VOLUME V

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NA-68-72

COPY NO.

(U) INTEGRATED PROGRAM FOR AIR BASE DEFENSE

VOLUME V (U) DEFENSE SYSTEMS ELEMENTS

WILLIAM HILL, JR.
RONALD G. KNIGHT
HAROLD G. STANLEY
et al

North American Rockwell Corporation

CONTRACT NO. AF33615-68-C-1112

16 MAY 1968

Deputy for Limited War
Aeronautical Systems Division
Air Force Systems Command
Wright-Patterson Air Force Base, Ohio 45433

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Deputy for Limited War
Aeronautical Systems Division
Air Force Systems Command
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FOREWORD

(U) The Integrated Program for Air Base Defense was sponsored by the Deputy for Limited War, Aeronautical Systems Division, Air Force Systems Command, Wright-Patterson Air Force Base, and was performed under Contract No. F33615-68-C-1112. The Air Force Program Manager was Mr. John V. Balch, ASJP.

(U) The contractor was the North American Rockwell Corporation (NR), Aerospace and Systems Group, Los Angeles Division, located at International Airport, Los Angeles, California. The NR Program Manager was Mr. Allan P. Jacoby, Operations Analysis and Systems Requirements, Advanced Systems Engineering of the Research and Engineering Department. A considerable contribution to the program was provided by the Autonetics Division of North American Rockwell. This engineering effort was under the leadership of Mr. Peter A. Harper, Control Systems, Advanced Systems of the Technology Department of Information and Life Sciences Systems Engineering, Autonetics. Assistance was also received from the engineering consulting firm of Ken O'Brien and Associates (KOA), Long Beach, California. The KOA work, primarily in the fields of air base design and construction, was directed by Mr. Pasquale Gallo.

(U) The technical effort described in this report was performed between 16 October 1967 and 16 May 1968. The complete report consists of six volumes as follows:

Volume I - Summary
Volume II - Base Survey
Volume III - Evaluation Methods
Volume IV - Base Defense Effectiveness Assessment
Volume V - Defense Systems Elements
Volume VI - Base Defense Program

(U) This volume of the final report (volume V) contains the results of efforts expended in identification and evaluation of equipments and techniques that could be employed within the next 5 years (1968-1972) to improve air base defense. Candidate elements have been described with respect to source, configuration, performance, availability, and cost. Also, to assist in identification of defense functional requirements and subsequent defense element evaluation and selection, a projection of the threat facing six specified bases in Southeast Asia and Korea was made and is documented in this volume. These tasks were performed under the leadership of Mr. W. Hill, Jr., who was assisted by Messrs. R. G. Knight, W. E. Nelson, W. B. Sorge, and H. G. Stanley.

(U) The highest security classification of this report is SECRET - NO FOREIGN DISSEMINATION, since it contains discussion of physical characteristics, operational capabilities, threat and defensive posture of specific U.S. Air Force installations in tactical theater operations. This report contains classified information extracted and summarized from a large number of other documents as referenced. The security classification of this report is the same as the highest classification on any of these references.

ABSTRACT

(U) A defense elements catalog is presented describing equipments applicable to base defense. Evaluations of these equipments within each functional class are described, and equipments are recommended for application in base defense system design. Acquisition and operational costs for the recommended equipments are presented. Threat projections to certain USAF bases in Southeast Asia and Korea for 1968 through 1972 are described.

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LIST OF ABBREVIATIONS AND SYMBOLS

ABAD	Air Base Air Defense
ACGW	Aircraft control and warning
AFWL	Air Force Weapons Laboratory
AM	Amplitude modulation
APC	Armored personnel carrier
ARPA	Advanced Research Projects Agency
BIT	Built-in test
BRL	Ballistic Research Laboratory
C3	Communications, command, and control
C & C	Command and control
CEP	Circular error probable
CHICOM	Chinese Communist
COIN	Counterinsurgency
COSVN	Central Office of South Vietnam
CPS	Cycles per second
C & R	Control and reporting
CRT	Cathode-ray tube
CT	Communist Terrorist
CW	Continuous wave
Deg	Degree
DIM	Dimension
DNA	Does not apply
EBDS	Evolutionary Base Defense Study
ECCM	Electronic counterccountermeasures
ESSD	Electronic Sensor Systems Division (Autonetics)
FAAR	Forward Area Alerting Radar
FGC	Frequency gain control
FL	Forward looking
FLIR	Forward looking IR
FM	Frequency modulation
FOV	Field of view
FROG	Free rocket over ground
FSK	Frequency shift keying
FSN	Federal Stock Number
Ft	Foot (feet)

Gal.	Gallon
GPS	Gallons per second
Gr	Gram
GSC	Geospace Corporation
HAW	Heavy antitank weapon
HE	High explosive
HLH	High-low-high
IF	Intermediate frequency
In.	Inch
IR	Infrared
KMC	Kilomegacycles
Kph	Kilometers per hour
KW	Kilowatt
Lb	Pound
LLH	Low-low-high
LLL	Low-low-low
LLLTV	Low light level television
LMSC	Lockheed Missiles and Space Company
LOS	Line of sight
LOX	Liquid oxygen
LTRS	Laser Target Recognition System
LTV	Ling-Temco-Vought
M	Meter
MAW	Marine Air Wing
MCID	Multipurpose Concealed Intrusion Detection
MCW	Micro carrier wave
Min	Minute
MM	Millimeter
MTBF	Mean time between failures
MPH	Miles per hour
MPS	Meters per second
MTI	Moving target indicator
MTTR	Mean time to repair
N mi	Nautical mile
NR	North American Rockwell Corporation
NVA	North Vietnam Army
OSLS	Omni-Directional Sound Locating System

POL	Petroleum, oil, lubricants
PPI	Plan position indicator
PRF	Pulse repetition frequency
RADC	Rome Air Development Center
RAIDS	Radar Air Base Intrusion Detection System
RAM	Rockets, artillery, and mortars
RATT	Radio teletype
R & D	Research and development
RHI	Radar height indicator
RPM	Rounds per minute
SAC	Strategic Air Command
SAM	Surface-to-air missile
SEA	Southeast Asia
Sec	Second
SLAR	Sidelooking Airborne Radar
SID	Seismic Intrusion Detector
SIF	Selective Identification Feature
SRI	Stanford Research Institute
SSB	Single side band
SVN	South Vietnam
TAB ESS	Survivability of Theater Air Bases (Study)
TAB VEE	Vulnerability of Theater Air Bases (Study)
TAC	Tactical Air Command
TADAR	Tactical Area Defense Alerting Radar
TAOR	Tactical Area of Responsibility
TI	Texas Instruments, Incorporated
Tlr	Trailer
Trk	Truck
TOW	Tube launched, optically tracked, wire guided
USAF	United States Air Force
USSR	Union of Soviet Socialist Republics
VATLS	Visual Airborne Target Locator System
VC	Viet Cong
Veh	Vehicle
VHF	Very high frequency
VTALS	Visual Airborne Target Locator System
WAS	"Wonder Arch" Shelter
WPAFB	Wright-Patterson Air Force Base

SECTION I

INTRODUCTION AND SUMMARY

Section 1

INTRODUCTION AND SUMMARY

(U) This report contains a description of the activities and outputs of Task 3 of the Integrated Program for Air Base Defense. The purpose of the program is the development of base or installation defense design concepts for each of six USAF bases in Southeast Asia and Korea for the years 1968 through 1972. Each design is to address the problems of defense as indicated by the threats postulated for the base per year. Successive designs for each base will evolve from the previous year's design. Increased defense will result from the addition of equipment that supersedes equipment already in place or supplements the existing defense as necessary to negate changes in the threat.

(U) It was the purpose of Task 3 activities to accumulate data on various items or elements of defense hardware and associated equipment. As previously noted, these items should include those immediately available and those projected for availability in the time period of interest.

(U) There were four major areas of effort required to achieve the objective of Task 3. These are shown in figure 1-1 by the heavy dashed lines and are titled in accordance with the major outputs of each effort: (1) threat projections, (2) defense element catalog, (3) candidate element selection, and (4) element costs. The number designations for each of these areas reflect their sequence of presentation in this report rather than their sequence of performance. In actuality, the accumulation of data for the catalog was initiated prior to the development of the threat, with both being completed about the same time. The other two activities followed in the sequence shown.

(U) The general approach to Task 3 was to amass data on as many different elements as could be considered useful to base security and defense in the form of an element catalog. Concurrent with the latter phases of this activity was the performance of a threat evaluation. Criteria were developed, as a result of the evaluation, for the purpose of selecting from the catalog entries those elements most appropriate for use in the development of base defense preliminary design concepts. The candidate elements thus selected were examined for determination of the effect of operational utilization in terms of costs. The final compilation of candidate element data was released for use in the cost-effectiveness comparisons made of the candidate defense systems, as described fully in volume VI of this report.

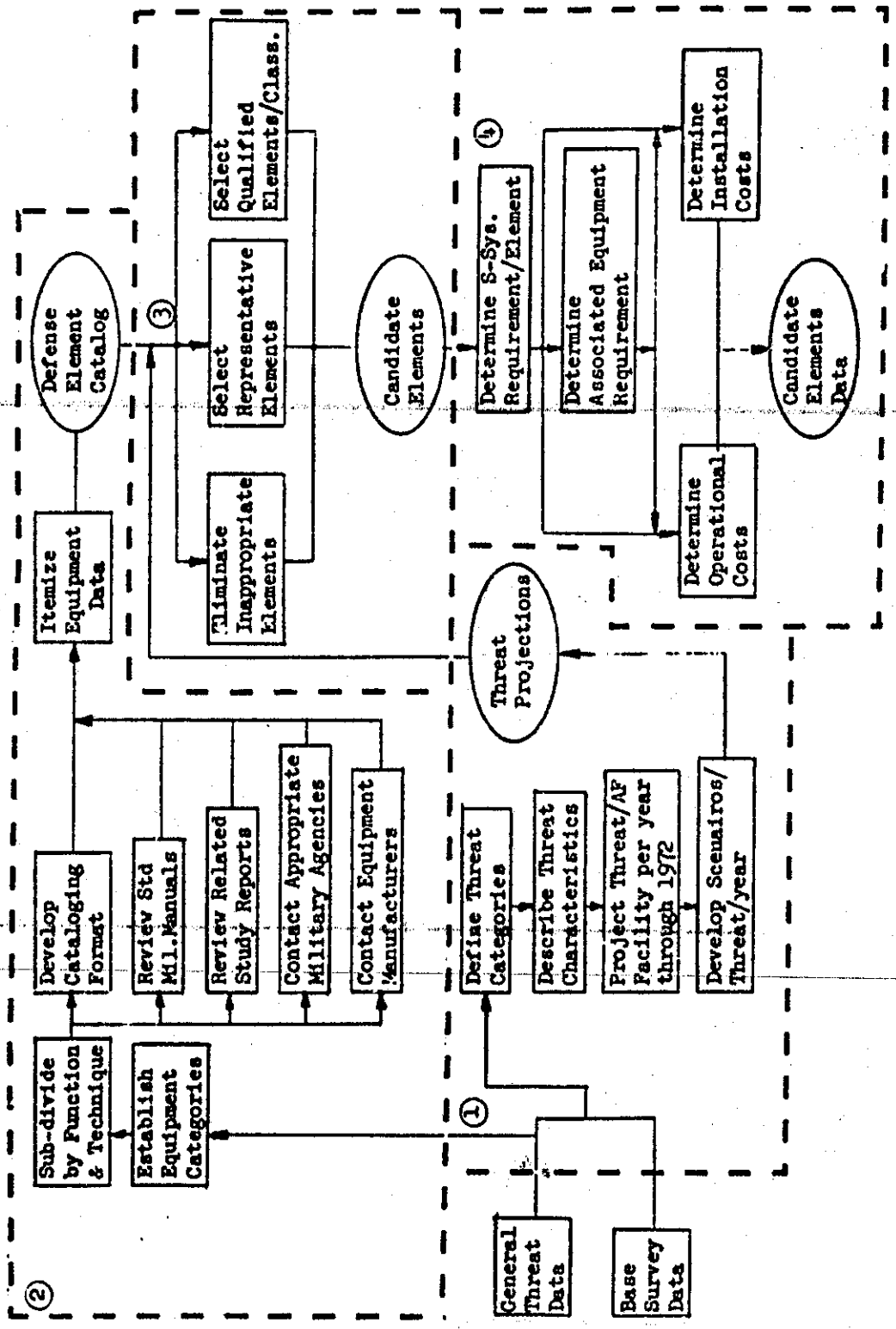

Figure 1-1 Task 3 Functional Flow Diagram

(U) The performance of the threat analysis was to make use of specific threat projection data as provided by outside sources. Since these data were unavailable, the scope of the threat effort had to be greatly increased to include (1) the development and definition of threat categories and characteristics, (2) the projection of these threats for each of the assigned USAF installations for each year through 1972, and (3) the development of scenarios per threat per installation per year. With the increase in scope, it became necessary to sharply reduce the intended level of effort in the formulation of element selection criteria. While the results of the threat effort were of limited use in Task 3, the data as presented in section II serve as a major input to the performance of activities in subsequent defense system design efforts.

(U) The process of building a defense element catalog involves at least the steps shown for this effort in figure 1-1. While these steps appear straightforward, numerous considerations are involved in the acquisition of the specific data wanted for each of the elements. Obtaining "need-to-know" approvals, confirming proprietary statements, and the reviewing of military and other source documents to insure completeness of the catalog are additional efforts involved.

(U) Subtask 3, as shown in the flow diagram, is concerned with the selection of the more appropriate defense elements for application to the design concepts. The threat projections developed in subtask 1 are used as the basis for a portion of this effort by indicating groups of elements in the catalog which are not appropriate for further consideration in this study. These projections are also used to develop evaluation criteria for the selection of elements representative of a particular category and class on the element deemed better suited to the defense requirements. The net result of this effort is the itemization of candidate elements, for application to defense designs, as determined from available element data and threat projections.

(U) The unit procurement costs are a part of the data sought in the generation of the element catalog. The additional costs associated with the operational employment of the candidate elements are developed in subtask 4. Personnel, complementary equipment, spares, and training are several of the cost categories that are generated for use in the cost-effectiveness evaluations of defense system preliminary designs as described in volume VI.

SECTION II

THREAT PROJECTIONS

Section II

THREAT PROJECTIONS

(U) The magnitude and composition of the threat to fixed installations in a combat environment is impossible to project exactly for a period of 5 years. However, information concerning currently available enemy weapons and those available in countries such as USSR and Communist China, along with past weapons employment practices, can be and have been studied to establish a spectrum of options available to the enemy. These studies have also been weighed against documented threat projections made by individuals in the combat environment of South Vietnam, Thailand, and South Korea to arrive at the threat category, weapons employment, and threat scenario projections contained in this section. The threat projections contained herein for the time period December 1968 through December 1972 were employed in base defense system design efforts as the enemy threat which must be defended against when selecting and recommending preliminary defense designs for the different bases.

THREAT CATEGORIES

(U) The projected threat which the North Vietnamese, Viet Cong, Pathet Lao, Communist Terrorists (Thailand), and North Koreans can mount against allied installations in Southeast Asia and South Korea during the 1968-1972 time period has been divided into six categories of attack types:

1. Airborne: Delivery of ordnance onto an allied installation by enemy aircraft.

2. Standoff: Delivery of ordnance onto an allied installation by ground launched weapons physically located outside of the installation perimeter.

3. Massed: A ground attack against an allied installation by a large military unit, one or more battalions, which makes use of a penetration to provide initial entry.

4. Penetration: A covert ground attack against an allied installation by a small military unit, one squad to two companies, which gains access to the installation through the base perimeter.

5. Sabotage: A covert ground attack against an allied installation by one or more indigenous personnel who reside on or are employed by the installation units. The attack is initiated from within the installation perimeter.

6. Electronic: The monitoring of allied installation communications for intelligence purposes and the transmission of spoofing and/or jamming signals that mislead, confuse, or interrupt installation communications such as defense nets and aircraft navigation and control systems. (U)

(U) The enemy has the capability to carry out, at any given time, any one or combinations of the threat categories. His decision for usage of a given category will be based upon an examination of his mission objectives, required expenditure of resources (quantity and type), expected damage to the target and his expected resource loss rate. Along with enemy capabilities, the probability of employment of these capabilities must be established to determine those threats which are indeed credible.

(U) The following presentation is based upon the projected credibility of the six threat categories to the six allied installations of interest. Once one of these threat categories has been established as credible for a particular installation in a given calendar year, that category represents a credible threat to that installation for the duration of the study period (1968-1972). This is not to imply there will be no variations of weapons or tactics in execution of a threat category, but only that a particular category will exist in some form or other after its initial introduction.

(U) A three-dimensional projected threat matrix (table 2-I) with three variables (threat category, calendar year, and installation) is utilized for clarity of presentation. The threat categories are represented by the rows, the calendar years by the columns, and the installations, coded by number, are located in the appropriate boxes.

AIRBORNE

(U) An airborne threat to any of the installations prior to 1970, although possible, is considered to be ~~highly unlikely~~. (Refer to table 2-I.) Prior to that time, the cost-effectiveness of such an attack, in terms of expected target damage versus expected attacking force resource loss, would be measurably ~~lower~~ than that for a standoff attack. For this threat to become a substantial one prior to 1970, a basic far-reaching change would have to occur within the environment of Southeast Asia or South Korea as well as the environment of each installation.

(U) The first credible airborne threat will appear in 1970 for Da Nang Air Base. The projection is based upon the following: (1) If the war is still in an active state, there will be a high probability of an appreciable escalation; (2) the geographical location of the air base minimizes the problems associated with an aircraft attack by the enemy; and (3) the Da Nang area represents the most significant symbol in Northern South Vietnam of United States and South Vietnamese government efforts.

(U) Table 2-I

PROJECTED THREAT - TYPE BY INSTALLATION BY YEAR

ATTACK TYPE	1968	1969	1970	1971	1972
AIRBORNE			4	1 34	123456
STAND OFF	12345	123456	123456	123456	123456
MASSED		2	12	12	12
PENETRATION	123456	123456	123456	123456	123456
SABOTAGE	123456	123456	123456	123456	123456
ELECTRONIC	123456	123456	123456	123456	123456

Installation	Country	Code No.
Nakhon Phanom	Thailand	1
Phu Cat	South Vietnam	2
Bien Hoa	South Vietnam	3
Da Nang	South Vietnam	4
Hon Tre	South Vietnam	5
Osan	South Korea	6

MC threat w/ time to open AB

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(U) Nakhon Phanom Air Base becomes a credible target for air attack in 1971. This is based upon the following: (1) By 1971 all allied air bases in Southeast Asia which support air activities over North Vietnam, Laos, and Thailand will be subject to enemy attack for neutralization purposes; (2) the geographical location of the air base minimizes the problems associated with the development of an attack profile by the enemy, in particular the air bases physical location in close proximity with the Thai-Lao border; and (3) the large indigenous population surrounding the air base who are sympathetic to the causes of the enemy therefore could lend valuable mission support.

(U) Bien Hoa Air Base also becomes a credible target in 1971 due to (1) the general increase in air activity by the North Vietnamese, (2) the importance of the base as a TAC fighter base for air operations in III and IV Corps area, and (3) the Bien Hoa area being the central logistical support facility for III and IV Corps. Attacking aircraft target approach patterns will be either from the South China Sea or by way of Laos and Cambodia.

(U) All installations are considered to have a credible airborne threat in the year 1972. This is to insure the exercising of the air defense system for each of the installations, during the study time period, to determine their effectiveness.

STANDOFF

(U) All installations in South Vietnam have a credible threat from standoff attack at the present time. (Refer to table 2-1.) The only standoff attack variation from installation to installation will be the weapons composition and tactics based upon contiguous base environmental considerations.

(U) Nakhon Phanom Air Base, although not having been attacked to date, does have a credible threat due to (1) its close proximity to the Thai-Lao border, (2) the chaotic conditions in Laos, (3) the large segments of indigenous population surrounding the air base who are sympathetic to the cause of the insurgents, and (4) the questionable control of area security by the Thai law enforcement agencies.

(U) North Korea is in the initial phases of setting up an insurgency program in South Korea with all of the steps of progression as advocated by Mao Tse Tung. By 1969, the program will have progressed to the point where delivery of ordnance onto allied installations from standoff weapons is credible. The frequency and effectiveness of these attacks will be determined by the effectiveness of the South Korean counterinsurgency program which has been recently reorganized and intensified.

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MASSED

(U) Massed attack, as an independent action against an installation, is considered to be the least likely mode of ground attack to be utilized by the VC and/or NVA. The probability of success will be limited by the lack of the surprise element and the high probability of an unacceptable ratio of attack force resource destruction to the damage inflicted to the installation. Due to this low probability of success measured by military criteria, most future attacks will employ covert tactics as much as possible and force sizes will be limited.

(U) As evidenced in attempted massed attacks against allied air bases, during the recent enemy winter-spring offensive, massed attacks have not been successful in overrunning, destroying, or holding key elements within the air base perimeters. The key to this lack of success on the part of the enemy was the early detection of the attacking forces because of its shear physical size. Lacking the element of surprise, the enemy was at a distinct, if not fatal, disadvantage to the allied forces' superior firepower.

(C) Phu Cat Air Base is projected as a credible massed attack target in 1969. The credibility of such a threat is based upon a lack of detection capability against an enemy force in the contiguous base area. Elements within the air base environment which could lend themselves to this lack of detection are (1) lack of permanent allied bases surrounding the air base; (2) the possibility of the Korean forces, whose tactical area of responsibility (TAOR) encompasses a majority of the air base, being assigned to another part of South Vietnam; (3) the terrain and vegetation; and (4) an indigenous population surrounding the air base who are sympathetic or passive to the causes of the enemy.

(C) Nakhon Phanom Air Base likewise experiences a minimally credible threat from massed attack during the study time period, but only after 1969. Prior to 1970, the Communist Terrorists (CT's) will not possess the required resources to execute an attack of battalion size without creating severe damage to their insurgency program. The detection, by the allied forces, of enemy forces entering the air base environment may be degraded by (1) the lack of permanent allied military installations located within the air base environment; (2) existence of indigenous population groupings surrounding the air base who are sympathetic to the cause of the insurgents; (3) the close proximity of the air base to the Thai-Lao border and the chaotic conditions in Laos; and (4) the questionable control of area security by the Thai law enforcement agencies.

(C) The Bien Hoa and Da Nang areas have been and will continue to be two of the three major logistical support bases in South Vietnam. At the center of each of these two areas, there is located an air base which in effect is insulated from any potential ground attacks by the surrounding friendly

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base areas. The indigenous population groups located in surrounding areas are generally friendly to the allied cause and thus provide a further belt of air base insulation in the form of warning networks. (C)

(C) Hon Tre ACSW site will be immune from this category of threat due to its location on an island and the nature of the target. The probability of detection of such a large sized force would be above an acceptable level to insure a successful attack, considering that the longest portion of ingress and egress would be over a water surface.

(C) The North Korean insurgency program being in its infancy will not reach the stage, during the study time period, to which it will have the ability to launch massed attacks against any of our air base installations in South Korea.

PENETRATION

(U) Penetration attacks are the type of threat which is readily mountable with a limited utilization of resources by an enemy which is not necessarily well organized. It, therefore, represents a credible threat to all allied installations in Southeast Asia and South Korea in the time period 1968-1972.

(U) All installations of interest, to date, have been probed or penetrated by small groups of enemy and/or indigenous personnel. In many cases, it was extremely difficult to determine whether the prime mission objective of the penetrators was to cause damage to the installation or to carry out acts of thievery. In either case, it does point up the capability of small groups to successfully penetrate the installation perimeters.

SABOTAGE

(U) Sabotage is a constant threat to any military operation or installation in time of war whether it be initiated by indigenous personnel, enemy personnel or members of allied military organizations. This category of threat is one of the most difficult to defend against in terms of resources allocated versus probability of saboteur detection and negation.

ELECTRONIC

(S) In 1965, the Military Intelligence Section of the COSVN (Central Office of South Vietnam) established a countrywide network of technical reconnaissance units to monitor allied communications for the purpose of intelligence collection, jamming and imitative communications deception. To date, they have achieved their greatest successes in the monitoring of low level allied

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tactical communication networks. However, they possess the resources to conduct a coordinated program against higher level allied communications systems, at any given time. (S)

(C) The North Vietnamese Army places special emphasis on the capability of its forces to conduct tactical electronic intelligence. Wherever its units operate in any substantial numbers, technical reconnaissance units are assigned to carry out this function. It is reasonable to assume that such a unit operating with the NVA forces in Laos could be detached and sent to the Thai-Lao border area in the vicinity of Nakhon Phanom Air Base to conduct electronic intelligence activities.

(C) Electronic intelligence activities conducted by the North Koreans in the vicinity of Osan Air Base will, in the near future, be limited to monitoring allied communications for intelligence-gathering purposes. In the later phases of the study time period, the enemy will possess the capability to transmit jamming and spoofing signals.

STANDOFF WEAPONS EMPLOYMENT

(U) The range and scope of the standoff weapons which are available to an enemy force to be utilized against allied installations in Southeast Asia and South Korea during the time period 1968-1972 is immense in size. These weapons range from 60mm mortars to medium-range surface-to-surface missiles.

(U) For the purpose of this study, only those weapons which can be launched within a 20-kilometer radius of an installation were considered. This constraint eliminates many categories of standoff weapons such as large-sized rockets, large artillery pieces, FROG's, and surface-to-surface missiles. The defense against such weapons would rest with a theaterwide defense system for it would be outside the capabilities of a single installation defense.

(U) Those standoff weapons which provide the most credible threat to the installations of interest in the study time period are rockets, mortars, and recoilless rifles. (Mortars and recoilless rifles may also be used in threat categories other than standoff.) Each weapon has been analyzed as to the probability of its usage by installation and introduction time period. Three-dimensional matrices with three variables (weapon, installation, and weapon introduction date) are presented to show the results of the analysis. A rationale is provided in subsequent paragraphs for weapons employment decision.

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ROCKETS

(C) The introduction of barrage-type free-flight rockets into South Vietnam by the North Vietnamese Army early in 1967 provided the enemy forces with a highly mobile, quick-firing, highly destructive warhead weapons system to be employed against area targets such as air bases. (Refer to table 2-II.) This class of weapons provided the enemy with an equivalent firepower up to the Soviet 152mm artillery piece without the necessity for a sophisticated launch platform and mechanized transport apparatus. Within the operational environment of South Vietnam, the rocket has proved to be the most effective standoff weapon to be employed to date and will probably continue to be, in the study time period of 1968-1972.

(C) The Soviet 122mm and 140mm rockets have been employed extensively in South Vietnam. The CHICOM 102mm rocket was employed in South Vietnam's I CTZ in June and September of 1967. The VC and NVA forces have also been equipped with the new Chinese Communist spin-stabilized 107mm Type 63 rocket for the winter-spring offensive. It has been used in attacks on the Quon Loi Base Camp and the Tay Ninh Airstrip both of which are north of Saigon near the Cambodian border. The weapon is 33 inches long, weighs 42 pounds, is equipped with a Type I contact fuze, and its maximum range is estimated at 9,000 meters.

(S) The launcher is probably a single tube and the launch method the same as that used for the other rockets in South Vietnam. This rocket could, however, be fired without a launcher, as is the 140mm Soviet rocket, although its accuracy would be severely degraded.

(C) The 107mm Type 63 rocket had not been previously identified. Like the Chinese Communist 102mm rocket used in 1967 in South Vietnam, it could be a scaled-down version of the United States 4.5-inch (115mm) rocket which was employed in Korea in the 1950's.

(C) The 107mm rocket does not significantly add to the enemy's firepower. However, because of its relatively light weight, it can be easily carried by infiltrators and is expected to be employed extensively in the future.

(U) The projected introduction of rockets into the environments of the six installations of interest can be discussed by geographical areas: South Vietnam, Thailand, and South Korea.

South Vietnam

(C) A large majority of rockets employed in South Vietnam, by the VC and/or NVA, have been the 122mm short-range and the 140mm long-range Soviet rockets. In addition, the enemy forces have been recently equipped with

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(U) Table 2-II

ROCKETS-TYPES BY INSTALLATION BY YEAR (U)

TYPE	ORIGIN	1968	1969	1970	1971	1972
102 mm	CHICOM	2 3 4	2 3 4	2 3 4	1 2 3 4	1 2 3 4
107 mm	CHICOM	2 3 4	2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
122 mm Short Range	USSR		1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
122 mm Long Range	USSR		2 3 4	2 3 4	1 2 3 4	1 2 3 4
130 mm	USSR	2 3 4	2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
132 mm	USSR			1 2 3 4	1 2 3 4	1 2 3 4
140 mm	USSR					
200 mm	USSR					

Installation	Code No.	Installation	Code No.
Nakhon Phanom	1	Da Nang	4
Phu Cat	2	Hon Tre	5
Bien Hoa	3	Osan	6

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(C) By 1971, an accelerated insurgency program will be underway in Thailand with several geographical areas under the control of the enemy. With this acceleration of activity will come the introduction of the shorter range rockets, 107mm and 130mm.

South Korea

(U) During the 1968-1972 time period, there will be no credible threat of a standoff attack utilizing free-flight rockets.

MORTARS

(U) The mortar class weapons systems have been the preferred standoff weapon during initial stages of insurgency. (Refer to table 2-III.) They are characterized by simple rugged construction, relative light weight, high mobility, and an excellent rate of fire. The mortar's simple, rugged construction makes it almost completely immune to operational environments. The weapon system is most effectively employed against personnel, material, and equipment located in the open, under light cover, or in defilade.

(U) The projected introduction of mortars into the environments of the six installations of interest is discussed according to geographical areas: South Vietnam, Thailand, and South Korea.

South Vietnam

(C) There are (according to order of battle information available) over 500 60mm, 700 81/82mm, and 47 120mm mortars presently in South Vietnam of Soviet, Chinese, and American origin. These weapons can be utilized, at any given time, against Phu Cat, Da Nang, and Bien Hoa Air Bases, or the Hon Tre AC&W site.

(C) The 120mm mortar will not be employed against Hon Tre due to the heavy weight of the weapon and its lack of easy manpack portability which makes it unsuitable for employment in rugged mountainous terrain.

(C) In 1969, the Soviet 107mm mortar will be introduced into South Vietnam. This mortar will be utilized by the VC/NVA against all of the installations of interest in South Vietnam. It is similar in design to the 120mm mortar but is lighter in weight and more portable. The mortar was designed to be utilized by mountain units, being broken down into five loads when pack transport is employed. When vehicle or animal draft is used, an ammunition limber supports the mortar carriage.

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(U) Table 2-III

MORTARS-TYPES BY INSTALLATION BY YEAR

TYPE	ORIGIN	1968	1969	1970	1971	1972
60 mm	CHICOM U.S.	12345	123456	123456	123456	123456
81/82 mm	CHICOM U.S.	12345	123456	123456	123456	123456
107 mm	USSR		2345	12345	12345	12345
120 mm	USSR	234	234	234	234	234
160 mm	USSR					

Installation	Code No.
Nakhon Phanom	1
Phu Cat	2
Bien Hoa	3
Da Nang	4
Hon Tre	5
Osan	6

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Thailand

(C) Nakhon Phanom Air Base has not experienced a standoff attack to date but a credible threat does exist. The initial standoff attacks against the air base will utilize the 60mm and 81/82mm mortars. These weapons will insure the enemy a lightweight, highly mobile weapon which can be set up, fired, and disassembled in a minimum time period. During the initial phases of an insurgency program, time is of the essence to the insurgent for he is attacking an enemy who is far superior to him in numbers and firepower.

(C) As the insurgency program grows in size and complexity, there is a corresponding growth in the weaponry utilized. In 1970, the insurgency program in Thailand will have attained a stature where the larger crew-sized weapons can be introduced with less chance of negation, such as the Soviet 107mm mortar. This weapon will provide the enemy with increased firepower and range while still retaining a high degree of portability.

South Korea

(U) Only the smaller sized, ranged, and firepowered mortars will be utilized by the North Korean infiltrators in attacking Osan Air Base during the time interval 1968-1972. Only those weapons which can be set up, fired, and disassembled in a short time interval by a minimal number of men will be utilized by the insurgents.

RECOILLESS RIFLES

(U) The recoilless rifle was originally developed to be utilized against hard and armored targets such as bunkers, strong points, tanks, and armored vehicles. To optimize the destruction of such targets a flat, high speed, trajectory was utilized.

(U) The weapon is now being employed by the enemy forces in attacks on air bases as a medium range standoff weapon against personnel, material, and equipment. With the increase in range, there has been a corresponding decrease in the accuracy of the weapon. In addition, it required frequent movement during an attack due to the visibility of the backblast flash, smoke, and debris and lacks the capability of being fired from closed quarters.

(U) The projected introduction of recoilless rifles into the environments of the six installations of interest is discussed by geographical areas: South Vietnam, Thailand, and South Korea. (Refer to table 2-IV.)

(U) Table 2-IV

RECOILLESS RIFLES-TYPES BY INSTALIATION BY YEAR (U)

TYPE	ORIGIN	1968	1969	1970	1971	1972
57 mm	CHICOM U.S.	12345	123456	123456	123456	123456
75 mm	CHICOM U.S.	12345	12345	12345	12345	12345
82 mm	USSR					

Installation	Code No.
Nakhon Phanom	1
Phu Cat	2
Bien Hoa	3
Da Nang	4
Hon Tre	5
Osan	6

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South Vietnam

(C) The 57mm and the 75mm recoilless rifles are presently being utilized in South Vietnam and represent a credible threat to all allied military installations.

Thailand

(C) No recoilless rifles have been utilized by the insurgents in Thailand to date, but the 57mm and the 75mm recoilless rifles represent a credible threat during the intermediate phases of any organized insurgency program such as is being carried out in Thailand.

South Korea

(C) The introduction of the recoilless rifles family to South Korea will occur in 1969 in the form of the 57mm recoilless rifle. This weapon will provide the North Korean infiltrators with a lightweight, ruggedly built, highly mobile, standoff weapon which can be set up, fired, disassembled, and cached in minimum time with minimum manpower requirements.

THREAT SCENARIOS

(U) Descriptions of the six threat categories consisting of penetration, massed, standoff, sabotage, aircraft, and electronic attacks require more specific details to be of use in the performance of base defense systems evaluations. It was necessary, therefore, to develop brief descriptions of at least one attack for each of the threat categories based on past VC/NVA attacks experienced by installations in South Vietnam.

STANDOFF ATTACK

Nakhon Phanom Air Base

(U) An 82mm mortar night attack is made against the air base in December of 1968. Six mortars are employed by a group of 60 enemy personnel, and each mortar fires 40 rounds in 5 minutes. The location of the mortar positions is at grid coordinates VE650230. Target of the attack is all incommission tactical and support aircraft. The attacking forces arrive at the firing position after having traveled from Laos or three successive nights. Travel time each night is 8 hours. Rate of travel is 2 kph. Direction of approach to the firing position is from the northeast. The vegetation to the northeast is approximately 60 percent hardwood forest and 40 percent rice fields to a distance of 13 kilometers from the air base. After

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13 kilometers, the Mekong River, which is approximately 1/2-kilometer wide, must be crossed. It is assumed that the force is not susceptible to detection on the Laos side of the Mekong River. The egress route is assumed to be the same as the approach route. (U)

(C) In December 1969, the Pathet Lao/CT/NVA, with a force of 400 personnel, employ the long-range (16-kilometer) 122mm rocket to attack the air base from the Laos side of the Mekong River. Thirty-six launchers are employed and three rounds are fired from each launcher. The launchers are located at approximately VE760298. All necessary equipment including rockets, launchers, and digging tools are brought to the site on the night of the attack. Two hours are required to prepare the launch positions. The launch sites have been surveyed and laid out prior to the night of the attack by a group of 10 personnel operating in the area at night during a 1-week period prior to the attack. The attack duration is 10 minutes.

(C) In December 1970, 1971, and 1972, the insurgency activity has reached such a point to allow standoff attacks from shorter ranges from the air base (within Thailand). A short-range (11-kilometer) 122mm rocket attack is employed during this time period as being representative. All aspects of this attack are similar to the December 1969 attack with the exception of the launch position location at approximately VE700290.

Phu Cat Air Base

(C) A 122mm rocket (short-range, 11-kilometer) night attack is made against the air base in December 1968. Elements of two battalions (400 personnel) with 36 launchers are employed in the attack. Two rocket positions are employed, located at BR790440 and BR800460, and 108 rockets are launched from the two positions. The attack duration is 10 minutes. All necessary equipment including rockets, launchers, and digging tools are prepositioned near the launch positions. This prepositioning activity is carried out by an average of 10 men per night over a 3-week period prior to the attack. Prior to the attack, there is a 1-week period employed for launch site survey. This survey is made by 10 enemy personnel who are active in the launch site area each night during the 1-week period. A protective force is deployed near the launch positions. This protective force is made up of four groups, each with two 12.7mm heavy machine guns for antiaircraft defense. The attacking force assembles at BR750520 and travels at a rate of 2 kph from the assembly area to BR790460. At this point, the group splits into two elements which proceed to their respective launch positions. Numerous trails provide concealed dispersion routes into the hills to the west, and nearby high ground provides adequate defense site locations for protection of the launch positions. Concealment from the assembly area to the launch positions consists of numerous brushwood clumps which are employed when aircraft fly over in the nearby area.

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(U) In December 1969, the VC/NVA employ the long range 122mm rockets in the same numbers previously described. The assembly point and all other parameters of the attack are identical with the exception of the launch position location. The launch positions are centered at approximately BR760493. High ground to the rear of this position offers concealed dispersion routes into the hills.

(U) In December of 1970, 1971, and 1972, the VC/NVA employ the 200mm rocket which has a maximum range of 20,300 meters. This range allows the enemy to employ launch position from areas such as BR740540. All other aspects of this attack are considered to be the same as previous attacks.

Bien Hoa Air Base

(U) A short-range 122mm rocket night attack is made against the air base in December 1968. The aspects of this attack which differ from the December 1968 attack against Phu Cat Air Base are as follows: Elements of one battalion employ YT020220 as a launch position and a second battalion employs YT040210 as its launch position. The assembly area is located at YT067297. The group moves together from the assembly area to approximately YT037230 where they split into two groups and proceed to their respective launch positions. They are in dense forest until they split, after which they are in an open area. Dense forest to the rear of the launch positions (located on the edge of War Zone D) offer nearby concealment for escaping rocket launch crews. This dense forest begins 2,000 meters to the rear of the launch positions.

(U) A long-range 122mm rocket night attack is made against the air base in December 1969. The aspects of this attack which differ from the December 1968 attack against Bien Hoa Air Base are as follows: The launch positions are located at YT082252 in War Zone D.

(U) In December of 1970, 1971 and 1972 the VC/NVA employ the 200mm rocket against Bien Hoa Air Base. The launch positions employed are in the vicinity of YT039308. All other aspects of this attack are considered to be the same as previous attacks.

Da Nang Air Base

(U) A short-range 122mm rocket night attack is made against the air base in December 1968. The aspects of this attack which differ from the December 1968 attack against Phu Cat Air Base are as follows: Two launch positions (18 launchers at each position) are located in the area at AT950680. There are two assembly areas. One located at approximately AT860680 and the other at AT940600. The 200 personnel traveling from

AT860680 to AT950680 travel through 3 kilometers of dense forest, 3 kilometers of 50 percent forest cover, and 3 kilometers of rice fields (open area), in that order, in arriving at the launch positions. The 200 personnel traveling from AT940600 to AT950680 employ two large boats and eight sampans and travel on the Yen River to within 1 kilometer of the launch position. They then travel for 1 kilometer over land (rice fields) from the river to the launch positions. (U)

(U) A long-range 122mm rocket night attack is made against the air base in December 1969. The aspects of this attack which differ from the December 1968 attack against Da Nang Air Base are as follows: The launch positions are located in the general area of AT863707, in a valley next to rugged terrain and dense forests which provide concealment prior to launch preparation and dispersion after the attack.

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(U) In December 1970, 1971, and 1972, the VC/NVA employ the 200mm rocket against Da Nang Air Base. The launch positions employed are in the vicinity of AT852650. All other aspects of this attack are considered to be the same as previous attacks.

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Hon Tre AC&W Site

(U) An 82mm mortar night attack is made against the AC&W site in December 1968. The attacking force is composed of an element of a platoon (20 men) with four 82mm mortars. Each mortar fires 40 rounds from CP127480. The attack duration is 5 minutes. Three mortars are directed against USAF resources on Missile Hill and one mortar against the USAF/USA cantonment area. The mortars and ammunition are prepositioned in the immediate area of the firing site through the use of fishing boats. Off-loading takes place at night. The platoon has been prepositioned on the island in the same manner as the weapons over a 1-week period prior to the attack. After the attack, the platoon disperses in cells of three each to preselected locations on the island and a small number take refuge in the four fishing villages on the island. Each member of the platoon has been issued civilian clothing of the type worn by island fishermen. Extraction from the island is accomplished in the same manner as the prepositioning. An average of two cells (six men) are picked up each night from individual preselected points about the island.

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(U) A 107mm mortar night attack, employing 40 enemy personnel, is made against the AC&W site in December of 1969, 1970, 1971, and 1972. The mortars are located at CP168486. All other aspects of this attack are considered to be the same as the foregoing attack.

Osan Air Base

(C) No standoff attacks are made against Osan Air Base in 1968. An 82mm mortar night attack is made against Osan Air Base in December 1969, 1970, 1971 and 1972. The firing positions are located in the general area of CS279054. Target of the attack is aircraft on alert in diamond C. Direction of approach to the firing positions is from the east.

AIRBORNE ATTACK

(C) No airborne (aircraft) attacks are made against any of the installations in 1968 or 1969. In 1970, a flight of four Beagle (IL-28) aircraft make a single low altitude pass over Da Nang Air Base on a moonlighted night. The flight is launched from Phuc Yen Air Base northwest of Hanoi. The first portion of the flight is at high altitude traveling over the North Vietnamese mainland. The flight descends to low altitude as soon as fuel provisions allow. The flight takes maximum advantage of terrain while at low altitude to decrease radar detection and tracking capability and continue over the SVN mainland to Da Nang. Approaching Da Nang from the northwest, the flight lines up on the Cape of Da Nang until it crosses the shoreline. After crossing the shoreline, the flight banks right and lines up on the Da Nang Air Base runway. Two aircraft are scheduled to drop their bombs on the east side of the runway and two aircraft on the west side of the runway. Each aircraft drops 6,600 pounds of bombs. Egress from the target is over the SVN mainland at low altitude. The aircraft recover at Dong Hoi or Vinh Air Base. Dong Hoi and Vinh are normally unserviceable due to a continual attack program carried out by U.S. fighter bombers. However, craters in the runways have been filled on the night of the attack to support the returning aircraft. This airborne attack is also assumed to occur against Da Nang in 1971 and 1972.

(U) In 1971 an identical attacking force of aircraft make an attack against Nakhon Phanom Air Base. The aircraft are launched from and are recovered at Phuc Yen Air Base. The total mission is flown at low altitude. The aircraft each make a single pass against the air base, dropping their bombs in succession on the northeast side of the runway.

(U) Bien Hoa Air Base is also attacked by aircraft for the first time in 1971. This attack is assumed to be a low altitude attack with the same type force as previously given. Low altitude aircraft attacks are postulated for all study air bases in 1972. These attacks will all be represented in the terminal phase of the attack by four aircraft attacking at low altitude as described in the above attacks.

PENETRATION ATTACK

Nakhon Phanom Air Base

(U) A sapper unit comprising 60 men penetrates the air base at night in December 1968 and places explosive charges against aircraft parked on the center and south parking aprons. Approach to the breach point is from the west through hardwood forests and rice fields. From the breach point out to 6,000 meters is 50 percent hardwood forest and 50 percent rice fields. Beyond 6,000 meters is 100 percent hardwood forests. Approach speed to the breach point is 2 kph. The breach point is across the runway from the center and south aircraft parking aprons. Distance from the breach point to aircraft is approximately 1,500 feet. Ten men set up an 82mm mortar approximately 3,000 meters west of the breach point to cover the withdrawal. Another 10 men are deployed on an arc approximately 150 meters outside the breach point in ambush positions to cover withdrawal. The 40 men who penetrate the air base perimeter are armed with mines, grenades, explosives, and automatic weapons. This penetration attack is also employed in 1969, 1970, 1971, and 1972, with two flamethrowers being employed in the ambush positions starting in 1969.

Phu Cat Air Base

(U) A sapper unit comprising 60 men penetrates the air base at night in December 1968 and places explosive charges against F-100 aircraft in revetments and C-7A and AC-47 aircraft parked in the open. The aspects of this attack which differ from the December 1968 attack against Nakhon Phanom Air Base are as follows: An 82mm mortar is located at BR860430. Direction of approach is from the west where numerous ravines, dense undergrowth, and abandoned housing areas afford the enemy cover in organizing and approaching the installation. The enemy force breaches the defenses directly across the runway from the revetment area and must cross the runway, taxiway and apron to reach the revetment area. The distance from the first installation defense (dog post) to the first revetment is approximately 2,000 feet. This penetration attack is also employed in 1969, 1970, 1971, and 1972, with two flamethrowers being employed in the ambush positions starting in 1969.

Bien Hoa Air Base

(U) A sapper unit comprising 60 men penetrates the air base at night in December 1968 and places explosive charges against F-100, A-37, and F-102 aircraft parked in revetments on the east ramp. Secondary targets in this same general area are tactical aircrew forces, LOX facilities, munitions storage areas, POL storage areas, and POL trucks. The aspects of this attack which differ from the December 1968 attack against Nakhon Phanom Air Base are as follows: An 82mm mortar is located at YT040135. The force

assembles at YT020370 2 nights prior to the attack and travels to YT060210 (dense forest) during that night. Travel time is 8 hours. The night prior to the attack, the force moves from YT060210 to YT050186 (one kilometer dense forest, two kilometers rice fields), crosses the Dong Nai River at this point and moves to YT040170 (1 kilometer open area, 1 kilometer dense forest) where they spend the remainder of the night and the next day. The force departs YT040170 at 1000 hours on the night of the attack, travels directly south to YT040140 (3 kilometers). From this point, the force moves west-southwest to the breach point located at YT010132 (3.2 kilometers). Travel on the night of the attack is through high growth vegetation and swampy area. This penetration attack is also employed in 1969, 1970, 1971, and 1972, with two flamethrowers being employed in the ambush positions starting in 1969. (C) U

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Da Nang Air Base

(C) A sapper unit comprising 60 men penetrates the air base at night in December 1968 and places explosive charges against USAF F-4C, F-102, C-123, and C-130 aircraft parked in the southeast area of the air base. The aspects of this attack which differ from the December 1968 attack against Nakhon Phanom Air Base are as follows: An 82mm mortar is located at BT021726. The enemy force assembles at BT021726 at 2200 hours on the night of the attack. They have arrived at this point in groups of 10 or less after having traveled over a number of different routes to the point. Their travel to the point was in civilian or ARVN/RF/PF uniforms to negate detection prior to arriving at the assembly point. Their weapons have been pre-positioned by local force VC units. At 2300 hours, the force moves from the assembly point to attack the air base. The distance to the air base perimeter where the breach will be attempted is 1,500 meters. The point which is to be breached is 800 meters north of the southeastern most corner of the outer security fence. The distance from the outer security fence to the nearest F-4C is 350 meters from the breach point. The distance to the farthest F-4C is 700 meters from the breach point. The distance to the F-102's is 500 meters and to the C-123's and C-130's is 800 meters from the breach point. This penetration attack is also employed in 1969, 1970, 1971, and 1972, with two flamethrowers being employed in the ambush positions starting in 1969.

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Hon Tre ACGW Site

(U) A 10-man sapper squad penetrates the installation at night in December 1968. This squad is composed of three cells. Two cells of three men each are assigned to destroy the USAF radars on Missile Hill. One three-man cell attacks the height finder radar and the other cell attacks the search and direction finder radar. The remaining cell of four men sets up an ambush

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100 meters down the road from the Missile Hill entrance guard tower to negate reinforcement of Missile Hill. The attack emanates from the western Missile Hill perimeter nearest the radars to be attacked. This is also the route of egress. The foliage near the Missile Hill perimeter is multicanopied dense undergrowth forest. Foot movement is not impossible, but is usually slow. Emplacement and extraction of the squad from the island is carried out with the use of fishing boats. Emplacement and extraction each takes three days and are carried out during hours of darkness. This penetration attack is also employed in 1969, 1970, 1971, and 1972, with two flamethrowers being employed in the ambush positions starting in 1969. (U)

Osan Air Base

(U) A sapper unit comprising 60 men penetrates the air base at night in December 1968 and places explosive charges against aircraft parked in diamond C. The aspects of this attack which differ from the December 1968 attack against Nakhon Phanom Air Base are as follows: The breach point is across the runway from diamond C. Distance from the breach point to the edge of diamond C is approximately 1,700 feet. A river (Chinwi), with high banks, roughly parallels the northern perimeter of the air base. This river is extremely shallow except during the rainy season, affording considerable concealment for personnel attempting to move against the air base. The Chinwi River banks are employed as the method of ingress and egress from the breach point. The area on both sides of the river is composed of rice fields. This penetration attack is also employed in 1969, 1970, 1971, and 1972, with two flamethrowers being employed in the ambush positions starting in 1969.

MASSED ATTACK

(U) No massed attacks are made against any of the installations during 1968. A VC/NVA battalion is given the mission of attacking Phu Cat Air Base in December 1969 with the objective of inflicting maximum damage on air base priority resources and then withdrawing. The battalion has three rifle companies, a reconnaissance platoon, a signal platoon, an engineer/sapper platoon, and a heavy weapons company for a total of approximately 500 men. The latter unit is broken down into a light mortar section, a recoilless rifle section and a light machine gun section. Two LPO-50 flamethrowers are also employed to breach the perimeter defenses. Extensive reconnaissance of both the route in and out of the area and the air base is assumed to have preceeded the attack.

(U) The first phase of this attack is similar to the penetration attack in that entrance to the air base is performed covertly by a sapper unit and the same breach point is employed as in the penetration attack. The sapper unit prepares means for the main force to move rapidly through the defense obstacles when the assault begins. Bangalores and explosives are placed to destroy fences and mines and ditches or pits have boards or ladders placed across them to assist in crossing. The breach points, routes of ingress, and approach speed, are the same as penetration attacks.

(U) Firing is initiated on command to attain immediate fire superiority. The placed charges and bangalores are detonated and the infantry assault commences. At this time the light mortars, recoilless rifles, light machine guns, and flamethrowers are employed to suppress the defenses. Each squad (10 men) in the assault team has been assigned specific objectives both primary and secondary and have the necessary weapons to complete their tasks.

(U) This type of attack is employed against Nakhon Phanom and Phu Cat air bases in 1970, 1971 and 1972.

SABOTAGE ATTACK

(U) A group of two to five enemy personnel have gained access to the installation as members of the indigenous work force. Over a period of time, they have managed to assemble the weapons they need for an attack against one or more of the installation priority resources. The priority resources have been reconnoitered and those allowing the highest probability of success selected. Direct engagement with security forces is avoided. The attack is conducted at night and synchronized so as to create confusion and allow safe withdrawal of the attackers. The main weapons to be used by the saboteurs are satchel charges and block explosives for the targets and hand grenades and automatic weapons for self defense. Timing devices and remote electrical detonators will be used as the target situation demands. This type of sabotage attack is expected at all installations during all years of study.

ELECTRONIC ATTACK

(U) A radio jamming and deception device and power generator are brought to within the general proximity of the installation perimeter and hidden in December 1968. On the night of a scheduled penetration attack against the installation, this device is recovered and placed in operation at the time the attack is discovered. The transmitted signal of the jammer and deception

device covers the frequency band of the security forces and reduces the response capability and effectiveness. A standard radio receiver is available to both the group with the jammer and the attackers. Normal security police communications are monitored prior to the attack and after jamming ceases. In addition to monitoring and noise jamming, imitative communications deception is employed to confuse the security forces. The withdrawal policy calls for discontinuance of the jamming and deception and removal of the unit to a preselected hiding place when discovery appears imminent from monitoring, as previously noted. (U)

THREAT EQUIPMENT DATA

(U) The following pages contain tables of the characteristics of enemy type weapons and equipment (tables 2-V through 2-XVII). Enemy forces as described in the preceding scenarios will be making use of these as well as captured equipment during the course of their attacks against allied installations.

(U) Table 2-V

SMALL ARMS CHARACTERISTICS

Type	Overall Length (in)	Loaded Weight (lbs)	Muzzle Velocity (mps)	Maximum Range (m)	Effective Range (m)	Rate of Fire (rpm) Cyclic	Rate of Fire (rpm) Practical	Feed Type	Type of Fire
9 mm pistol (PM)	6.34	1.62	315	1400	50		30	8 round box	semiautomatic
9 mm machine pistol (AFS)	9.75	2.69	340	1400	50 w/o stock 100 w/stock	750	40 SA 90 A	20 round box	selective
7.62 mm assault rifle (AK-47)	34.2	10.58	710	2500	400	600	40 SA 100 A	30 round box	selective
7.62 mm assault rifle (AKM)	34.5	8.87	710	2500	400	650	40 SA 100 A	30 round box	selective
7.62 mm light machine gun (RPD)	40.8	15.6 (unloaded)	735	2500	800	750	150	2-50 round belts	automatic
7.62 mm light machine gun (RPK)	40.5	12.35	735	2500	800	600	40 SA 150 A	40 round box or 75 round drum	selective
7.62 mm light machine gun (RP-46)	50.5	28.7 (unloaded)	825	4000	1000	600	250	250 round belt or 47 round drum	automatic
7.62 mm general purpose machine gun (PK)	45	20 (unloaded)	825	4000	1000	600	250	250 round belt	automatic

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(U) Table 2-VI

HEAVY MACHINE GUN CHARACTERISTICS

Type	Length Overall (in)	Weight (lb)	Muzzle Velocity (mps)	Maximum Range (m)	Effective Range (m)	Rate of Fire (rpm) Cyclic	Rate of Fire (rpm) Practical	Feed Type	Type of Fire
7.62 mm	44.75	gun only 29.8 mount only 50.9	850	4000	1000	600	250	250 round belt	automatic
12.7 mm	62.5	78.5 gun only unloaded	840	3500	2000 ground 1000 AA	600	80	50 round belt	automatic
14.5 mm ZPO-2	96 (includes tow bar)	2205	1000	7000	2000 ground 1400 AA	1200	300	150 round belt	automatic
14.5 mm ZPO-4	197(includes tow bar)	4400	1000	7000	2000 ground 1400 AA	2400	600	150 round belt	automatic
23 mm		2100	930	7000	2000 AA	1600-2000	400		
37 mm		4630	880	8000	1700 AA	160-180	80		

(U) Table 2-VII

MORTAR CHARACTERISTICS

Type	Length (ft)	Weight (lb)	Loading Method	Firing Method	Fire Control Type	Elevation (deg)	Traverse (deg)	Rate of Fire		Ammunition	
								Maximum (rpm)	15 Min. Total	Complete Round	Pr
60 mm	3.5	75	muzzle	drop				20			
82 mm	4	123 (firing)	muzzle	drop	telescope	45-85	6	25	125	6.95	
107 mm	5.4	375 (firing) 750 (travel)	muzzle	drop or trigger	optical	45-80	3	15			17
120 mm	7.4	606 (firing) 1100 (travel)	muzzle	drop or trigger	telescope	45-80	6	15	40	36.33	
160 mm	15	2875 (firing) 3240 (travel)	breech	trigger		to 65	24	3	21	95.0	

(1) The effective fragmentation radius is defined as that maximum distance at which fragments would penetrate a one inch pine board (such a penetration requires 58 ft-lb of energy). The effective radius is further defined as that distance at which personnel are expected to be incapacitated (killed or wounded to the extent that their combat duties cannot be resumed) from the fragments of one projectile.

e 2-VII

ACTERISTICS

Fire .5 Min. Total	Ammunition Wt. (lb) Complete Round	Projectile	Muzzle Velocity (Max. Chg.) (mps)	Range (m) Maximum	Minimum	Type Ammo
		4.0		1430		
125	6.95	6.77	210	3040	90	frag-HE
		17.4/19.3		5150/6300		HE
40	36.33	35.20	272	5700	500	frag-HE
21	95.0	90.7	343	8070	750	HE

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(U) Table 2-VIII

GUN AND HOWITZER CHARACTERISTICS

Type	Length (ft)	Weight (lb)	Elevation (deg)	Traverse (deg)	Ammo Type	Muzzle Velocity (mps)
57 mm	21.7	2800	-5 to 25	56	HE	700
85 mm	19.7	5000	-7 to 35	54	HE	800

Type	Rate of Fire			Maximum Horizontal Range (meters)	Fire Control System
	Maximum (rpm)	15 min	30 min		
57 mm	20-25	125	200		Telescopic sight
85 mm	10	60	90	15,650	Panoramic sight and direct fire telescope

(1) In addition to these types, the VC/NVA are known to have captured a limited number of 70, 75 and 105 mm weapons of Japanese, French and U.S. design.

(U) Table 2-IX

GRENADE LAUNCHER CHARACTERISTICS

Type	Length Overall (in)	Weight (lbs)	Rate of Fire (rpm)	Maximum Range (m)	Practical Range (m)	Armor Penetration (in)
50 mm		25		180		11-12
80 mm RPG-2	37.4	6.3	4-6	150	100-150	7
80 mm RPG-7	41	15	4-6	548-640	300-500	9.4
90 mm		21		100		

(U) Table 2-X

Hand Grenade Characteristics

Type	Weight (lbs)	Body Material	Fuze		Range (m)	Effective Frag Radius (ft)
			Type	Delay (sec)		
F-1	1.54	cast iron	delay	3-4	35	45
RG-42	0.88	steel	delay	3-4	35	45-50
RGD-5	0.68	steel	delay	3-4	45	60

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CLAS BY: FSTC
DECLAS: OADR

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UNCLASSIFIED

(U) Table 2-XI

RECOILLESS RIFLE CHARACTERISTICS

Type	Weight (lbs)	Practical Rate of Fire (rpm)	Maximum Range (m)	Practical Range (m)
57 mm	78 w/tripod	15	3657	450
75 mm	190 w/mount	10	6675	
82 mm	188 w/mount	5-6	4470	390
107 mm	672 w/mount	4-5	6650	457

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Remainder still classified, probably by FSTC. [signature] 10/CT

(U) Table 2-XII

FLAMETHROWER CHARACTERISTICS

Type	Fuel Capacity (gal)	Weight (lbs)		Maximum Range (m)
		Filled	Empty	
LPO-50	2.7 (0.9 per tank)	50.6	30	70
ROKS-3	2.1 ✓	51.6 ✓	32	35 ✓

UNCLASSIFIED

(10)

(U) Table 2-XIII

ROCKET CHARACTERISTICS

Type	Origin	Length (ft)	Weight (lb)	Range (meters)	
				Maximum	Minimum
102 mm	CHICOM	2.3	35	5100	
107 mm	CHICOM	2.8	42	9000	
122 mm	USSR	6.3	102	11,000	4000
122 mm	USSR	9.0		16,000	
130 mm	USSR		50	9000	
132 mm	USSR	4.8	94	9000	3000
140 mm	USSR	3.6	87	10,500	600
200 mm	USSR	10.4	427	20,300	12,700
250 mm	USSR	18.2	838	55,900	18,000

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CLAS BY: FSTC
DECLAS: OADR

UNCLAS

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(U) Table 2-XIV

FROG MISSILE CHARACTERISTICS

Type	Weight (short ton)	Maximum Range (n.mi.)
FROG-3	18.3	18
FROG-4	18.1	35
FROG-5	18.1	35
FROG-6	8.7	18
FROG-7	25.0	30

SECTION III

DEFENSE ELEMENT CATALOG DEVELOPMENT

Section III

DEFENSE ELEMENT CATALOG DEVELOPMENT

(U) The product of this phase of Task 3, the Defense Elements Catalog, has been included as an appendix to this report. The catalog has been divided into the following 10 sections which reflect the specific functional areas of interest.

1. Sensors - Radar, IR, LLLTV, seismic, acoustic, chemical, visual, and lasers.
2. Communications - AM and FM voice and CW equipment; fixed, vehicle and man-packed.
3. Weapons - Individual, crew served, mines, anti-tank, anti-aircraft, assault vehicles, and air-delivered.
4. Aircraft - Attack, bomber, cargo, electronic, fighter, helicopter, observation, reconnaissance, and utility.
5. Drones
6. Balloons
7. Ground vehicles - Cargo, command, and utility
8. Ground platforms - Towers.
9. Revetments and shelters - Aircraft, personnel, and munitions.
10. Barriers - Fences and impediments

DATA ACQUISITION

(U) Reports from related studies such as TAB VEE, TAB ESS, and EBDS were used as the initial sources of information for inclusion in the catalog. Additional data were obtained from the base survey team, manufacturer representatives, and various USAF and other military manuals and documents.

(U) The largest single category for which data were gathered was sensors. A sizable number of the sensor items are not much beyond the prototype stage. Therefore, much of the data required for evaluation of their characteristics and capabilities were in the process of being obtained and/or in non-uniform

units of measurement that precluded a rigorous comparison with competitive elements. Since much of the element testing thus far has been devoted to determining the feasibility of the techniques involved or basic operational capability, there are very little data available on such operational items as maintainability and reliability. (U)

(U) A second area of difficulty encountered was that of determining useful information on equipment still in development or that which could be obtained by putting together existing components. This difficulty was due, in part, to the lack of specific operational requirements, whether the research would be funded or unfunded and how soon some form of "go-ahead" would be given.

(U) A third area of difficulty tending to proliferation of the catalog was lack of commonly accepted nomenclature for describing sensors. Where joint nomenclature was unknown or not referenced, variations in the titles assigned could result in two or more fact sheets for the same item.

(U) In the next three element categories, viz., communications, weapons, and aircraft, care had to be exercised to keep down the number of items to be included in the catalog. A first cut filtering process was performed, whereby those elements with the more apparent applicability were selected for inclusion in the catalog. Because of the great quantity of data available in various military manuals on most of these elements, restrictions were placed on the type and quantity reproduced for the report. Therefore, many of the elements considered are identified in the catalog index with reference to source documents for additional information.

(U) All but one of the final categories were very limited in the quantity of elements that were available. The exception was the category of ground vehicles. Here again, a coarse filtering procedure was followed whereby only those vehicles which might be unique to the purposes of defense were put into the catalog.

SECTION IV

CANDIDATE ELEMENT SELECTION

Section IV

CANDIDATE ELEMENT SELECTION

GENERAL

(U) The large quantity of elements identified in the Defense Element Catalog made necessary an evaluation whereby the more promising are identified for subsequent consideration. It was the purpose of the evaluation, as conducted herein, to compare the characteristics of elements in the same category and of the same type. The comparison of one type element to another was of necessity performed in design of the candidate defense systems, where effectiveness of their employment can be judged.

(U) The basic assumption used in the process of selecting many of the elements was that the items would be employed by military units whose prime responsibility was that of base security and defense. Some of these military units might be trained and equipped for other forms of enemy engagement. The candidate elements presented herein are intended to supplement and not replace the standard equipment of the unit. This approach will insure noninterference between the existing roles and missions of the unit and job of base defense.

(U) As previously noted, the category of Sensors has numerous entries. To facilitate ease in reviewing the selection process, an outline has been provided in the first several pages.

(U) Approximately 82 communications elements were reviewed and entered in the catalog. No candidates were selected in this evaluation. It was recognized that the basic criterion for such a selection is a definition of the operational employment of the equipment. This, in turn, provides the requirements of interface and the tie-in with the base defense command and control system. Since the definition of the C&C was done in the system design task, selection of equipment was deferred until that time.

CANDIDATE SENSORS

(U) Approximately 245 sensors were identified. Sixty of the sensors identified were insufficiently documented for purposes of classification and evaluation. Selections were made from the remainder. The selections are representative of sensors within a class having the most favorable parameters for specific functions, viz., performance, size and weight, cost, and availability.

(U) Desirable maintenance data were not readily available. Thus selections were made without regard to deployment costs, time to deploy, time and

manpower to operate and maintain, time to disassemble, meantime between failure (MTBF), and mean-time-to-repair (MTTR). (U)

(U) Sensors were grouped in 14 main classes according to type of sensor. Subcategories within these main classes were by type, function, and method of deploying. The sensor classes were:

Chemical
Contact
Electronic countermeasures
Electromagnetic
Lasers
Magnetic
Olfactory
Radar

- Airborne
- Ground-Based

Radar equipments
Seismic
Sonic
Thermal and infrared radiation sensors
Visual
Visual - Illuminators

(U) The sensor missions included:

1. Manned or unmanned ground, air/ground, ground/air surveillance for the purpose of identifying ground or ground support activities with a potential affect on installation security and safety
2. Discrimination: Determining with some degree of certainty the probability that a detection poses a threat to the installation
3. Data-link: The function of disseminating acquired intelligence for evaluation and decisive action

(U) A requirement for covert emplacement and monitoring was considered as well as requirements for overt monitoring.

(U) Evaulations were not performed for Electronic Countermeasures, Radar Equipments, or Cameras (a subcategory of the Visual class). Selection of these equipments is predicated on precise definition of roles and missions. Pertinent Radar Equipments corresponding and compatible with selected Radars were identified.

(U) Some sensors identified were the only ones of their specific kind. They were reviewed and are indicated in the Sensor Evaluation Summary with an asterisk in the space designated for the Summary page.

(U) Sensor Evaluation forms were prepared to facilitate the evaluation and display parameters compared. Selections within each class and sub-class are designated with the rationale for selection.

OR

(U) A listing of the evaluations performed follows (Sensor Evaluation Summary). The summary cites the classes, subclasses, and items evaluated; and references the Sensor fact sheets in the Defense Element Catalog in addition to the evaluation page(s) in the summary.

SENSOR EVALUATION SUMMARY

SUMMARY PAGE

DEFENSE ELEMENT CATALOG

ok

SUMMARY PAGE — DEFENSE ELEMENT CATALOG

*No Evaluations were prepared for items coded with an asterisk because they are the only members of a subclass (see catalog reference).

GROUND AIR SURVEILLANCE

VEHICLE DETECTORS

Man Portable

Truck Portable

Special Radar Techniques

Weapons Locators

OK

SUMMARY PAGE

DEFENSE ELEMENT CATALOG

OK

OK

SUMMARY PAGE	DEFENSE ELEMENT CATALOG
CAMERAS	A-1-129 thru A-1-138
FLASH DETECTORS	
FLASH DETECTORS VISUAL	A-1-140
PICEONS	A-1-149
REAL TIME TELEVISION	
UVR-313 LLL-TV	A-1-153
VISUAL - ILLUMINATORS	
BATTLEFIELD ILLUMINATION	
LIGHT SOURCE	A-1-213
MINILIGHT	A-11-24
MAGIS	A-11-23
WHITE NIGHT CONSTRUCTION LIGHT	A-1-215
XENON SEARCH LIGHT	A-1-216
60" SEARCH LIGHT	A-1-219
30" SEARCH LIGHT	A-1-218
18" SEARCH LIGHT	A-1-217

OK

SENSOR EVALUATION

CHEMICAL SENSORS

Only one identified.

Sensor:	XM-3 G.E. Ammonia Sniffer System
Function:	Detect Urea (Human Source)
Technique:	Airborne sampling & testing for ammonia
Deployment:	Minimum Fly-In conditions @ 100 ft. altitude at 120 knots or less. Requires .24 hour data on air content and atmospheric conditions.

EQUIPMENT PARAMETERS

Weight - 100 lbs.
Components - 7

2 boxes	12 x 12 x 12 inches
2 meters	2 x 2 x 2 inches
2 controls	3 x 8 x 5 inches
1 recorder	12 x 4 x 4 inches

Cost: Est $50,000 ea with spares

Operation:	1 Operator
Evaluation:	Under test detected 50,000 particles/cc within 10 miles (heavy personnel concentration AFB)
	Discrimination - doubtful
	Not useful for detecting personnel quantities below 15 (under ideal conditions)

SENSOR EVALUATION

CONTACT SENSORS

Only one identified with sufficient data

Sensor:	~~AN/GSS-9 Intrusion Detector and Alarm~~
Function:	Intrusion detection
Deployment:	Above ground around perimeter of secured area (2000 yds. circumference)
Technique:	Wire break circuit disruption and alarm
Equipment:	Break Wire loop Requires hook-up to audio or visual alarm system. Easily repaired or replaced by one man.
Evaluation:	Signal would require continuous monitoring.
	Wire can be broken by wind, animals, non-friendly or friendly forces. System - Nondiscriminate
	Could be used by non-friendly forces to acquire reconnaissance data or setting up ambush if detected.
	Most suitable for outpost defense alerting system.

CLASSIFY!

SENSOR EVALUATION

Electronic Countermeasures (30 Items)

Items of equipment for this purpose have been identified by Joint Nomenclature only.

No comparisons made because of insufficient data and the requirement for matching equipment to specific mission parameters.

SENSOR EVALUATION

FUNCTION: Magnetic Sensing

TECHNIQUE: Magnetometers

DEPLOYMENT:

FACTORS -	EQUIPMENT					
DESCRIPTION:	A-2	G FZ	G.4-102	M-49A	M-500	MF-1
SIZE						
WEIGHT	14 lbs.	7.6 Lbs.	18 lbs.	22: lbs.	6 lbs.	9 lbs.
PERFORMANCE: ENVIRONMENT						
PERFORMANCE: RANGE	50K Ga	60K-65K Ga	42.3K-83K Ga	16.9K ga to 101.02K ga	0-300K ga	1K to 100 ga
PERFORMANCE: SCAN DIM.						
PERFORMANCE: ACCURACY	Sensitivity 10-30 Ga	230-250 Ga per degree	± 10 Ga	± 5 Ga	± 5 Ga	20 Ga
OPN: POWER						
OPN: FREQUENCY						
OPN: DISCRIMINATION						
REL: MTBF						
REL: MTTR						
MAINTAINABILITY:						
AVAILABILITY:	3 weeks 1968	1½ mo. after 1968		2 weeks 1968	Dev. after 1968	
COST $/UNIT:	$1000	$1720	$3300	$3950	$1750	$1750
EVALUATION	The G.4-102, M-49A and M500 are most sensitive. Range favors the M500 as well as price					
RATIONALE	1968 - availability: M-49A, after 1968: M-500 and/or GM-102					

02

SENSOR EVALUATION

FUNCTION: Intrusion Detection

TECHNIQUE: Magnetic Sensing/Changes in Magnetic Field with Alarm

DEPLOYMENT: Ground Buried

FACTORS -		EQUIPMENT		
DESCRIPTION:		MCID	MDI	
SIZE				
WEIGHT				
PERFORMANCE:	ENVIRONMENT		All weather	
	RANGE	2 to 150M	12.5 to 18.5M.	
	SCAN DIM.			
	ACCURACY			
OPN:	POWER		Battery	
	FREQUENCY	DNA	DNA	
	DISCRIMINATION	Lightning False Alarm	No	
REL:	MTBF		Battery Life-3 mo.	
	MTTR			
MAINTAINABILITY:		Tamper Proof	Batteries 3 - Mo.	
AVAILABILITY:		1968	After 1968	
COST $/UNIT:				
EVALUATION		SELECTION: MCID for 1968		
RATIONALE		Only one available		

Ok

SENSOR EVALUATION

FUNCTION: Ground/Air Surveillance

TECHNIQUE:

DEPLOYMENT: Ground Based - Veh. Transportable

FACTORS -	EQUIPMENT		
DESCRIPTION:	AN/TPS-23	AN/TPS-54	AN/MPS-29 (XP-1)
SIZE		Ant-16'x12', Cont-18"x10"x12" Mast-21' RT-18"x12"x12"	Trailer mounted
WEIGHT	150 lbs.	600 lbs (includes power)	17,500 pounds
PERFORMANCE: ENVIRONMENT		Remote opn from 50 ft.	
PERFORMANCE: RANGE	35 KM	100 NM Alt - 30,000 Ft.	10 KM
PERFORMANCE: SCAN DEM.	Pulse: W-10 sec. 4550 PPS	4 RPM-Pulse W: 6 microsec 340 PPS Az Bw: 3.1	9990 PPS Pulse Width: .05 sec.
PERFORMANCE: ACCURACY	Res: 2 KM @ 3?4 mils	MTI-2-25 NM	Res: 7.5 meters scan mode angular: 3.6 mils
O&M: POWER	450 W, 115V AC, 60 CPS		200 V-AC, 400CPS, 3 ø 12 KVA & 28V-DC, 2.5 KW
O&M: FREQUENCY	410 MC	L-Band	69.75 KMC
O&M: DISCRIMINATION		MTI Mode Selector	Scanning mode with switch to search light mode
REL: MTBF		Built in test - Go-No-Go, Modular replacements - 2000	
REL: MTTR			
MAINTAINABILITY:		15 Min to calibrate	
AVAILABILITY:	After 1968	1968	Dev. after 1968
COST $/UNIT:		$150,000 ea - qts of 2?	
EVALUATION RATIONALE:	AN/TPS-54 serves as FAC counterinsurgency, Infiltration Detector Strike control, Resource, & contingency radar. The identification mode of AN/MPS is attractive. AN/TPS-because of availability & capability. Subsequent AN/MPS-29 (complementary) AN/TPS-23 favored for range and maintenance.		

02

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UNCLASSIFIED

SENSOR EVALUATION

FUNCTION: PERSONNEL AND VEHICLE DETECTION

TECHNIQUE: GROUND BASED RADARS

DEPLOYMENT: MAN PORTABLE (BACK PACKS)

FACTORS - EQUIPMENT

	DESCRIPTION:	AN/PPS-4	AN/PPS-5	AN/PPS-6	AN/TPS-30	AN/TPS-33
	SIZE			8" x 11" x 11"	H = 3' or 5'	
	WEIGHT	One operator Two-man carry (115#)	3 Manpack 95 lbs.	35 lbs.	60 lbs.	6man-pack 306 lbs
PERFORMANCE:	ENVIRONMENT	All Weather Day/Night				
PERFORMANCE:	RANGE	Man: 80 meters to 3Km Vehicle: 8Km	Man: 3 Km Vehicle .05 to 10 Km	Man:1.5 KM Veh:2 KM	20Cm to 20KM Sector: 20°	Man:.01-7.5KM Veh:.01-17KM
PERFORMANCE:	SCAN DIM.	6400 mils	180 to 80,000 meters @ 10Km	BW: 6° 2000 PPS	Pulse:0.1 USEC, BW-1.2°H&V 3000PPS	6400 mils;BW 180 or 53mils
PERFORMANCE:	ACCURACY	12 mils or 8 m @ 3.7Km. 19 mils @ 6Km	1000 meters-elev. 1-10 mils			± 20 mils at ± 40 meters
OPN:	POWER		6V-DC or 24V-DC Bat.	12 V BAT	6W to 20KW 110V-AC,400CPS,3Ø	
OPN:	FREQUENCY		16.0 to 16.5 gc	8.5 to 9.2KMC	1F:30MC 35ac	
	DISCRIMINATION		Manual Track		Noise-16db	
REL:	MTBF					
REL:	MTTR					
	MAINTAINABILITY:	Transistorized TBR: PPS-5 or 6	Replaces AN/PPS-4 and AN/TPS-33	TBR-AN/PPS-7		TBR-AN/PPS-5
	AVAILABILITY:	1968		TBR	After 1968	TBR
	COST $/UNIT:	$3024				$14,197
	EVALUATION	See Sheet 2 of 2				
	RATIONALE					

OK

Sheet 1 of 2

SENSOR EVALUATION

FUNCTION: Weapon Locators (Mortar - Mortar and Artillery-Artillery)

TECHNIQUE: Radar

DEPLOYMENT: Ground Based (Fixed)

FACTORS -			EQUIPMENT
	DESCRIPTION:	Omnidirectional Mortar Loc. Rad.	Counter Point Radar
	SIZE	4 antennas	10 units to a facility.
	WEIGHT	2000 lbs.	
PERFORMANCE:	ENVIRONMENT		All weather Day/Night
	RANGE	Max - 12 KM Slev - Unlimited	1200M - Mortar 300M - Round
	SCAN DIM.	360° F.O.V. Max. Targets - 20	360°
	ACCURACY	Res: .001 m^2 (60mm target)	Attacks Incoming Round
OPTI:	POWER	1500KW	
	FREQUENCY		
	DISCRIMINATION	Inflight Detect Digital-Real Time	
REL:	MTBF		
	MTTR		
	MAINTAINABILITY:		
	AVAILABILITY:	1st Unit 14 mo. AGA	After 1968
	COST $/UNIT:	R&D(3 prototypes) $5M	each unit at 250-400K

EVALUATION RATIONALE: considered for 1968 as well. If Mobility is desired AN/MPQ-10A and AN/MPQ-32 are indicated. The AN/MPQ-32 is favored.

This page is releasable

SENSOR EVALUATION

FUNCTION: Intruder Detection

TECHNIQUE: System Components, SEISMIC

DEPLOYMENT:

FACTORS -		EQUIPMENT	
	DESCRIPTION:	CJ-12 Amplifier	HS-1 Geophones
	SIZE	Amplifier + Bat + Recorder	1 7/8" x 1 5/8" d.
	WEIGHT	Portable 65 lbs.	Land - 9.5 to 16 oz. Marsh - 13 to 24 oz.
PERFORMANCE:	ENVIRONMENT		All Weather Operation
	RANGE		40 meters
	SCAN DIM.	24 channels 115 CPS Bandwidth	14-30 CPS
	ACCURACY	Selectable AQC-Rates 175-125-85-50 DB/sec - 1% Distortion	
OPN:	POWER		Compatible QT 2 Refraction Seismograph
	FREQUENCY	8-400 CPS FM-Recorder	
	DISCRIMINATION	AGC Threshold @ 1 micro-volt RMS input - Noise: 0.2 MV. RMS 917	Floating coil eliminates spurious frequencies
REL:	MTBF		
	MTTR		
	MAINTAINABILITY:		
	AVAILABILITY:	30 days 1968	1968
	COST $/UNIT:	$24,000	$13 each for 30 CPS
	EVALUATION	Both components should be considered - Application detect tunneling man.	
	RATIONALE	The channel capacity of the CJ-12 is attractive as well as weight for situations requiring full channel usage.	

SENSOR EVALUATION

FUNCTION: Detect Personnel and Vehicles

TECHNIQUE: Sound sensing (personnel and vehicles)

DEPLOYMENT: Vehicle or Man carried (man placed) (air drop TM-805 may be feasible)

FACTORS -		EQUIPMENT		
	DESCRIPTION:	Periguard	TM-805	
	SIZE		3" x 12"	
	WEIGHT	350#	2.8#	
PERFORMANCE:	ENVIRONMENT		Difficult	
	RANGE	± 5' along line		
	SCAN DIM.	10 ft.		
	ACCURACY	Gusty (35 mph) winds may false alarm		
OPN:	POWER		Battery	
	FREQUENCY	.02 to 10 CPS		
	DISCRIMINATION	Monitor Judgment	Monitor Judgment	
REL:	MTBF	30K hrs.		
	MTTR			
	MAINTAINABILITY:	Rodent - Repellant Unmanned.		
	AVAILABILITY:	1968	1968	
	COST $/UNIT:	$5000 ea.	$3850	
EVALUATION		Applications for both are envisioned		
RATIONALE		Both are considered because of deployment possibilities.		

SENSOR EVAILUATION

FUNCTION: Aided Night Sight - Troop Use - or Detecting IR Sources

TECHNIQUE: IR - Monocular

DEPLOYMENT: Hand held or Weapon mounted

FACTORS - EQUIPMENT

	DESCRIPTION:	Hand held Night Observation Device	M-5800	PNVD	Sniperscope	T-1 Weapon Sight
	SIZE					Similar sniger-scope - smaller
	WEIGHT	11 lbs	3 lbs	Weapon-Mounted	Package - 180 lbs.	20 lbs.
PERFORMANCE:	ENVIRONMENT	Starlight Con.	Invisible Light for Covert Surveillance	Limited by Fog-Rain		
PERFORMANCE:	RANGE	200 to 450 Meters	100 ft.	300 meters	300 meters	200-300 meters
PERFORMANCE:	SCAN DIM.	F.O.V. 19°		F.O.V. 8°		F.O.V. 142 mils
PERFORMANCE:	ACCURACY					
OPN:	POWER			Battery		
OPN:	FREQUENCY					IR - Whitelight
OPN:	DISCRIMINATION					
REL:	MTBF					
REL:	MTTR					
	MAINTAINABILITY:			Battery - 6hr Cont.Recharge		
	AVAILABILITY:	1968		1968	Stand. C. 1968	1968
	COST $/UNIT:	$5745		$677	$515	
	EVAILUATION	See Sheet 2 of 2				
	RATIONALE					

Sheet 1 of 2

UNCLASSIFIED

CAMERA EVALUATION

No attempt was made to evaluate cameras displayed under the headings:

- Airborne Reconnaissance Cameras
- Cartographic Cameras
- Panoramic Cameras
- Television Cameras
- Ungrouped Miscellaneous Cameras

Selection of cameras is highly dependent on mission parameters (lighting conditions, film and shutter speed, aircraft speeds, resolution required, and altitude flown and photography purposes and requirements).

Typical cameras were identified for some anticipated operating modes.

Airborne Reconnaissance Cameras

KA-51A Low-Altitude Reconnaissance

KA-30 General-Purpose - Low to Medium Altitude Day/Night

F-426 Low to High Altitude - Day/Night

KA-1 Medium to High Altitude - Framing Camera-All Speed - Day Reconnaissance

HR-228 High Altitude - lightweight

KS-72A Low to Medium Altitude - Day/Night

Cartographic Cameras

KC-1B Lens distortion less than 10 microns and a plateu flat to 0.0002 inch

T-11 Precision topographic mapping camera with AEC (Automatic Exposure Control)

OK

Panoramic Cameras

F-415 Low Altitude - Rotary Prism

F-409 Low to Medium Altitude

F-436 Medium to High Altitude - Stationary Film, Oscillating Lens

D-416 High Altitude, Rotary Prism

Television Cameras

200 Series	All environment TV camera solid state miniaturized circuitry designed for use with Control Unit (CU) 1995
Fairchild Airborne System	LLL-TV for drones or manned aircraft-direct viewing or transmission to remote base for real time display and recording
Lear Siegler Airborne System	Low-Altitude, Forward-Looking Reconnaissance with air/ground image orthicon TV system for ground filming and viewing from manned aircraft or drones up to 10 miles between camera and ground station

Ungrouped Miscellaneous Cameras

CA-120 Covert Camera

Night Laser Camera

OK

CANDIDATE WEAPONS

(U) Individual weapons presently in use in SEA were considered to be the best choices from the spectrum of individual weapons available for base defense. The weapons list includes many items of Standard B or lower standard which have been superseded by more modern and better weapons. Those Standard A items are the weapons in widespread use in Vietnam today. These include the M16 and M14 rifles which are lighter in weight and fire lighter weight cartridges, resulting in more efficient and suitable weapons for a COIN environment.

(U) Only one anti-intrusion warning mine, the XM44, was identified in the defense elements catalog, so no trade-off evaluation is possible in this category. Table 4-I summarizes the major characteristics of the four anti-personnel mines described in the catalog.

(U) Table 4-I

ANTIPERSONNEL MINES

	CASUALTY AREA	DANGER AREA	TRIGGER MECHANISM
M14	Nonlethal	Immediate area	Point contact
M16	30 mi radius	200 mi radius	Trip wire, prongs
M18	50 mi within 60° sec	250 mi front side, 100 mi rear side	Trip wire, remote control
M25	Nonlethal	Immediate area	Point contact

UNCLASSIFIED

For a base perimeter impediment and defense element, the M18 claymore anti-personnel mine appears to be the most effective mine with its rather large area of effectiveness and directional characteristics as well as the versatility of control, either trip wire or remote control. The M18 bounding-type mine is recommended as an alternate, as it also has a reasonably large area of effectiveness, if the larger danger area on the back side or friendly side of the perimeter does not pose a great problem in the particular area of employment. No evaluation of antitank mines was performed as tanks and other vehicles were not part of the threat to the air bases in this analysis in such numbers or methods of employment that the use of these mines was practical.

(U) Two grenade launchers are listed under "Crew Served Direct Fire Forward Area Weapons" in the catalog. Both are developmental items. The XM172 is short range (350 meters effective range), semiautomatic, crank-type 40mm grenade launcher with flexible belt feed and maximum rate of fire of 250 shots per minute. The second one, the XM175, listed is a blowback recoil-type automatic 40mm grenade launcher firing long range (2,200 meters effective range) 40mm grenades from a metallic link belt at a maximum rate of 350 shots per minute. Each of these is recommended for its respective class of weapon.

(U) A rather large list of antitank rifles, rockets, and missiles has been identified in the catalog. As the projected threat to the air bases does not include any large-scale attacks utilizing tanks or other vehicles but rather only the possibility of a stolen friendly vehicle, APC, or similar situation, the use of the individual-type weapons or less complicated layout weapons is recommended. In keeping with these constraints, the 66mm M72 LAW rocket launcher is recommended for a small, inexpensive, shoulder fired weapon with a short-range capability (230 meters against armored vehicles) and disposable launch tube. For a heavier, longer range weapon (MAW type) the Dragon anti-tank guided missile system is recommended. This system is a light (27 pounds), shoulder fired, command guidance weapon that has a minimum range of 400 meters and maximum range of 1,500 meters. For a heavy antitank weapon (HAW) the (tube-launched, optically tracked, wire-guided (TOW) guided missile system MGM-71A is recommended). This system weighs approximately 160 pounds, has a range in excess of 3,000 meters, and requires a four-man crew.

(U) Recommendations for machine guns, principally for ground use, are as follows for the individual classes and types. Only one light, flexible machine gun was identified, the M60 7.62mm. For a light, vehicle-mounted, machine gun the M73 7.62mm weapon is recommended over the M37 which is a Standard B item. The M73 is recommended over the miniguns, as the very high rates of fire are not considered really necessary for the soft relatively slow target, the VC, and would actually pose problems in ammunition resupply, as well as the support problems of gun drive battery charging. The miniguns are also more expensive. Only one heavy flexible machine gun for ground use, the .50 caliber M2, was identified. For a heavy, fixed-vehicle-type machine gun the M85 .90 caliber weapon is recommended because of its simplicity, ease of maintenance and operation, and selective firing rate.

(U) Initial comparisons of the greatly increased costs of self propelled mortars over conventionally mounted mortars coupled with the lack of a true requirement for a highly mobile mortar weapon resulted in the elimination of the self propelled mortars from the recommended list. Of those remaining, the 81mm M29 mortar is recommended for a medium-range mortar which is more effective than the 60mm round and has sufficient range (approximately 4,000 yards for HE) to counter the prevalent 82mm standoff threat. For an even longer range mortar the M30 107mm grenade launcher with an approximate maximum

range of 6,000 yards with HE ammunition is recommended. The latter could be used to counter the standoff threat up to and including the 107mm mortar and 102mm rocket threats. (U)

(U) Air defense weapons recommendations include those items presently in use by the Air Base Air Defense (ABAD) units. These are the Vulcan system, the HAWK system, and the Chaparral system. No change of types of equipment for this air defense unit is suggested.

(U) A rather large number of tube artillery weapons were identified in the catalog. As was the case with mortars, initial analysis indicated that, lacking a definite requirement for highly mobile artillery pieces in a base defense situation, the self-propelled artillery pieces were not recommended where there existed counterparts of a towed variety. Table 4-II describes the main characteristics of the artillery weapons examined.

(U) Table 4-II

TUBE ARTILLERY

	Type	Range	Sustained Rate of Fire	Weight Lb.	Cost
105mm M101A1	Towed	12,330 yd (HE)	1.7/mm	4,980	$ 17,328
105mm M102	Towed	11,000 mi 15,000 mi	3/min	3,140	49,735
105mm XM164	Lightweight Towed	--	N/A (Development)	--	--
155mm M114A1	Towed	14,600 mi	1/min	12,950	30,618
155mm M123A1	Towed, Aux prop.	14,600 mi	N/A	14,710	54,794
175mm M107	Self prop.	32,810 mi	.5/min	62,100	131,493
8-inch M115	Towed	16,800 mi	.5/min	29,700	65,784

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For a 105mm class of weapon the M102 105mm howitzer is recommended for its capability to accept extended range ammunition, high rate of fire, and lightweight, despite its increased cost. The M114A1 towed 155mm howitzer is recommended for a 155mm weapon over the M123A1 because of the equal range performance, lighter weight, and less cost. No trades remain for either the 175mm or the 8-inch classes of weapons as only one item in each of these respective classes are shown in table 4-II. Each of the later weapons has

sufficient range to direct counterfire upon all the projected mortar threats and the rocket threat up through the 140mm rocket. The 175mm gun has sufficient range to counter the 200mm rocket threat. (U)

(U) Of the surface-to-surface rocket artillery listed in the defense elements catalog, only the Lance and Honest John are identified as having conventional ordnance capability. Either of these weapon systems has sufficient range (maximum range of the Honest John is approximately 92 km and of the Lance is approximately 48 km) to counter all of the standoff threats except the 250mm rockets, although the use of these weapons appears rather costly.

(U) A wide variety of types of assault vehicles has been identified in the catalog. Of these the full-tracked combat tanks were considered too costly and more vehicle than is required for base defense. The major requirements for these assault vehicles are armor, reliable transportation for reaction forces and patrols, and antipersonnel weapon systems. The vehicles which fulfill the requirements at a reasonable cost are the 4X4 armored car XM706 (Commando) and the various versions of the M113 APC, as the XM734 which has firing ports built into the vehicle. The XM706 is especially attractive because of its low cost ($13,000) and is a wheeled vehicle which can be driven around the base without tearing up the roads as would a tracked vehicle. It can also be driven on punctured tires as the sidewalls of the tire are sufficiently strong to support the vehicle.

(U) Recommendations on the aerial weapons systems were strongly dependent on the aircraft on which they are mounted and on the mission requirements. For these reasons these recommendations will be given in section IV.

CANDIDATE AIRCRAFT

(U) With the large inventory of aircraft to select from and their various characteristics and capabilities, the level of analyses performed here were intended to provide representative aircraft for each of the missions defined. As representative, they may be replaced by suitable substitutes, considering both function and cost.

(U) Five basic aircraft missions have been identified which can contribute to the overall defense and security of an installation against ground attack. For the purpose of this study these missions were defined as follows.

1. Reconnaissance/Surveillance: The function of observing a defined section of terrain for the purpose of detecting activities on the ground which may directly or indirectly effect the safety of the installation.

2. Identification: The task of determining with some level of certainty that the detected activities pose a threat to the installation.

3. Strike: The function of bringing to bear sufficient firepower to destroy or otherwise negate the threat posed by an identified enemy force.

4. Command, Control, and Communication (C^3): This includes the two functions of (a) acting as relay station for signal from remote ground sensors to the Central Security Control, and (b) providing a means of coordinating localized ground activities and directing action against the enemy.

5. Airmobile Reaction: This is the function of transporting troops from their alert station to the scene of enemy activity. (U)

(U) The process by which candidate aircraft were selected is shown by the following series of matrices. The first of these, table 4-III, shows the aircraft requirements considered as significant for each of the missions. Aircraft types (series) identified in the column on the right appear to be the most suitable for the missions.

(U) The similarity of aircraft requirements for the reconnaissance/surveillance mission and the C^3 mission allow for comparison of both on a single matrix, table 4-IV. Four candidates were selected in order to be assured by covering the payload requirements that might be expected in either mission. High endurance for each of the payload classes was the second factor for the final selection.

(U) For the identification mission, table 4-V, one fixed wing and one rotary wing candidate aircraft were selected. The possibility of having to make a direct rather than remote (sensor) identification was the reason for the inclusion of the helicopter.

(U) Fighter and large attack type aircraft were intentionally omitted from the strike mission matrix, table 4-VI, for several reasons. The primary reason for this omission was the apparent inefficiency of using such highly sophisticated aircraft to maintain a strike alert status when they could be better used for tactical operations on a scheduled basis. Another reason was that the general types of engagements expected were better suited to a slower ordnance platform with, perhaps, a longer time on-target.

(U) Aircraft with conventional engines were also eliminated from use in a ground alert capacity because of their longer reaction time as compared to a gas turbine. The UH-1D was selected as the prime ground alert candidate since it has a wider range in its ordnance carrying capability as compared

(U) Table 4-III

MISSION AIRCRAFT REQUIREMENTS

MISSION	AIRCRAFT REQUIREMENTS							POTENTIAL AIRCRAFT TYPE (SERIES)
	CARGO CAPACITY	WEAPONS DELIVERY	ENDU[illegible]	SPEED	PERSONNEL TRANSPORT	HELICOPTER CAPABILITY	RANGE ALL WEATHER CAPABILITY	
Recon/ Surveil.	Yes		Y				Yes	C,U,O,R
Identif.			Yes		Possibly	Possibly	Yes	U,O,H
Strike		Yes	Possibly			Possibly	Yes	A,H(modified),O
C^3	Yes		Yes				Yes	C,U,O
Airmobile	Yes				Yes	Yes	Yes	H

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(U) Table 4-IV

AIRCRAFT COMPARISON - RECONN./SURVEIL. AND C^3 MISSIONS

AIRCRAFT	CARGO CAPACITY	ENDURANCE	ALL WEATHER	REMARKS
C-7A	4,000#	9.0 Hr.	Yes	*Med-Hvy payload
C-47D	7,000#	8.5 Hr.	Yes	
C-119	13,000#	10.6 Hr.	Yes	
C-123B	11,000#	13.4 Hr.	Yes	
C-130E	19,500#	14.3 Hr.	Yes	* Heavy payload
U-1A	1,900#	5.2 Hr.	Limited	
U-3A	670#	5.7 Hr.	Limited	
U-6A	1,050#	3.3 Hr.	Limited	
U-7A	250#	9.0 Hr.	No	
U-10D	700#	7.5 Hr.	Limited	
O-1C	50#	5.0 Hr.	No.	* Light payload
O-2B	760#	7.9 Hr.	Limited	* Med-light payload
OV-1C	App. 500#	4.0 Hr.	Yes	
OV-10A	850#	3.6 Hr.	Yes	
RB-47	None	7.5 Hr.	Yes	Over Size
RB-57	None	8.75 Hr.	Yes	Over Size
RB-66	Appro. 4,000#	4.8 Hr.	Yes	Over size
RC-130	10,000#	8.7 Hr.	Yes	Over Size

* Candidate aircraft

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(U) Table 4-V

AIRCRAFT COMPARISON - IDENTIFICATION MISSION

AIRCRAFT	ENDURANCE	PERSONNEL TRANSPORT	HELICOPTER	ALL WEATHER	REMARKS
U-1A	5.2 Hr.	10 Pass.	No	Limited	Over Sized
U-3A	5.7 Hr.	3 Pass.	No	Limited	
U-6A	3.3 Hr.	5 Pass.	No.	Limited	
U-7A	9.0 Hr.	1 Pass.	No.	No	
U-10D	7.5 Hr.	5 Pass.	No	Limited	
O-1C	5.0 Hr.	1 Pass.	No	No	
O-2B	7.9 Hr.	3 Pass.	No	Limited	*
OV-1C	5.0 Hr.	1 Pass.	No	Yes	
OV-10A	3.6 Hr.	1 Pass.	No	Yes	
UH-1F	3.1 to 2.9 Hr.	5 to 10 Pass.	Yes	Yes	*
SH-3A	4.9 Hr.	12 Pass. (Est.)	Yes	Yes	Over Sized
CH-3E	5.9 to 3.1 Hr.	7 to 25 Pass.	Yes	Yes	Over Sized
UH-13D	2.0 Hr. (Approx.)	3 Pass.	Yes	Yes	
UH-19B	.7 Hr.	10 Pass.	Yes	Yes	Low Endurance
CH-21C	2.5 Hr.	20 Pass.	Yes	Yes	Over Sized
CH-37C	3.0 Hr.	20 Pass.	Yes	Yes	Over Sized
UH-43C	3.1 Hr.	3 Pass.	Yes	Yes	
CH-47A	1.9 Hr.	34 Pass.	Yes	Yes	Over Sized
CH-53A	1.7 Hr.	38 Pass.	Yes	Yes	Over Sized

* Candidate aircraft

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(U) Table 4-VI

AIRCRAFT COMPARISON - STRIKE MISSION

AIRCRAFT	WEAPONS PAYLOAD-TYPES	ENDURANCE	REMARKS
AT-37D	300# G,B,R,N,ED	.6 Hr.	
OV-10A	3600# G,B,R,N,GD,F	3.6 Hr.	* Alert (Alt.)
AC-47	7000# G, F,L	8.5 Hr.	* On-Station 1968-1969
AC-130	19,500# G, F, L	14.3 Hr.	* On-Station 1970 and subs
AH-1G	2100# G,R,GD	2.0 Hr. (Est.)	
AH-56A	8000# G,GD	3.0 Hr.	
UH-1D	4000# G,R,M,GD,L	2.0 Hr.	* Alert

* Candidate Aircraft

Key

G = Guns
B = Bombs
R = Rockets
N = Napalm
M = Missiles
GD = Grenades
F = Flares
L = Lights

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to the other two helicopters. A second reason is that it could be used in the double capacity of transporting troops and as a weapons platform. The use of a helicopter has an advantage over a fixed-wing aircraft on the alert strike mission through its independence from runway traffic problems, both on initial scramble and for turnaround servicing. (U)

(U) The helicopter was the only type of aircraft considered for the airmobile mission, table 4-VII. Selection of a single candidate from those listed in the table was deemed too restrictive because of the number of troops which might be employed in an airmobile action. For this reason two sizes were selected based on passenger carrying capability. Cargo capacity was the final factor used in selecting the candidate for each of the passenger categories. The relatively larger cargo capability of the UH-1F and the CH-47A allows for more efficient support of the troops once the action has begun.

CANDIDATE DRONES

(U) There have been only two drones identified for possible use in the defense of bases. While there might be some disadvantage to the use of this type of air vehicle at night, tie-in with a radar position monitoring system could result in a credible system. Since one of the drones is fixed wing and the other is rotary wing, they have both been included as candidate elements.

CANDIDATE BALLOONS

(U) Recommendations for balloon-type airborne platforms are a direct function of the type of equipments to be placed on board the craft and the operational requirements of these equipments. For this reason the selection of a balloon-type airborne platform will be delayed until a specific combination of equipments with their respective requirements is to be evaluated (task IV). It should be noted, however, that the use of tethered balloons could pose a serious flight hazard.

CANDIDATE GROUND VEHICLES

(U) The only ground vehicles recommended for direct application to the immediate base defense requirement are those recommended under "Section III-WEAPONS, Assault Vehicles." None of the ground vehicles in Section VII are armored and are thus not considered as desirable as armored vehicles.

(U) Table 4-VII

AIRCRAFT COMPARISON - AIRMOBILE MISSION

AIRCRAFT	CARGO	PERSONNEL TRANSPORT	REMARKS
UH-1F	4000# Sling 2545# Internal	10 Pass.	* For small force deployment
SH-3A	2400# Internal	12 Pass. (Est.)	
CH-3E	8000# Sling 5000# Internal	25 Pass.	
UH-19B	2000# Sling 1750# Internal	10 Pass.	
CH-21C	4500# Internal	20 Pass.	
CH-37C	7000# Internal	20 Pass.	
CH-47A	13,000# Sling 10,000# Internal	33 Pass.	* For large force Sling for Outsize cargo
CH-53A	8,000# Internal 12,700# Overload	38 Pass.	

* Candidate aircraft

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GROUND PLATFORMS

(U) The selection of a suitable ground platform was, as was the selection of airborne platforms, a direct function of the requirements of the equipment to be supported. For this reason selection was delayed until specific applications were proposed in the design process. The use of towers of any considerable height would have the disadvantage of posing a distinct flight hazard.

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REVETMENTS AND SHELTERS

(U) Numerous aircraft revetment concepts have been described in the defense elements catalog. Table 4-VIII summarizes the protection levels afforded by each of these methods. From the standpoints of construction time, cost, protection level, minimum maintenance and versatility, the Armco Steel Bin appears to be the best general-purpose aircraft revetment.

(U) A summary of the protection levels afforded by the aircraft shelters cataloged are given in table 4-IX. The Wonder Arch appears to afford a reasonable amount of protection for a relatively simple type of construction requiring minimal equipment and construction time. It is estimated the cost will be low compared to the other shelters affording comparable protection. The Wonder Arch will afford better protection if equipped with armored doors, nylon blanket doors, or some similar protection over the ends of the shelter. These tend to increase cost greatly, however, and pose problems in operating under field conditions.

(U) Table 4-X summarizes the protection characteristics of the personnel shelters cataloged. None of the listed personnel shelters were rated as very desirable. The AAI personnel shelter affords no protection from direct rifle fire or delayed fuze mortars or rockets. The WES Newmark Arch is a timber construction requiring considerable labor to construct and considered not a very good building material for the SEA environment. The WES concrete arch is a precast concrete structure that will protect against the 155mm howitzer but is logistical difficult and expensive to transport to the air base and install. A simple shelter like the Wonder Arch with end protections is recommended for a personnel shelter. The structure could be sized to fill the specific requirements of the base.

(U) Table 4-IX

BARRIERS

(U) Barriers in general are of little use in base defense other than simple boundary delineation if they are not paired with a detection system such that the momentary delay encountered by the enemy when breaching the barrier can be utilized to ready and position defensive forces to counter the attack. A secondary use of barriers might be to prevent spoofing of sensors by animals and accidental penetrations by friendlies.

(U) For barriers, a multiple-strand cattle fence just outside sensor detection range (either with or without a chicken wire skirt, depending on sensor spoofing characteristics from animals) is recommended. This serves as an outer barrier for boundary delination and to prevent accidental friendly penetration and false alarms from animals. Inside any sensor detection area, a triple concertina fence paralled by 20-meter-wide area of caltrops at a density of 85 per meter length of barrier is recommended for an impediment. The later combination of concertina wire and caltrops would serve to delay the penetration as well as to inflict an estimated 50% injuries to the intruders.

SECTION V

ELEMENT COST DATA

Section V

ELEMENT COST DATA

GENERAL APPROACH

(U) The basic approach was to develop the initial investment and annual combat operating costs for each air base defense element (equipment or weapon item), in order to permit calculation of total costs for any mix. The costs for each element are a per-item slice, including costs for the material, for its direct manning, and for the required command, support, and overhead.

(U) The per-item cost slices have been estimated in two different ways, depending upon whether the item is or is not the primary weapon of a military unit organized for the purpose of operating and supporting that weapon.

COSTS FOR OTHER EQUIPMENTS

(U) Comparable cost slices for the other types of elements, such as detectors and radars, were derived differently, since there exist no military units organized solely to operate such individual items. In the case of these elements, the per-item costs have been built up as the sum of the costs for the material, for the direct manning, and for the command and support

DIRECT MANNING

(U) The total number of direct personnel, or operators, required per item (exclusive of command and support personnel) was estimated as four times the number of duty posts, inasmuch as these equipments are to be manned

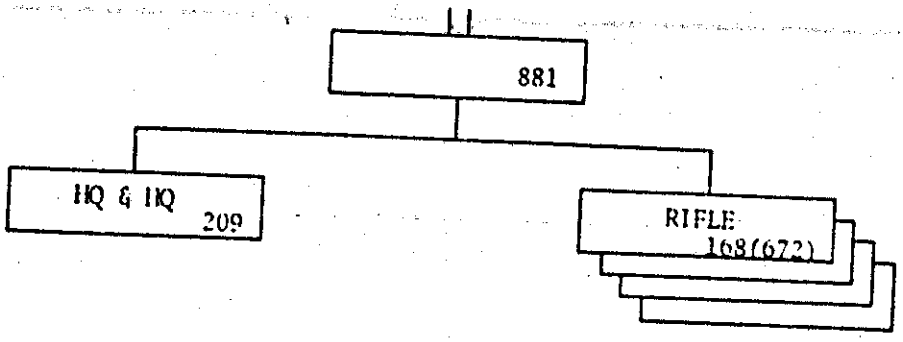
continuously, 24 hours per day. Reference 1 indicates that "after allowing for average absences for illness, training, other organizational duties, etc." a factor of four would mean that each operator would be at his primary duty post for about 51 hours per week. For 40 hours per week, the factor would increase to about five, while for 60 hours, the factor would drop to about 3.4. (U)

(U) As indicated in table 5-1, the batallion personnel total 881. The "indirect," or command and support, personnel include all in the headquarters, and headquarters company, plus about 35 men (11 in company headquarters, plus 4 platoon leaders, 4 platoon sergeants, and 16 squad leaders) in each company, leaving about 133 men per company, or 532 for the battalion, as "direct" personnel, exclusive of command support.

(U) Table 5-I

BATTALION ORGANIZATION AND EQUIPMENT

TOE: 7-55T Infantry Battalion,
Airmobile Division
(ARCOV)



VEHICLES	WEAPONS	COMMUNICATIONS EQUIPMENT
10 Trk 1/4-Ton	37 Mg 7.62mm	2 AN/GRC-106
20 Trk Util 1/2-Ton	16 Mort 81mm	1 AN/GRC-125
2 Trk 3/4-Ton	106 Lchr Gren 40mm	72 AN/PRC-6
6 Tlr 1/4-Ton Amph	4 Rifle 106mm	90 AN/PRC-25
2 Tlr 3/4-Ton	679 Rifle 5.56mm	3 AN/PRC-47
2 Veh Util 2-Wheel	197 Pistol .45 cal	1 AN/VRC-24
		1 AN/VRC-46
		2 AN/VRC-49
		1 AN/ARC-122

Source: Reference 3

[redacted]

ELEMENT COSTS

(U) Costs for elements were computed on individual worksheets. Computed data are summarized in the following 9 pages which comprise table 5-III.

SECTION VI

REFERENCES

REFERENCES

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19. "Standard Aircraft Characteristics," (SAC) charts.

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21. "U.S. Army Material Requirements, 1968-1978 Equipment Descriptions," North American Rockwell Corporation, 1 January 1968.

APPENDIX A

DEFENSE ELEMENT CATALOG

FOREWORD

(U) The "Defense Elements Catalog" contains descriptions of the defense elements considered in the development of preliminary air base defense system designs. Items considered for base defense are listed in the Table of Contents. Some are not described in this appendix but, rather, reference is made to this description in a few official publications. This was done to avoid repetition of voluminous official descriptions and cataloging previously completed by various government agencies. Only those items for which technical data were obtainable are listed in the catalog.

(U) For the user's convenience, an outline of the sections contained in this appendix is presented below.

DEFENSE ELEMENT CATALOG

OUTLINE

DEFENSE ELEMENT CATALOG

TABLE OF CONTENTS

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RADAR (Continued)

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