQ-150 radar. SLAR, then, had an edge only for foul weather reconnaissance, a quality recognized and requested in other areas of the war. ^{91/}

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The discrepancy between SLAR identified movers and AC-130 detections was perplexing to all concerned and gave rise to much speculative reasoning. Lt Col John J. Garrity, Jr., Director of Current Intelligence, Hq 7/13th AF expressed the view that the movers were indeed up there (PDJ), but were not being detected by Spectre for a variety of reasons. Col Garrity stated that the enemy did not have to employ very sophisticated tactics to avoid contact with the AC-130s. For example, the enemy knew that air coverage of the PDJ was particularly sparse during the hours just after sunset and just before dawn. He knew that Raven FACs had to be back on base before dark, and that without the Ravens, the fast movers could not expend their ordnance.^{92/} The night gunships were never on station during daylight hours.^{93/} The enemy might easily have taken advantage of these lulls in air activity, adjusting his "on-the-road" time appropriately.

By the dry season of 1971-1972 the enemy had become more familiar with gunships, and had developed antidotes that, in many cases, vitiated the effects of the sophisticated sensors. A simple camouflage was often sufficient protection against LLLTV or NOS, and a canopy of foliage absorbed much of a truck's IR emissions. Electronic shielding of a truck's ignition system was a simple counter-measure against Black Crow, a fact discussed in the popular literature.^{94/} These methods could have been implemented and would have been most effective had the enemy known the time on target and locations of the gunships, i.e. if the element of surprise was lacking.

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In-the-clear communications had long been recognized by some as a compromising factor in the effectiveness of many of the gunship missions.^{95/} Hunter-Killer operations required extensive communications between Spud, Alleycat, and the gunship, much of which was conducted in the clear.^{96/}

It was conceivable that the enemy simply monitored the conversations necessary to conduct Hunter-Killer, and then got off the roads when air cover was imminent. Stated more succinctly: "One of the biggest mistakes we are making is the great amount of in the clear communication being carried on. . . .

The enemy knows what we've done, what we are going to do, where we have been and where we are going."^{97/} The OV-1 did not have a secure transmitting capability compatible with the Air Force, and the other parties concerned were reluctant to use theirs. Alleycat was particularly fond of conducting its business in the clear.^{98/}

Crew training and experience was another consideration deemed important by many. At the conclusion of Hunter-Killer I the U.S. Army Attache, Vientiane, outlined recommendations for OV-1 detachment experience "necessary to continue to produce excellent intelligence." It stated: "Experience indicates that a thirty to sixty day period is necessary to achieve proficiency in support of the Barrel Roll Operation." The letter went on to recommend that personnel be retained for at least six months within the Udorn detachment, that imagery interpretation technicians have a 30-day overlap, and that the commander and the executive not rotate within 60 days of each other.^{99/}

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The imagery interpreter (T0) was a particularly sensitive position because interpretations had to be made and exact coordinates assigned within a short time. If the pilot flew the plane at other than a precisely appropriate altitude and speed the scale of the imagery would not coincide with that of the map, and, in addition, might vary within the same picture. An adequate T0 had to be very familiar with the country being "recced."^{100/}

The few officers assigned to the Udorn detachment were occupied with much more than their operational duties. Much of their time and effort was taken in negotiating support agreements with the various Air Force agencies on base, and administering to the many other problems associated with running a detachment far from its MSB. It often took newly arrived commanders several weeks before they were able to devote much time to the problems of producing "excellent intelligence."^{101/}

During Hunter-Killer II the OV-1 detachment at Udorn was in organizational fluctuation. From 10 June 1971 to 19 September 1971, the detachment was part of the 131st Aviation Company, Capt Warren W. Spencer commanding. On 19 September the unit became a detachment of the 225th Aviation Company and Capt Terry L. Warford was assigned as commander and chief pilot.^{102/} In addition, the Udorn assignment was considered a welcome respite from the more dangerous duties in other parts of Southeast Asia, with the result that the enlisted people, including the T0, were rotated every six weeks.^{103/} Thus the "Hunter's" experience was minimal during a very critical time period.

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One difficulty encountered during Hunter-Killer I, that of coping with unfavorable rules of engagement, was overcome for the second evaluation period. On 22 September the Air Attache, Vientiane, established a special night operating area within a Raven Box. Special rules for this area allowed armed reconnaissance by gunships without a Forward Air Guide's (FAG) exercising control over the strikes. (See figure 9 for the Special Night Operating Area and the SLAR track.)

Although the Hunter-Killer teams involving the OV-1 and gunships had been terminated by 7/13th AF on 19 November, and the suggestion made that the OV-1s be fragged elsewhere other than PDJ, interest in the reconnaissance capability of the Spud remained.^{104/} The Ambassador considered them vital,^{105/} and so informed the Southeast Asia Commander in late September.

The OV-1B SLAR aircraft which flies for ARMA nightly from Udorn RTAFB is the only vehicle detection sensor routinely operating at night in the PDJ area. USAF engage movers located by the SLAR ship, usually within fifteen minutes of detection. . . . ARMA/AIRA consider SLAR coverage in the PDJ absolutely vital to assess NVA activity and intentions in Laos.

Just after 7/13th AF's final analysis of the Hunter-Killer operation there arose some agitation to increase the Army aviation contingent at Udorn by six to eight helicopter gunships. These gunships were to be financed through Deputy Chief, Joint U.S. Military Advisory Group, Thailand (DEPCHJUSMAGTHAI), ostensibly for use as armed escorts for medevac helicopters in Laos. In a series of messages between Commander in Chief, Pacific (CINCPAC) and the Secretary of Defense a requirement for helicopter gunships

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was justified first on their being used as medevac escorts, and secondly that they would enable Army advisors to reach besieged Lao outposts and save them. ^{106/} The net result, in any case, was to provide an Army air strike force to complement its reconnaissance capability.

The OV-1s continued to fly missions in Barrel Roll providing intelligence data to the American Ambassador, Laos, and whoever else had a need for it. Just as the Hunter-Killer concept was rediscovered in the fall of 1971, it is not unreasonable to assume that in another year, when another group of men are learning the lessons of the war in Laos, Hunter-Killer will again be rediscovered.

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CHAPTER IV

SUMMARY AND CONCLUSIONS

In retrospect, the activities ascribed to the title OV-1/AC-119 Hunter-Killer included two widely spaced periods of concerted effort and various uncatalogued instances of spontaneous cooperation. Aircraft participating were the AC-119 Stinger, the OV-1 Mohawk, the AC-130 Spectre, and the (C-130) Alleycat. Results inspired initial optimism and final disillusionment.

Put in proper perspective, Hunter-Killer was a small part of the air support over Northern Laos (Barrel Roll), an area that occupied low priority in the war in Southeast Asia. The operation, however, did suffer from and graphically illustrate some of the problems plaguing the conduct of the war as a whole.

As can be said of most SEA operations, a major obstacle to the success of Hunter-Killer was the lack of continuity imposed by the 12-month tour concept. Ideas, difficult to grasp initially, had to be relearned by each new regime of personnel. This necessarily kept operational finesse at a rather low level, one incompatible with the success of Hunter-Killer. In lieu of the benefits of accumulated experience the U.S. Command in many cases substituted ingenious, though expensive, technology. Thus, the AC-130 was the more popular weapon system for performing tasks attempted by the AC-119K and the OV-1.

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The AC-119/OV-1 team was effective in the spring of 1970, and could have been again under favorable conditions. For success the team required an active, aggressive organizational effort and adequate crew training. There is evidence that OV-1 advisories were possibly inaccurate during Hunter-Killer II, and that the resulting lack of confidence made subsequent accurate advisories less effective.

During the course of the operation it was established several times that the OV-1 could not provide FAC-type control of air strikes. This was a point brought out by the ARMA liaison officer in the early going, but largely forgotten in subsequent reorganizations.^{107/} There were some important qualifications to OV-1 detections. For example, the IR detections were originally intended to be verified by VFR reconnaissance and were many times inadequate as gunship advisories.^{108/} The SLAR advisories, frequently given as "broad-brush" intelligence, were received as coordinates to "pin point" accuracy. SLAR intelligence did not compare either in precision or consistency with the Igloo White advisories. Gunship crews were very familiar with the quality of the Igloo White data, which may have contributed to expectations that could not be fulfilled by the SLAR advisories.^{109/}

Both the Stingers and the Spectres were too successful on their own to accept the inadequacies of the less than professionally organized Hunter-Killer II. The program, an orphan, needed adoption by some dominant organization or personality. The chain of control was too tortuous to respond to the needs of Hunter-Killer.

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Direct AC-130, OV-1 cooperation was, at best, an expensive redundancy. The advantages of an additional intelligence source were more than offset by the loss of an element of surprise because of the second plane and the increase in in-the-clear communications. The target detection capability of the AC-130, though dearly bought, was second to none.

On the other hand, the OV-1/AC-119 team had a place in the overall scheme of Southeast Asia strategy. The team could operate in situations where low priority precluded the immense expense of Igloo White sensors and more sophisticated weapons systems. Hunter-Killer was an attempt to beat the North Vietnamese at their own game--using readily available, inexpensive items to fashion a formidable weapon.

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APPENDIX I

AIRCRAFT SPECIFICATIONS

1. Aircraft	AC-119K Stinger
Mission	TICs/Armed Recce/Interdiction
Armament	4X7.62mm Mini-guns Fast: 6000 Rds/Min Slow: 3000 Rds/Min 2X20mm Cannon 2500 Rds/Min
Aarmor	2000 Lbs
Ordinance	31500 Rds 7.62mm 4500 Rds 20mm
Fire Control	Computerized FCS, Incorporating fully-auto, auto, manual firing, off-set capable
Target Acquisition	Night Observation Sight (NOS) Infrared (AAD-4) Side Looking Radar (APQ-133)
Illumination	Illuminator 1.5 million candlepower pencil beam (20-kw). 24 flares dispensed from launcher.
Altitude	3500 Ft AGL (Optimum for miniguns) 5500 Ft AGL (Optimum for 20mm cannon)
Reaction Airspeed	180K+TAS
Fuel Duration	5+00
Turnaround	30 Min
Aircrew	2 Pilots; 3 Navigators, Table Nav, NOS Opr, Radar/ IR Opr; 1 Illuminator Opr; 3 Gunners; 1 Flight Engineer
One Engine Out	500 FPM Climb

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II. Aircraft	AC-130E Spectre
Mission	Armed Recce/Interdiction/TICs
Armament	2X20mm Cannon 2500 Rds/Min 2X40mm Bofors Guns
Armor	5000 Lbs
Fire Control	Computerized FCS, incorporating fully-auto, semi-auto, offset capable
Target Acquisition	LLTV Infrared (AAD-7) Side looking radar Ignition detection
Illumination	Illuminator 1.5 million candlepower with 20-40 DFG variable beam (20Kw) and IR filter capability. 24 flares dispensed from launcher.
Reaction Airspeed	200K TAS
Operating Altitude	5500 Ft AGL (Optimum for 20mm cannon) 9500 Ft AGL (Optimum for 40mm)
Fuel Duration	6+30
Turnaround	1+30
Aircrew	2 Pilots; 5 Navigators, Fire Control Officer, Black Crow Opr, Table Nav, IR Opr, LLLTV Opr; Illuminator Opr; Flight Engineer; 5 Gunners.
One Engine Out	400 FPM Climb
III. Aircraft	OV-1 Mohawk
Mission	VFR, IR, and SLAR Reconnaissance
Target Acquisition	IR (OV-1C) Side Looking Radar (OV-1B) Belly and nose pan VFR (OV-1A, OV-1D)
Operating Altitude	7000 Ft AGL (Optimum SLAR) 2000 Ft AGL (Optimum IR)

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Airspeed	200+K TAS
Fuel Duration	3+30
Aircrew	1 Pilot; 1 Technical Observer (TO)

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FOOTNOTES

FOREWORD

1. (S) CHECO Report, Hq PACAF, "First Test and Combat Use of FC-47," 8 Dec 65. (Hereafter cited as "FC-47.")
- (S) CHECO Report, Hq PACAF, "AC-47 Operations," 14 July 66.
- (S) CHECO Report, Hq PACAF, "The Role of USAF Gunships in SEA," 30 August 1969. (Hereafter cited as "USAF Gunships in SEA.")
- (S) CHECO Report, Hq PACAF, "Fixed Wing Gunships in SEA," 30 Nov 71. (Hereafter cited as "Fixed Wing Gunships.")
- (S) CHECO Report, Hq PACAF, "Air War in Northern Laos, April-Nov, 1970," 15 Jan 71.
- (S) CHECO Report, Hq PACAF, "Air War in Northern Laos, 1 Nov 70-1 April 71," 3 May 71.

CHAPTER I

2. (S) FC-47, p. 1.
3. (S) CHECO Report, Hq PACAF, "PAVE AEGIS Weapon System," in draft.
4. (S) USAF Gunships in SEA, pp. 11-12.
5. (S) Fixed Wing Gunships, p. 17.
6. (S) USAF Gunships in SEA, p. 2.
7. (S) Ibid., p. 42.
8. (S) Interview, topic: AC-130, with 16th SOS personnel including Capt Charles Seifert, AC-130 AC and 16th SOS Historian, by Capt William M. Hodgson, 24 June 72. (Hereafter cited as "16th SOS Interview.")
9. (S) USAF Gunships in SEA, p. 4.
10. (S) Interview topic: AC-119K, with 18th SOS personnel including Capt J. D. Millar, AC-119K co-pilot and 18th SOS Historian, by Capt William M. Hodgson, 15 June 72. (Hereafter cited as "18th SOS Interview.")

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11. (S) Ibid., specifically Capt Burt O'Neill, 18th SOS Navigator.
12. (S) Ibid.
 - (S) Fixed Wing Gunships, p. 30.
13. (S) Interview, topic: OV-1 Operations, with Capt Chip Adam, Commander Udorn Detachment of the 131st Military Intelligence Company, by Capt William M. Hodgson, 14 June 72. (Hereafter cited as "Capt Adam Interview.")
14. (S) Ibid.
15. (S) End of Tour Report, Hq 7th AF, Maj Gen James F. Kirkendall, 14 Oct 70.
16. (S) Letter; from DO 7/13th AF to Deputy for 7/13th AF. Subject: Final Report of Gunship/OV-1 Activities, 23 Nov 71. (Hereafter cited as "7/13th AF Final Report.")

CHAPTER II

17. (S) Capt Adam Interview
18. (S) Ibid.
 - (S) Briefing; by Capt Darryl R. Billings, ARMA Liaison Officer, Udorn RTAB, to AC-119K crew members. Subject: SLAR. 13 Dec 1970. (Hereafter cited as "SLAR Briefing.")
19. (S) Ibid.
20. (S) CHECO Report, Hq PACAF, "Air Support of Counter-Insurgency in Laos, July 1968-November 1969," 10 Nov 69, pp. 70-75.
21. (S) Ibid.
22. (S) 18th SOS Interview.
23. (S) Tactics Manual, AC-119K, 15 June 1972. This "Tactics Manual" is a collection of publications and message accumulated by the 18th SOS, NKP.
24. (S) 18th SOS Interview.

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25. (S) Ibid.
26. (S) Technical Manual, AAD-4 IR Sensor. Texas Instruments Inc. Undated.
27. (S) Message 270850Z, Nov 71; from 7th AF to 56th SOW, Subject: Removal of APQ-133 Antennas from AC-119K Aircraft.
28. (S) Combat King, Intro and Eval of the AC-119K Gunship, CHECO micro-films S-279 (063-077) and S-364 (030-044), Undated. (Hereafter cited as "Combat King.")
29. (S) Ibid., p. 59.
30. (S) Letter; from 7th AF DOC to 7th AF TACD, 24 Feb 70. Subject: AC-119K Temporary FOL.
31. (S) Ibid.
32. (S) Combat King, pp. 100-136.
33. (S) Message 251415Z April 70; from 7/13th AF to 7th AF, Subject: AC-119 Gunships. (Hereafter cited as "7/13th Msg, 25 April 70.")
34. (S) Report; 7th AF (DOA), Subject: "Air Interdiction in SEA, 15 April-15 June 1970"; August 70, pp. 11 and 16.
35. (S) Hq USAF (DCS, Plans and Operations), "Trends Indicators and Analysis," Dec 70, pp. 2-11.
36. (S) Msg 7/13th AF, 25 April 70.
37. (S) Interview, topic: Hunter-Killer, with Capt Darryl R. Billings, ARMA Liaison Officer, by Maj Richard Sexton, 24 Sep 71. (Hereafter cited as Capt Billings Interview.)
38. (S) Ibid.
39. (S) Ibid.

CHAPTER III

40. (S) Capt Adam Interview
41. (C) ARMA Liaison Report, "Operation H-K," June 1970. (Hereafter cited as "Operation H-K.")

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42. (S) Combat King, pp. 110-130.
43. (S) Interview, topic: Barrel Roll Operations, with Lt Col John J. Garrity, Jr., Director of Current Intelligence, Hq 7/13th AF, by Capt William M. Hodgson, 15 July 1972. (Hereafter cited as "Col Garrity Interview.")
44. (S) Message 220400Z Spe 71; from USAIRA, Vientiane to 7th AF; Subject: Special Night Operating Area Military Region II.
45. (S) Capt Billings Interview.
46. (S) Operation H-K.
47. (S) Ibid.
48. (S) Message 100400Z May 70; from 56th SOW to 7/13th AF; Subject: OV-10 Utilization.
49. (S) T.I.A., 7th AF, Dec 70, pp. 2-8 to 2-12.
50. (S) 18th SOS Interview.
51. (S) Message 091134Z June 70; from 7/13th AF to 7th AF; Subject: AC-119 Gunships. (Hereafter cited as "7/13th Gunship Msg, 9 June 70.")
52. (S) Message 250345Z June 70; from 7/13th AF to 7th AF; Subject: AC-119 Utilization.
53. (S) 7/13th AF Gunship Msg, 9 June 1970.
54. (S) Message 141101Z June 70; from General Kirkendall to General Hardin; Subject: AC-119 Utilization.
55. (S) Message 250345Z June 70; from 7/13th AF to 7th AF; Subject: AC-119 Utilization.
56. (S) T.I.A., 7th AF, Dec 1970, pp. 2-11 and 2-12.
57. (S) Message 312308Z July 70; from PACAF to 7th AF; Subject: OV-1/AC-119 Operations.
58. (S/ Spec) Message 080340Z Aug 70; from 7th AF to CSAF/AFXPD; Subject: OV-1 Mohawk.

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- 59. (S) Message 170500Z Aug 70; from Amembassy, Vientiane, to COMUSMACV; Subject: OV-1 Aircraft Support to U.S. Mission, Laos.
- 60. (S/ NF) End of Tour Report, 7th AF, Maj Gen James Kirkendall, 9 October 1970, pp. 19-20.
- 61. (C) Insum, ARMA Liaison Office, Udorn RTAB, 4 June-10 June 71.
- 62. (S) Message 150735Z Mar 71; from 7/13th AF to 7th AF; Subject: AC-119 Utilization in Barrel Roll.
- 63. (TS) 7th AF OPLAN 730, Southwest Monsoon Campaign Plan, 5 May 71. Material extracted is Secret.
- 64. (S) Letter; 23 July 71, from DO 7/13th AF to Deputy for 7/13th AF, Subject: OV-1/AC-119 Hunter-Killer.
- 65. (S) Col Garrity Interview.
- 66. (S) Personal Diary, Maj Richard Sexton, Project CHECO, 19 Sep 71.
- 67. (S) Memo; undated but approx. last week of Sep 71, from 7/13th AF (CD) to 7/13th AF (DO).
- 68. (S) End of Tour Report, 7th AF, Maj Gen Andrew J. Evans, Jr.; 30 June 71, p. 19.
- 69. (S) Message 191056Z Oct 71; from 7/13th AF to 56th SOW; Subject: Daily Coordination Report.
- 71. (S) Letter; from 7/13th AF (DO) to 7/13th AF (CD); Subject: AC-119K Performance in the Barrel Roll for the First Quarter Fiscal 72; Undated but sometime in Oct 71.
- 72. (S) Ibid., paragraph 7.
- 73. (S) Letter; 16 Oct 71, from DO, 7/13th AF to Deputy for 7/13th AF; Subject: Weekly Summary of Gunship/OV-1 Activities.
- 74. (S) Letter; 31 Oct 71, from DO, 7/13th AF to Deputy for 7/13th AF; Subject: Weekly Summary of Gunship/OV-1 Activities.
- 75. (S) Letter; 26 Nov 71, from DOM, 7/13th AF to Deputy for 7/13th AF; Subject: Barrel Roll Gunships driven off target by AAA.
- 76. (S) Letter; 15 Oct 71, from DO, 7/13th AF to Deputy for 7/13th AF; Subject: Gunship/OV-1 Activities.

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- 77. (S) Letter; 23 July 71, from DO, 7/13th AF to Deputy for 7/13th AF; Subject: Gunship/OV-1 Activities.
- 78. (S) 7/13th AF Final Report.
- 79. (S) Ibid.
- 80. (S) Col Garrity Interview.
- 81. (S) 18th SOS Interview.
 - (S) Message 210316Z Feb 71; from 14th SOW to 18th SOS; Subject: TIC Support.
- 82. (S) Message 240045Z Feb 71; from 7th AF to Amembassy, Vientiane; Subject: Response to Request for AC-119 Gunship Coverage of TICs.
- 83. (S) 7/13th AF Final Report.
 - (S) Message 141101Z June 70; from 7/13th AF to 7th AF; Subject: AC-119 Gunships.
- 84. (S) 7/13th AF Final Report.
- 85. (S) Interview; topic: AC-130/OV-1 Operations, with Capt Waylon Fulk, Chief, Gunship Branch, Hq 7/13th AF, by Capt William M. Hodgson, 13 July 1972. (Hereafter cited as "Capt Fulk Interview.")
- 86. (S) End of Tour Report, 7th AF, Maj Gen Andrew J. Evans, Jr., 30 June 1971, p. 1.
- 87. (S) 16th SOS Interview.
- 88. (S) Capt Fulk Interview.
- 89. (S) Capt Adam Interview. Capt Adam did not participate in Hunter-Killer II, but had been involved in Hunter-Killer efforts in the Steel Tiger region of Laos.
- 90. (S) AAD-7 Technical Manual, undated, Texas Instruments Inc.
 - (S) "Conventional Airmunitions Guide for USAF Air Liaison Officers and Forward Air Controllers," 7th AF Publ. 136-2, 25 March 71.
 - (S) 16th SOS Interview.

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91. (S) Letter; 23 Jan 71, from 7th AF (DOP) to MACJ211; Subject: OV-1 SLAR Coverage. The letter notes Maj Gen Hardin's request for SLAR coverage of the exit routes out of Steel Tiger because of inclement weather.
92. (S) Col Garrity Interview.
93. (S) Ibid.
94. (U) Aviation Week and Space Technology, Vol 94, Number 19, May 10, 1971, p. 76. Subject: "Advanced Sensors Spur Gunship Success."
95. (S) Letter; 18 Oct 70, from 7th AF (DOX) to 7th AF; Subject: 432nd TRW Opord 70-3.
96. (S) Capt Fulk Interview.
97. (S) Ibid.
98. (S) Ibid.
(S) Minutes of Barrel Roll Working Group (BRWG) meeting, 27 June 72.
99. (S) Letter; 23 June 70, from Lt Col Edgar W. Duskin, ARMA, Vientiane to Udorn Detachment, 131st Aviation Co. Subject unstated.
100. (S) Capt Adam Interview.
101. (S) Ibid.
102. (S) Administrative Files, ARMA Liaison Office, Udorn RTAB, 15 July 1972.
103. (S) Capt Adam Interview.
104. (S) 7/13th AF Final Report.
105. (S) Message 250030Z Sep 71; from JANAF, Vientiane to COMUSMACV; Subject: Evaluation of Use of Aerial Platforms in Laos.
106. (S) Message 012310Z Dec 71; from CINCPAC to SECDEF; Subject: Helicopter Gunships for Laos.
(S) Message 220147Z Dec 71; from CINCPAC to SECDEF; Subject: Helicopter Gunships for Laos.

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CHAPTER IV

- 107. (S) SLAR Briefing.
- 108. (S) Ibid.
- 109. (S) 18th SOS Interview.

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GLOSSARY

AAA	Antiaircraft Artillery
ABCCC	Airborne Battlefield Command and Control Center, an HC-130 equipped with a control capsule, flying over Laos
AC	Aircraft Commander
AGL	Above Ground Level
AIRA	U.S. Air Attache, in this case at Vientiane
ARMA	U.S. Army Attache, Vientiane
armed recce	Armed reconnaissance conducted by a gunship
Barrel Roll (BR)	The area of Northern Laos
Black Crow (BC)	A Lockheed ignition detecting sensor
CAS	Controlled American Source
CHECO	Contemporary Historical Examination of Current Operations
CINCPAC	Commander-in-Chief, Pacific Command
Clik	Military jargon widely accepted as an abbreviation for Kilometer
COMUSMACV	Commander, U.S. Military Assistance Command, Vietnam
CSAF	Chief of Staff, USAF
DEPCHJUSMAGTHAI	Deputy Chief, Joint U.S. Advisory Group, Thailand
DO	Director of Operations
FAC	Forward Air Controller
FAG	Forward Air Guide
FLIR	Forward Looking Infrared
FOL	Forward Operating Location
frag	Section or fragment of an Operations Order giving airplane, target, ordnance used and time over target
IDP	Interdiction Point
IGLOO WHITE	A surveillance system consisting of air delivered sensors, relay aircraft, and an infiltration surveillance center.
IPER	Immediate Photographic Evaluation Report
IR	Infrared radiation (1 to 12 microns)
IRAN	Inspect and Repair as Necessary
JANAF	Joint Army-Navy-Air Force
LOC	Line(s) of Communication
Medevac	Medical Evacuation
movers	Moving enemy vehicles
MSB	Main Support Base

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NKP	Nakhon Phanom RTAB
NOD	Night Observation Device
NOS	Night Observation Sight
PAVE AEGIS	The 105mm howitzer equipped AC-130 Gunship
ROE	Rules of Engagement
RTAB	Royal Thai Air Base
SEA	Southeast Asia
SECDEF	Secretary of Defense
short rounds	Rounds of ammunition or bombs which fell short of the target. The term was also used to mean the inadvertent or accidental delivery of ordnance with resultant death or injury to friendly forces or non-combatants.
SLAR	Side-Looking Airborne Radar
Spud	OV-1 Mohawk
Stinger	AC-119K Gunship
SOA	Special Operating Area
SOS	Special Operations Squadron
SOW	Special Operations Wing
Steel Tiger (SL)	Southern or panhandle Laos
TACAN	Tactical Air Navigation (radio air navigation system)
TASS	Tactical Air Support Squadron
TIC	Troops in Contact
TO	Technical Observer
TOT	Time Over Target; Time On Target
TRW	Tactical Reconnaissance Wing
UTM	Universal Transverse Mercator (map projection)

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