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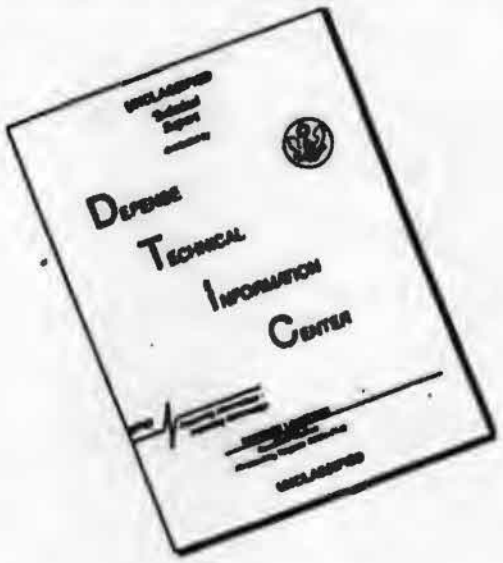

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Report No. QR-8

QUARTERLY REPORT

1 Oct. - 31 Dec. 1962

PROJECT AGILE

ADVANCED RESEARCH PROJECTS AGENCY

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ADVANCED RESEARCH PROJECTS AGENCY

PROJECT AGILE

QUARTERLY REPORT

1 October - 31 December 1962

15 January 1963

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FORWARD

This issue of the Project AGILE Quarterly Report includes a description of the existing and planned research and development programs for each of the eight subprojects. In addition to more fully informing the recipients of this report, it is thought that by so doing recommendations that will assist in further defining the content of the individual subprojects, the tasks to be performed, the priority of effort, and new ideas relating to specific weapons, equipment, and devices will result. Such comments and suggestions are solicited.

This report is classified CONFIDENTIAL and is released to the foreign governments participating in Project AGILE on a need-to-know basis. Information relating to some of the tasks that require a higher classification is excluded and so noted. Also, because this report contains the longer range programs and objectives of Project AGILE it should not be re-transmitted to existing or potential Government contractors.

R. C. Phelps

R. C. Phelps
Assistant Director for
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Advanced Research Projects Agency
Washington 25, D. C.

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CONTENTS

ADVANCED RESEARCH PROJECTS AGENCY

PROJECT AGILE

REMOTE AREA CONFLICT RESEARCH & ENGINEERING

MISSION

Project AGILE performs research and engineering support for the military and para-military forces engaged in or threatened by conflict in remote areas of the world. Its activities are oriented toward the requirements of the indigenous forces in these areas, while the Service research and development agencies are primarily concerned with the requirements of the U. S. forces.

At the present time, Project AGILE is providing research and engineering support for the forces engaged in Vietnam and to the Ministry of Defense in Thailand. Preliminary discussions with U. S. officials in other countries to explore the feasibility and desirability of R&D support for those forces have been approved by OSD and State and are under way.

REQUIREMENT

There are several forms of conflict which lie below the threshold of that categorized by the term "Limited" War, and there are many remote areas of the world where discretely different environmental conditions affect the nature of any level of conflict which can or does exist. The counterinsurgency conflict in Vietnam and the border war between India and Red China are two current examples of quite different types of warfare - each of which has some discrete materiel requirements.

Until quite recently, U. S. Country Teams faced with these conditions could draw only on supplies of weapons and equipment designed fundamentally for employment by U. S. Forces, with their attendant logistical support systems, in General and Limited Wars. Past and present experience has demonstrated that weapons and equipment supplied under the MAP program in these situations are often less effective than current technology is capable of developing and the U. S. is able to supply at an acceptable cost.

The not unlimited economic, military, and technological assets of the U.S support to those Free World countries threatened by or experiencing insurgency and other forms of conflict in remote areas, the increasing capability of the Communist Bloc to mount and support such activity, the wide-ranging commitments of the United States to aid in the defense of threatened countries, the environmental and tactical peculiarities of these conflicts, and the physiological and psychological nature of the indigenous personnel engaged all combine to establish the necessity that an integrated and improved capability be developed within the U S Government to counter these threats. Project AGILE was created to provide one of the essential elements, that of performing the research, development, test, and engineering of more suitable and effective devices, weapons, and equipment for employment under these conditions.

ORGANIZATION

The mission assigned and the tasks to be performed have determined the general form of Project AGILE organization.

Development of a capability to acquire and analyze data, from which requirements for remote area conflict research and development are derived, has been accomplished by the creation and implementation of a plan for Research and Development Field Units; two of the units are now in Southeast Asia, one located in Saigon and the other in Bangkok. These Field Units bring to bear a broad spectrum of military and technical capability; they are staffed by officers with research, development and combat experience from each Service, and by civilians with scientific or technical specialities particularly suited to the tasks assigned to these units. The capabilities of the field units are augmented from time to time by the assignment of teams of research, or technical specialists on an ad hoc basis. Such teams are organized and staffed to perform specific tasks which are either beyond the normal capability of the Field Unit to accomplish or of such immediate concern that the task must be accomplished more rapidly than the capability and capacity of the permanent staff of the Field Unit permits.

These Research and Development Field Units are combined with a contingent of military officers from the various Services of the host country to form Combat Development and Test Centers (CDTCs). The Director of the CDTC is a senior officer of one of the Services of the

host country; his deputy is the senior American on the permanent staff of the Field Unit. Basically, the organization plan for the CDTCs pairs a military officer from the host country with each U.S. military officer. Although the initial emphasis of Project AGILE and the presently existing Field Units are concerned with Southeast Asia, similar, although initially smaller Field Units are being considered by OSD for other areas of the world.

On August 1, 1962, a plan for establishing a Joint Operations Evaluation Group in Vietnam (JOEG-V) was implemented. The Secretary of Defense subsequently directed that the Research and Development Field Unit and JOEG-V operate from the same facility under the control of a single U.S. director, who is responsible for both U.S. elements JOEG-V was assigned responsibility for evaluation of combat operations and user (U.S Service) tests Project AGILE continues to be responsible for all research, development, test and evaluation for remote area conflict in support of indigenous forces, for the development of research and development requirements, and the engineering tests of equipment and systems.

The Field Units are coordinated and controlled from Washington by OSD/ARPA. An AGILE staff in Washington performs those functions which are beyond the capability of the Field Units to perform in-country. It also provides the means for integrating and controlling the total effort, provides the scientific and technical support for the various tasks and projects described below, and assembles and coordinates those ad hoc groups which are sent into the field from time to time to augment the capability of the Field Units. In addition, the Staff reviews the efforts of Field Units to insure that valid data and requirements have been obtained or developed, and conducts broader studies into the elements of Remote Area Conflict.

The Staff provides or obtains the scientific and/or technical assistance required to accomplish the various tasks, either in the field or in the U.S It is charged with the responsibility of maintaining liaison with all Service and civilian laboratories engaged in or capable of supplying the specific talents required by the Project, within the U.S. and within other nations with whom the U.S. is closely allied. One of the major objectives of Project AGILE is to bring the broadest applicable spectrum of scientific and technical capability to bear on the unique problems of Remote Area Conflict, in an endeavor to substantially

enhance the capability of U.S. and friendly foreign governments threatened with, or engaged in this form of conflict.

The various tasks undertaken by Project AGILE have been grouped into the following project areas:

1 Tactical Unit Weapons Systems

2. Area Fire Weapons Systems

3. Remote Area Mobility and Logistics Systems

4 Communications Systems

5 Combat Surveillance and Target Acquisition Systems

6. Individual and Special Projects

7 Technical Planning and Programming

8 Research and Exploratory Development

REPORTS

Each Field Unit issues a monthly report, and a quarterly report is prepared in Washington summarizing the activities of the individual Field Units and the work performed in CONUS Both the monthly and quarterly reports receive wide distribution within the Department of Defense, additional copies are provided to other interested Departments and Agencies and on a need-to-know basis to the foreign governments participating in Project AGILE.

Interim and final test reports for the individual tasks are prepared and distributed as the information becomes available. These reports are referred to but not incorporated in the monthly and quarterly reports.

Tab 1

AGILE PROJECT 1

Tactical Unit Weapons Systems

PROJECT OBJECTIVE:

To provide significant improvement in the organic weapons and equipment employed by small tactical units engaged in conflict in remote areas. This objective is derived from the Project AGILE mission which is to provide research and engineering support for the indigenous forces engaged in such conflict with ancillary consideration of the requirements of U.S. forces. Under this task, research and engineering efforts to significantly improve the weapons, equipment and devices used by the individual soldier are undertaken. This task also includes those weapons, devices and equipment required by ground forces operating in tactical units up to company level.

PROJECT BACKGROUND:

Current research and engineering efforts to be accomplished under the primary mission of Project AGILE are to a great extent influenced by the nature of the conflict in which the indigenous forces of friendly governments are engaged at this time. Such operations place a much greater emphasis on the small tactical unit as the primary combat element while, at the same time, the use of heavy ground support weapons, such as tanks and artillery is diminished.

In these operations, the enemy generally is armed with small hand weapons, recoilless rifles and mortars, and strike at the time and place where they have a high probability of success. No definite battle lines are drawn. These forces rely heavily on the natural topographic and climatic advantages of the remote areas in which these conflicts take place. Often both terrain and weather combine to create conditions under which the sophisticated mechanization of modern armies is of little use. Under certain conditions, it is only the foot soldiers operating in small "hunter/killer" groups which will provide a counter-threat to guerrilla domination of an area. It is the function of the Tactical Unit Weapons system to provide scientific and technical support to friendly indigenous forces by developing weapons and weapons systems which will eventually improve their capability to win in this form of conflict.

PROJECT DESCRIPTION

In order to accomplish the requirements of AGILE Project I a series of tasks have been established

1 Assault Rifle

A. This task was initiated to provide a weapon better suited to the individual soldier A lighter, more effective weapon capable of delivering accurately aimed, high rates of fire is desired.

2 Special Purpose Weapons

This task comprises a group of weapons, weapons systems and auxiliary equipment which are intended to provide a special capability not now available to the indigenous forces

A Special Shotgun - The shotgun is particularly suitable to the needs of friendly paramilitary forces where quick reaction and high lethality at moderate ranges is required This sub-task deals with the design and development of shotguns designed expressly for such needs

B Microrocket Projectiles - This sub-task has been initiated to provide detailed information on the feasibility of small caliber rocket projectiles as ammunition for individual weapons Investigation of the cost, lethality, weight and accuracy of a family of microrocket projectiles is being studied both by theoretical analyses and experimental testing

C M79 Grenade Launcher - A sub-task was initiated to provide information on the applicability of this weapon to indigenous forces, and the development of optimum rounds

D Lightweight Automatic Weapons - This task is devoted to a feasibility study and development of improved automatic weapons for use by small tactical units of ground forces

[redacted]

E. Lightweight Jungle Mortar - As in the case with the lightweight automatic weapon, a need exists for improved mortar weapons designed for use in remote areas. New designs for mortar weapons will be based on increasing the lethal effect of the shell in order to reduce the weight per round as much as possible thus allowing either a reduction in the total weight carried or an increase in the number of rounds which might be used for the same weight.

F. Man-Portable Flame Throwers - The role of flame weapons in remote area warfare is being investigated at present. Although needs have increased for new flame weapon systems, very little work has been done in this area since World War II. This task proposes to take advantage of many new advances which have been made in materials of construction and in improved systems design which have resulted from research and development in the rocket industry to produce man-portable flame weapons of increased effectiveness, lower weight and greater safety.

G. Strip Bullets - Experimental bullets have been produced which can be fired from conventional arms to give a shotgun-like effect. The applicability of these bullets to various weapons is being studied and further experiments are being conducted to improve dispersion, lethality and mechanical characteristics for a number of calibers ranging from .30 to .50.

H. Hand Grenades - The purpose of this sub-task is to investigate the feasibility of providing indigenous forces with improved hand grenades suited to their needs. Concurrently, it will explore general improvements which might be made in hand grenade design. It is intended to investigate a smaller, lighter hand grenade better adapted to the stature and hand size of the indigenous forces. Designs of a multi-purpose fusing for this grenade will be investigated to determine whether such fusing is economically, practically and technically feasible.

I. Rifle Grenades - Investigation will be made into new and improved rifle grenades particularly as adapted to the assault rifle. The requirement is to produce a rifle grenade which can be fired by using the standard rifle cartridge rather than a special grenade launching cartridge.

[redacted]

[redacted]

J. Special Devices - This sub-task has been created for the purpose of funding small research and development tasks which are applicable to small unit weapons, but do not allow it to be logically placed in one of the more general categories.

K. Night Sights - Since a great deal of small unit activity takes place under cover of darkness, improved weapon systems which will make the friendly forces much more effective at night are required. It is believed that the possibilities of using optical and electronic instruments of high light gathering power for night operations has not been completely explored and warrant additional effort.

[redacted]

REQUIREMENTS AND TASKS

Listed below are those major requirement areas and the status of tasks with which this project is concerned. Succeeding sheets are summaries of the purpose and the current status of each task.

1. Assault Rifle
   - A. Armalite (AR-15)
2. Special Purpose Weapons
   - A. Special Shotguns
   - B. Microrocket Projectiles
   - C. M79 Grenade Launcher
   - D. Lightweight Automatic Weapons
   - E. Lightweight Mortars
   - F. Portable Flame Throwers
   - G. Strip Bullets

[redacted]

Tab 1

Requirement: **Assault Rifle**

Task: **Armalite AR-15**

Problem Because of his smaller physical stature, and because of the nature of conflict in remote areas, the individual soldier requires a lighter, more effective weapon capable of delivery an accurately aimed, high rate of fire on fleeting targets. Available U.S. arms did not fulfill the needs of these forces. The Colt Armalite rifle was obtained in test quantities to determine if this rifle better suited the needs of the individual soldier.

Description The Armalite AR-15 rifle is a lightweight, gas-operated rifle, capable of fully automatic fire and is equipped with a 20-round detachable magazine. It is chambered for a .223 caliber cartridge, firing a 55 grain fully jacketed bullet at a muzzle velocity of 3200 feet per second. The empty weight of the weapon is 6 1/4 pounds. An integral muzzle device is incorporated as part of the barrel which serves as flash-suppressor, grenade launcher and front support for a bayonet. Standard accessories include bayonet with scabbard, bipod with case, grenade launching sight and cleaning rod.

Current Status: The 1000 AR-15 rifles initially provided as the test items have been continued in the hands of the Vietnamese combat units to collect additional data. COMUSMAC-V has requested 21,000 AR-15s for Vietnamese units, through MAP channels. Sufficient AR-15 rifles have been withdrawn from RVNAF troops to provide 48 weapons to USMC helicopter crews. These AR-15s have been issued to USMC crews after being processed through the ARVN 80th Ordnance Rebuild Depot to obtain parts consumption data. Tracer ammunition for the AR-15 has been issued to Trung Lap Ranger Training Center and to the USMC helicopter squadron for evaluation. CDTC-Thailand has made available to SCAF the results of the above testing and other data on the AR-15. The U. S. Naval Ordnance Test Station is conducting experimental studies on rifle grenade launching methods for the AR-15 which do not require special grenade launching cartridges. Additional efforts are programmed to further reduce noise, muzzle flash and recoil.

[redacted]

Tab 1

Requirement: Special Purpose Weapons

Task Special Shotguns

Problem: To develop special shotguns suitable for use by indigenous military and paramilitary personnel for village defense and counter-ambush situations

Description: A program of four phases is now being undertaken Phase I is an evaluation of commercially available 12 gauge shotguns and determining what should be done to them to make them more suitable for use by 4'10" 90 lb men. Phase II is to purchase and modify ten each of three different types of shotguns for evaluation. Phase III will be a field evaluation of this special weapon Phase IV will be to devise an optimum shotgun for military use by indigenous forces

Current Status: A preliminary draft of the report on the "quick-fix" portion of this program has been received from the Ballistic Research Laboratories of Aberdeen Proving Ground, Maryland This report covers the testing of several pump action military riot guns commercial semi-automatic guns and commercial bolt action guns Also included is a report on the test of several brands of commercial standard ammunition which might be suitable for use in this role As a result of these tests the semi-automatic shotgun selected for further testing was the Remington Model 11-48 12 gauge self-loading shotgun chambered for the 2 3/4" shell with a 20" full choke barrel The bolt action shotgun selected was the Mossberg Model 195K, chambered for 2 3/4" 12 gauge shot shells with a 20" full choke barrel The selection of the pump action shotguns has not been completed because only military riot guns were tested, the Laboratory has been asked to perform additional tests with commercially available pump action shotguns to determine their relative worth

Tab 1

Requirement: Special Purpose Weapons

Task: Microrocket Projectiles

Problem: To investigate potential uses of very small caliber microrocket projectiles in hand-held, salvo-fired weapons

Description: An experimental research and feasibility study program has been initiated at the Bureau of Naval Weapons to investigate small caliber microrocket projectiles. Participating in this effort are U. S. Naval Ordnance Test Station, Naval Weapons Laboratory, Army Ballistic Research Laboratory, and MB Associates. The objective of this program is to determine whether small caliber rockets can be produced which have sufficiently low dispersion, high velocity and reduced size and weight to be competitive with shotguns or automatic hand held weapons.

Current Status: Though contractual difficulties have caused this program to be delayed, some work has been carried out by several of the agencies involved on microrockets. Because of recent advances in improving the stability and energy level of spin-stabilized microrocket projectiles, a test to develop a cheap village defense arm based on microrockets has been initiated. The objective of this task is to provide a lightweight expendable small arm for village defense. Under this program, 100 pistols designed to fire .49 caliber microrockets will be produced for evaluation. These pistols, which are extremely simple in design, are expected to cost no more than $1.50 with two microrockets. The striking energy of the projectiles is greater than that of the .45 caliber pistol bullet, and initial test results warrant continuation of this portion of the task.

Tab 1

Requirement: Special Purpose Weapons

Task M79 Grenade Launcher

Problem: To develop a close range capability for the M79 grenade launcher and test a supplementary shotgun type round

Description: The M79 grenade launcher is a shoulder fired, single shot, 40 mm, break open anti-personnel weapon. It has a range of 376 meters It has been tested for use as a supplement to or replacement for the rifle grenade and the 60 mm mortar.

Current Status. The weapon phase of this project has been transferred to the cognizance of the Army Concept Team in Vietnam (ACTIV) Investigation into the feasibility of a shotgun type round is continuing.

[redacted]

Tab 1

Requirement: Special Purpose Weapons

Task: Lightweight Automatic Weapons

Problem: To develop improved lightweight, automatic individual and crew-served weapons for use in small unit operations.

Description: Indigenous forces are limited in weaponry by the weight of weapons and ammunition that can be carried by small units and also by the lack of a sophisticated logistics chain. This is one of several tasks aimed at providing maximum kill potential for the individual and small unit. Specifically this task will include belt-fed light machine guns and multiple-round salvo ammunition for use in conventional machine guns.

Current Status: Funding has been apportioned for this task and the technical feasibility of various approaches to these weapons is being investigated. It is anticipated that the development of prototype weapons will be underway within the next sixty days.

[redacted]

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Tab I

Requirement: Special Purpose Weapons

Task: Lightweight Mortars

Problem: To provide improved light mortars and mortar ammunition for use by small tactical units.

Description: Available mortars impose an undue burden in both weight of weapon and weight of ammunition. This task encompasses investigation of light metal alloys and reinforced plastic as weapon materials and development of improved ammunition which has reduced weight, increased lethal radius, and/or less noise.

Current Status: Funding has been apportioned for this task; preliminary studies are underway in Service laboratories and industry.

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[redacted]

Tab 1

Requirement: Special Purpose Weapons

Task: Portable Flamethrowers

Problem: To provide indigenous forces with portable flamethrowers which are light enough to be carried on deep patrol and which offer greatly improved range and lethality.

Description: Effort under this task is aimed at adapting pressure pumping techniques and liquid fuels developed by the rocket industry to the design of small, self-pressuring flamethrowers.

Current Status: Funding for this task is being allocated. That portion of the flame weapons program which will be carried out under AGILE Project 1 will be devoted to the development of experimental hardware designed to test improved methods of construction, pressurization and projection of the flame. The investigation of new fuels and fundamental techniques for flame weapons will be carried out under AGILE Project VIII.

[redacted]

Tab 1

Requirement: Special Purpose Weapons

Task: Strip Bullets

Problem: To improve the effectiveness of small arms fire against fleeting, close-range targets.

Description: A method of forming bullets of multiple wire segments designed to be fired from conventional weapons is being experimentally evaluated at the U.S. Naval Ordnance Test Station. The bullets are identical in configuration to standard ball ammunition but, when fired, are disrupted by centrifugal force into the component fragments which provide a shotgun effect.

Current Status: The fabrication and feasibility demonstration of strip bullets has been demonstrated. Sub-machine gun firings of .45 caliber projectiles have been successful except for bore leading problems. Solution of the bore leading may require gilding metal jackets on each strip. Efforts to design a .50 caliber strip bullet for use in .50 caliber machine guns have been initially successful. This effort will be accelerated to provide better counter-ambush capability to truck and railroad car mounted Quad .50 machine guns.

[redacted]

Tab 2

AGILE PROJECT II

Area Fire Weapons Systems

PROJECT OBJECTIVE:

To develop effective, or improve the effectiveness of, area fire weapons systems for both ground and tactical air employment which will provide maximum flexibility in application and superiority in fire power to the friendly forces engaged in remote area conflicts. Since advanced intelligence or warning in remote area conflict situations is usually very meager and often non-existent, weapons systems which will provide quick reaction and saturating area fire, from air and/or surface vehicles supporting ground tactical units, are essential to meeting this requirement.

PROJECT BACKGROUND:

In remote area conflict, the primary combat unit of friendly indigenous forces is generally a company or smaller size infantry unit. These units, as a general rule, rely on individual weapons and equipment capable of being hand carried into the combat area. Opposing enemy forces are generally similarly, or less well armed and supplied; however, they do have the advantage of being able to control the time and locale and, to a great extent, the degree of contact. One method of off-setting these significant enemy advantages lies in the use of area fire supporting weapons tailored to the particular tactical and physical environment of the conflict.

Air power, in both the tactical close air support role and the offensive strike role, can provide a significant advantage to the friendly forces. However, existing air weapons systems do not provide as great a capability as is desired.

Ground crew served area fire weapons which can provide a pronounced fire power superiority to the friendly forces are also necessary to offset the distinct inherent advantages generally present

[redacted]

to the opposing forces. Typical of one such advantage, and one of the most effective and common actions of the opposing forces, is the ambush. For counter-ambush action, instantaneous and saturating area fire, as well as aimed fire, is essential for any degree of survivability.

PROJECT DESCRIPTION.

To approach the objective specified for area fire weapons systems, and to develop a capability which is optimized for the situation and environment, this Project is presently sub-divided into the following five requirements. It should be recognized that the emphasis on one or more requirements may well shift as the research and development programs involved begin to produce more measureable results, or there are changes in the underlying objectives brought about by further definition of the threats to which they are related.

1. Armament Systems for Armored Patrol (Convoy Escort) Cars: The determination of the vehicle best suited for the role identified falls within the mobility project; the requirement identified here is for an optimum armament system to be applied to that vehicle. As described by the title, such an armament system must be effective in both counter-ambush action as well as the tactical offense role. Armament systems developed under Requirement 2, following, may fulfill this requirement with the effort here being the adaptation of those systems to the vehicle once it is identified.

2. Vehicle Mounted Convoy Counter-Ambush Weapons: Efforts under this requirement are directed principally to achieving optimum counter-ambush weapons systems. Such weapons systems, where possible, should have practical and effective application in other support roles of counterinsurgency actions Optimum counter-ambush weapons must possess at least the features of instantaneous application and saturating area fire, as well as aimed fire. In many other applications, from surface as well as aerial support vehicles, the saturating area fire feature is essential if more effective weapons systems are to be achieved.

3 Air-Ground Armament and/or Aircraft & Armament System
Equipment and systems employed to date in counterinsurgency actions have been those existing in the hardware state within the US inventory and, for the most part, which are obsolete by US standards or are surplus to US needs Even though modifications have been made to some of these equipments to improve their effectiveness, totally adequate systems have not resulted Systems specifically designed for the intended support role and the environment are essential to achieve efficient air weapons systems While not included in the tasks now being undertaken and studied within Project II, it is considered that, as one element of achieving this objective, the development of a light attack/reconnaissance aircraft system, optimized to perform the various missions of this type in counterinsurgency conflicts, is urgently needed The Bureau of Naval Weapons has been requested by DDR&E to investigate the technical feasibility of such an aircraft system

4 Special Purpose Air-Ground Munitions
In general, suitable air strike targets are mobile "people targets" consisting of only a few people (either isolated or sparsely grouped) and often (particularly in tropical areas) protected by dense surface vegetation Therefore the primary requirement is for anti-personnel munitions which can be effectively and efficiently applied in this environment In addition there exist urgent requirements for such items as target marking munitions and illuminating flares as the currently available munitions have not been designed for optimum effectiveness in actions in these environments

5 Ground Based Crew Served Weapons for Tactical Unit Support
A support weapon, effective against the targets described in 4 above and sufficiently mobile to be efficiently applied in the environment is urgently required to provide the tactical unit with a marked superiority in fire power over the opposing forces Such a weapon may be of almost any caliber, from above individual weapon calibers to 100 mm or over, as long as the projectile possesses the desired characteristics A weight limitation must be imposed as the weapon must be sufficiently light to be carried or towed intact by a light vehicle (a helicopter or jeep) It must also be capable of being readily broken down into a limited number of units which are reasonably man portable and then capable of being quickly reassembled into a functionable weapon The ammunition must be sufficiently light in weight so that a usable amount may accompany the weapon without undue manpower requirements.

[redacted]

Tab 2

Requirements and Tasks

Listed below are those major requirement areas and the status of tasks with which this project is concerned. Succeeding sheets are summaries of the purpose and the current status of each task.

1. Armored Patrol (Convoy Escort) Car

   A. Armament Systems for Armored Cars

2. Vehicle Mounted Convoy Counter Ambush Weapons

   A. Quad 50 and Quad 30 Machine Guns

   B. Salvo Squeeze Bore .50-.30 Caliber Machine Gun

   C. Multiple Grenade Launcher

   D. Flame Throwers

3. Air-Ground Armament and/or Aircraft and Armament Systems

   A T-28 Nomad Aircraft (terminated)

   B. Helicopter Armament (Transferred to Army)

   C Counterinsurgency Aircraft

4. Special Purpose Air-Ground Munitions

   A Delayed Proximity Fuzes

   B. 2.75" Rocket Launchers

   C. Target Marking Munitions or Devices

   D. Improved Ammunition Capacity for T-28, .50 Caliber MG Pod (Transferred to Air Force)

   E. Illuminating Flares

   F. High Explosive Anti-Personnel Bombs

5. Ground Based, Crew Served Weapons for Tactical Unit Support

   A "State of the Art" Survey

[redacted]

[redacted]

Tab 2

Requirement: Armored Patrol (Convoy Escort) Car

Task: Armament Systems for Armored Cars

Problem: Armament, in addition to armor, is required for vehicles employed in patrol, convoy escort, and similar roles to meet the threat of ambushes by providing an immediate area and aimed fire reaction capability.

Description: Complete self protection in the form of armor is impractical for application to all vehicles of concern; therefore, the ambush threat cannot be met by this means alone Overwhelming fire power must be combined with sufficient armor in these weapon systems to provide a better counter ambush capability. The ability of convoy escort or patrol cars to survive the initial fire of an ambush and immediately return saturating area fire is required and, further, this capability can be expected to act as a strong deterrent to the setting of ambushes by the opposing forces.

Current Status: Actions are underway by Project III (Remote Area Mobility and Logistics Systems) to determine an optimum Patrol/Convoy Escort vehicle. Upon determination of an optimum vehicle a weapons system will be developed which will incorporate, in part, the multiple grenade launchers under development (see Task 2 C)

The M-113 personnel carrier is currently undergoing evaluation. It has been determined that the machine gunner on the M-113 requires protection; action is being taken to find a suitable turret/shield

[redacted]

[redacted]

Tab 2

Requirement: Vehicle Mounted Convoy Counter Ambush Weapons

Task: Quad 50's and Quad 30's

Problem: To provide a capability for applying saturating area fire to deny choice ambush positions to the enemy and to provide the capability of applying instantaneous area fire in counter ambush actions. The ability to apply saturating area fire can be expected to provide a strong deterent to setting ambushes as well as providing effective counter ambush action capabilities.

Description: Caliber .50 or .30 Quad mounted machine guns mounted in patrol, convoy, or convoy escort vehicles are considered applicable to this problem. The high rate of fire of Quad mounts provides a good saturating fire to a reasonably large area from one vehicle such as patrol or scout vehicles. In convoys where several vehicles may have Quad mounts, a large area can be swept with nearly instantaneous saturating fire.

Current Status: Ten M55 trailer mounted Quad 50 machine guns were shipped to the CDTC-V in October 1962 for field evaluation. Ammunition was provided with the machine guns. These Quad .50's are suitable for 2-1/2 ton truck, railroad flat car, and appropriate halftrack vehicle mounting. A .50 - .30 salvo squeeze bore and ammunition are being developed for these weapons (see following task).

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Tab 2

Requirement. Vehicle Mounted Convoy Counter-Ambush Weapons

Task. Salvo Squeeze Bore .50-.30 Caliber Machine Gun

Problem: To provide capability of applying saturating area fire to deny choice ambush positions to the enemy and to provide the capability of applying instantaneous area fire in counter ambush actions. The ability to apply saturating area fire can be expected to provide a strong deterrent to setting ambushes as well as providing effective counter ambush action capabilities.

Description: The feasibility of increasing the effective fire power of a single machine gun has been demonstrated by the RICA Company in conjunction with the U.S. Army Limited War Laboratory. For a 50 caliber machine gun the increase in fire power is a factor of five. The technique is to fire one caliber .50 cartridge, fitted with a special bullet, through a squeeze bore barrel which separates the special bullet into five individual caliber .30 projectiles. These projectiles emerge from the barrel in series and strike the target in salvo. If the practicality of this approach is verified, this increase in fire power will be significant in applying saturating area fire for counter ambush actions and also should have application in close air support and other tactical roles in counter-insurgency action against soft targets

Current Status. A contract was let on 21 Dec 62 for the procurement of sufficient barrels and ammunition to conduct a complete CONUS test of the squeeze bore. Testing is expected to commence about mid-February 9[illegible] If the practicality of the squeeze bore approach is verified, sufficient barrels and ammunition will be sent to the CDTC-V for environmental evaluation.

[redacted]

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[redacted]

Tab 2

Requirement: Vehicle Mounted Convoy Counter-Ambush Weapons

Task: Multiple Grenade Launcher

Problem: To provide capability of applying saturating area fire to deny choice ambush positions to the enemy and to provide the capability of applying instantaneous area fire in counter ambush actions. The ability to apply saturating area fire can be expected to provide a strong deterent to setting ambushes as well as providing effective counter ambush action capabilities.

Description: For medium and close in ranges salvo delivery of appropriate anti-personnel type munitions would appear to provide a means of applying area saturating, quick reaction fire for counter ambush action. The Army has developed and tested a multiple launcher capable of salvo firing a variety of desirable munitions. This launcher unit is readily mountable on a variety of surface vehicles and is subject to manufacture with minimum skills and materials normally available in-country. With HE grenades there is a "dead" area from 0 out to about 35 meters. This is the area from vehicle side out to the minimum safe distance for HE grenade employment. Auxiliary devices must be provided to cover this area.

Current Status: The multiple launcher unit tested by the Army was mounted on a 2-1/2 ton truck. This unit was designed for salvo of 60 munition items, 15 from each corner quadrant of the truck. Two sets of this configuration, accompanied by a technician, were sent to the CDTC-V by the Army on 29 October 1962. These sets are currently undergoing field evaluation. On 10 December 1962 3 sets of a slightly different configuration were shipped to the CDTC-V. On 15 December a third shipment of 3 sets, again with some changes in configuration, was made. In addition, this third shipment contained an auxiliary (canister shot) device to cover the close-in area.

Study is continuing on other devices which will cover the area from vehicle side out to about 200 yards which may fulfill this requirement.

[redacted]

[redacted]

Tab 2

Requirement: Vehicle Mounted Convoy Counter Ambush Weapons

Task: Flame Throwers

Problem: To provide the capability of applying saturating area fire to deny choice ambush positions to the enemy and to provide the capability of applying instantaneous area fire in counter ambush actions. The ability to apply saturating area fire can be expected to provide a strong deterent to setting ambushes as well as providing effective counter ambush action capabilities.

Description: For close-in to medium ranges (in relation to ambush situations) long range, high capacity flame throwers could be very effective anti-personnel area fire weapons.

Current Status: Two large capacity, long range flame throwers (U.S. Standard M10-8) complete with 2 M4 mixers and recharging materials are currently undergoing evaluation at the CDTC-V. One M10-8 is mounted on an LCM for evaluation in conjunction with the RVNAF River Forces and the other is mounted in an M-113 personnel carrier for evaluation with the ARVN.

[redacted]

Tab 2

Requirement: Air-Ground Armament, and/or Aircraft and Armament Systems

Task: T-28 Nomad Aircraft

Problem: To evaluate the fighter-bomber characteristics of the modified aircraft for employment by the VNAF in the tactical attack role for counterinsurgency actions.

Description: The T-28 Nomad is a single engine two place trainer which has been modified to accept munitions (demolition bombs, rockets, napalm, and a caliber .50 machine gun package) on six wing mounted bomb racks.

Current Status: The modified T-28 has been employed by both U.S. Forces and the VNAF in the tactical attack role in Southeast Asia. Present evaluation indicates that it is a suitable aircraft, at least as an interim measure, for this tactical attack role. Any AGILE sponsored efforts to increase the effectiveness of this aircraft as a weapon system will be accomplished by improved aerial munitions.

This task of T-28 evaluation is terminated. No formal report is expected.

[redacted]

Requirement — Air-Ground Armament, and/or Aircraft and Armament Systems

Task: — Helicopter Armament

Problem: To provide helicopters with a system of armament whereby suppressive fire from the helicopter can provide protection to the aircraft and crew in the conduct of normal operations. Low altitude aerial operations in SVN are receiving an increasing volume of more effective small arms fire.

Description. Light automatic weapons are envisioned in employment as a defensive suppressor of ground fire while the helicopter is engaged in airlift of personnel and equipment or recovery of casualties. The weapons should also provide armed helicopters with the capability to provide escort protection to transport helicopters during air mobile operations and assault landings.

Current Status. The JCS has referred the requirement for helicopter armament to the Army for action. The U.S. Army has provided helicopter armament for combat employment and evaluation in SVN. A company of HU-1A helicopters was dispatched to SVN armed with fixed lateral, semi-flexible vertical .30 caliber M37 machine guns. The new Army flexible machine gun system for helicopters is in procurement and employs the M60 machine gun. This system is compatible with the HU-1B, the H-34 and H-21 helicopters. Efforts by the Army have overtaken the effort intended by Project AGILE, therefore, no further action in machine gun armament for helicopters is indicated at this time. This task has been transferred to the Army, no formal report is expected.

[redacted]

[redacted]

Tab 2

Requirement: Air-Ground Armament, and/or Aircraft and Armament Systems

Task: Counterinsurgency Aircraft

Problem: To determine and develop a light attack/reconnaissance aircraft system optimized to perform the various missions of this role in counterinsurgency actions.

Description: Initially considered characteristics of such an aircraft include: light-weight, very short STOL capabilities; operational capability from roads, rivers and canals in a severe and austere environment; simple and easy maintenance and support; effective support armament and target sensors for all suitable targets; and communications and navigation systems which are compatible with other ground and air systems and low altitude operations.

Current Status: The Bureau of Naval Weapons was requested by ODDR&E on 19 December 1962 to examine the feasibility of producing such a system and to report thereon by 31 January 1963.

[redacted]

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Tab 2

Requirement: Special Purpose Air-Ground Munitions

Task. Delayed Proximity Fuzes

Problem: To achieve effective detonation of high explosive bombs against personnel targets shielded by jungle canopy The optimum detonation point of HE bombs against multiple soft targets is generally considered to be three bomb lengths above the inhabited surface

Description. The jungle canopy acts as a reflecting plane for proximity fuzes and initiates detonation of the bomb generally at or above tree top level. This renders the munition ineffective against the target (primarily people) when shielded by a jungle canopy To allow effective use of HE bombs as anti-personnel munitions, it is necessary to effect detonation delay after activation of the fuze to allow the bomb to penetrate to below the jungle canopy before detonation and, ideally, above ground level Based upon the general average jungle canopy height and thickness, a time delay feature of 75 millisecond has been incorporated in standard M-188 proximity fuzes which will yield a general detonation height of 10 to 50 feet above the ground in jungle A standard impact fuze is used to provide contact detonation in cases where the canopy is not sufficient to activate the proximity fuze

Current Status: One thousand M-188 fuzes have been modified with the delay feature. One hundred of these fuzes were used in CONUS tests to verify proper fuze functioning and the remaining 900 were shipped to SVN in October 1962 Initial environmental tests in SVN indicate good operational results Test results have indicated that it was desirable to reduce the MinSAT (minimum safe arming travel) for some of the fuzes for certain tactical employments in SVN. Modification of an additional 1000 M-188 fuzes is underway to incorporate the time delay feature and to reduce the MinSAT from 3600 feet to 2300 feet. It is anticipated that these fuzes will be modified CONUS tested and arrive in SVN during the first quarter of 1964

[redacted]

Requirement: Special Purpose Air-Ground Munitions

Task: 2.75" Rocket Launchers

Problem: To evaluate the 2.75" rocket and the various available launchers as an aerial munition for counterinsurgency operations.

Description: The U.S. Air Force and the VNAF in SVN have both the standard LAV-3 (19 rocket capacity) and the MA-2 (2 rocket capacity) launchers for the 2.75" FFARS. Twenty sequencing switches (produced by the Aerojet Corporation) for the LAV-3 launchers were provided initially for evaluation. These switches allow selection of fire of two rockets at a time, one shot ripple fire of the entire bank of rockets.

Current Status: Initial evaluation has been quite promising and an additional LAV-3 and 30 MA-2 launchers were provided the CDTC-V in October, 1962. Procurement action is underway to provide an additional 40 sequencing switches for the LAV-3 with an expected delivery in mid-February 1963. Informal evaluation reports to date on the LAV-3 with sequencer switches have indicated improved accuracy, more efficient use of rockets, and better tactical results. Two of the MA-2 launchers have been installed as armament on an L-19 aircraft. No evaluation has been reported.

[redacted]

Tab 2

Requirement: Special Purpose Air-Ground Munitions

Task: Target Marking Munitions or Devices

Problem: To mark ground targets, air strike locations, drop zones, etc. The mark must be effective when employed in all types terrain (to include heavy jungle area and swamps), be visible by the unaided eye from altitudes of 4,000 feet, and with a duration of at least 5 minutes.

Description: The heavy jungle canopy generally contains the smoke emitted by normal smoke grenades or smoke pots and renders them ineffective as markers for air strike purposes. Soft, marshy areas extinguish the grenades after impact. For these devices to be effective as markers in jungle, some device which will cause them to hang and burn on the top of the jungle canopy when dropped is required. The most logical approach to date for an effective marking device involves an improved smoke emitter and an improved method of delivery.

Current Status: The AF and Army are investigating methods for improved target marking. Improved smoke systems as well as other methods are being evaluated under this effort.

Preliminary tests of a new smoke munition (grenade Model E 7241) provided to the CDTC-V by the Army for evaluation has shown this munition to be superior to all smoke devices previously tested. It is capable of emitting a dense cloud of white smoke for a period of 10 minutes. A modification, being considered by the CDTC V, to cause the munition to "hook" in the top of the jungle canopy will make this an effective target marker for a jungle environment.

Additionally, balloon concepts for both ground and aerial emplacement are being evaluated as target/position markers.

[redacted]

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Tab 2

Requirement: Special Purpose Air-Ground Munitions

Task. Improved Ammunition Capacity for the T-28 .50 Caliber MG Pod

Problem: The 105 rounds of ammunition capacity originally available in the T-28 .50 caliber gun pod was an insufficient quantity of ammunition for combat operations.

Description: The .50 caliber machine gun pod initially available for adoption to the T-28 aircraft was a training pod which had a maximum capacity of 105 rounds of ammunition. This amount does not provide sufficient firing time to make this a practical aircraft armament system for counterinsurgency application.

Current Status: ARPA and the Air Force recognized this problem shortly after the modified T-28 was deployed to Vietnam and the Air Force took action to have pods developed with greater ammunition capacity. Pods have been procured from the North American Aviation Company which have a capacity of 350 rounds and from the General Electric Company with a 750 round capacity. Both N. A. A. and G. E. pods were sent to SVN about 1 September 1962 for evaluation. Preference is given to the N. A. A. pod for T-28 armament because of its lighter weight. Two G. E. pods are being prepared for installation in an AD 6 aircraft for evaluation by the VNAF.

The requirements of this task have been fulfilled by Air Force actions. No AGILE effort is therefore planned in this specific area and this task will be deleted from future AGILE reports.

[redacted]

Requirement: Special Purpose Air-Ground Munitions

Task: Illuminating Flares

Problem: To determine suitable aerial dispensed illuminating flares for night tactical operations.

Description: The standard MARK 6 MOD 6 aircraft illuminating flare in use in SVN possesses suitable dispensing characteristic (safe for release by hand) but does not provide sufficient burning time or light intensity. M-138 and M 139 flares provide improvement in burning time and light intensity but unsafe for hand delivery because of fusing arrangements. A practical approach to this problem appears to be a different fusing arrangement for the M 138/M-139 flares.

Current Status: The Air Force has taken action on this problem. Various fuses and fusing arrangements are being tested for the M-138/M-139 flares. M-139 flares have proven unsatisfactory for use in SVN when fused with the normal M-146 arming vane. Tests were conducted during November of the M-139 flare fused with the M 146E3 (modified w/anemometer vane). This combination appears to be [illegible] flare for hand-delivery from the C-47 aircraft. The added illumination provided by the 3 million candlepower of the M 139 was reported as strikingly apparent over the 1 million candlepower of the MK 6 MOD 6. An interim report on these tests is expected momentarily with a final report expected based on the tests of a greater number of flares.

The Navy has under [illegible] development a flare dispenser (LAV-25/A) for the Mark 24 Mod [illegible] flare. This launcher is an external store for [illegible] aircraft at altitudes of sea level up to 70,000 feet and [illegible] Mach 0.95. The MK-24 Mod 1 flare has an illuminating [illegible] candlepower for 2 minutes. Flares may also be dropped from [illegible] racks at airspeeds up to 300 KIAS. This development was [illegible] in anticipation that it may have useful application in SVN.

Tab 2

Requirement: Special Purpose Air-Ground Munitions

Task High Explosive Anti-Personnel Bombs

Problem: To determine best available munitions for anti-personnel application in the environment, those modifications which will increase their effectiveness, and the R&D requirements to achieve optimum munitions.

Description. The scattered nature and size of the targets (normally few numbers of fleeting people), generally dispersed and often protected by heavy vegetation or jungle canopy, renders normal H. E. munitions inefficient and often ineffective. Efficient area coverage, fragmentation effect, and jungle penetration capability are required characteristics of effective munitions.

Current Status. (1) Three hundred AN-M1A2 fragmentation clusters deliverable by T-28 and B-26 aircraft have been sent to the CDTC V for evaluation.

(2) The 20 pound M41 World War type fragmentation bomb is currently undergoing evaluation in SVN.

(3) MK 54 350 pound depth charges are being evaluated. Some of these MK 54's will be tested with the XM 914 fuze and some with the standard M 166 proximity fuze.

(4) The Air Force is continuing testing of specially developed combinations of munitions and dispensing mechanisms to produce efficient fragmentation and area coverage effect with jungle penetration capability.

Tab 2

Requirement: Ground Based, Crew Served Weapons for Tactical Unit Support

Task: "State of the Art" Survey

Problem: To provide that support to the tactical units engaged in counterinsurgency actions necessary to achieve a marked superiority in fire power over that possessed by the opposing forces. A requirement has been identified, as one example, for a 4.2" mortar replacement which is more suitable for the environment and conflict in Vietnam.

Description: This requirement is for a support weapon highly effective against counterinsurgency type targets and sufficiently mobile to be efficiently applied in the environment. Such a weapon need not be restricted by caliber as long as the projectile possesses the desired characteristics. A weight limitation must be imposed as the weapon must be sufficiently light to be carried or towed intact by a light vehicle (a helicopter or jeep). It must also be capable of being readily broken down into a limited number of man packable units and then quickly reassembled into a functionable weapon. The ammunition must be sufficiently light in weight so that a usable amount may accompany the weapon without undue manpower requirements. As a general guide, it is estimated the weapon should not exceed 250 lbs., demountable components no more than 50 lbs., and individual rounds of ammunition a maximum of a few pounds.

Current Status: Actions are under way to:

1. Survey all, foreign as well as U.S., existing weapons.

2. Survey all weapons which are under development, against other requirements but which may have application against this requirement.

3. Survey existing weapon development proposals by industry to identify weapons which may be considered against this requirement.

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AGILE PROJECT III

REMOTE AREA MOBILITY AND LOGISTICS SYSTEMS

(TAB 3)

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AGILE PROJECT III

REMOTE AREA MOBILITY AND LOGISTICS SYSTEMS

PROJECT OBJECTIVE

Improvement in all aspects of air, ground, and water mobility capabilities of friendly indigenous forces engaged in remote area conflict. Included are vehicles, aircraft, and boats for transport of tactical units and for the delivery of supplies and equipment in support of military operations.

PROJECT BACKGROUND

1. General Discussion

Remote area conflict typically requires military operations where the topography and climate preclude or minimize the use of conventional military mobility equipment. Many novel vehicles have been developed to meet requirements for operation in swamps, on muskeg, and in forests and marshes of the U.S. and Canada, but there are areas of the world in which no systematic approach to the basic military problems of mobility has been attempted. Such an area is Southeast Asia where the geomorphological aspects including extremes of rainfall, man-made features such as rice paddies and canals, lack of roadways, shallow, vegetation-choked waterways, and few improved airfields present formidable barriers to mobility. Conventional wheeled, tracked and amphibious vehicles are roadbound or have extremely limited off-road mobility in many parts of the area, especially in the rainy season. Conventional watercraft and aircraft often lack satisfactory design and performance characteristics for the environment.

Similarly, remote area conflict situations have unusual requirements for aerial resupply. Again, topography, vegetation and climate render conventional techniques ineffective and wasteful. New techniques of aerial resupply must be developed appropriate to the region and type of operation.

2. Ground Mobility

Present day development of ground vehicles remains essentially an empirical art. Study of available records and interviews with experienced design personnel, both in government and in industry, reveal that the scientific approach

has rarely been applied to land vehicles. Rather than adapt the ground system to its operating environment, man has generally chosen to adapt the environment to the system through the construction of roads, bridges, tunnels, etc. Consequently, modern mechanized armies have become increasingly dependent upon road nets for mobility and logistical support. When confronted with environments having only rudimentary transportation networks, as in Korea and South Vietnam, the movement of modern forces is reduced to, or less than, that of "backward" peoples, who are capable of operating without established road systems. The plight of the French forces in Indochina, and a contributing factor in the defeat of these forces, is a recent example of these conditions.

ARPA will undertake to achieve an improved remote area mobility capability through a three pronged research program.

1. Mobility Environmental Research Studies (MERS).

2. Mobility Research and Testing (MORT).

3. Ground Vehicle Test and Evaluation (GROVETE).

3. Mobility, Ground and Water

The interfaces between air, ground and water present serious, unique mobility problems. Here we must be concerned with devices optimized for waterborne performance, but which retain a high capability for mobility over land and over obstacles of various types. Since operations must be conducted in this boundary zone in certain areas susceptible to involvement in remote area conflicts, this project is investigating three major approaches to the interface problem areas under the headings: Delta mobility, Sine disc propulsion and Catamarans.

4. Mobility, Air

Remote area operations place a premium on air mobility. This task is concerned with improvement of air mobility in remote areas, where restrictions of weather, topography, and lack of facilities are acute.

CONDUCT OF PROGRAMS

1. MERS. A detailed study will be made of the factors of the environment in Southeast Asia which are related to surface vehicle mobility to gain the basic

data required to develop design parameters, tools, and techniques for use by military and civilian agencies in the development of vehicles capable of satisfactory off-road operation under remote area conflict conditions. Necessary information includes data on soil properties, terrain geometry, effects of climate and weather on soil and terrain, temperature and humidity ranges influencing engine and mechanical design, effects of the environment on deterioration of vehicle materials, and size and spacing of trees, rocks, ditches, etc., which constrain vehicles design parameters.

2. **MORT:** Studies will be conducted and selective tests run to develop quantitative requirements and characteristics, in engineering terms, for the development, or acquisition for test, of an item or system of material to perform a specific military function in SEA. Advanced vehicles, embodying unique design approaches, and/or improved components, have been selected with the advice of qualified Service development experts. These items will be subjected to controlled tests over carefully defined and selected courses, to determine the value for the intended user in a given remote area of selected concepts, components and configurations. Tests will be conducted by the indigenous armed forces concerned under the direction of CDTC, Bangkok, and in coordination with MAAG personnel.

3. **GROVETE:** Selected material items and systems currently available from military or civilian sources will be tested to determine their immediate suitability for adoption by indigenous armed forces engaged, or likely to be engaged, in remote area [illegible]. Tests will be conducted by and for the indigenous armed forces concerned, under the direction of CDTC, Bangkok, and CDTC, Saigon, based on requirements developed by the U.S. and host nation Commands, the CDTC's and the ARPA staff. The ARPA staff and the CDTC's will then review [illegible] requirements with competent development agencies [illegible] reasonable probability of [illegible] the requirements [illegible] CDTC for test and evaluation.

4. **DELTA MOBILITY:** [illegible] mobility in the Delta is critical. The [illegible] marshes and rice paddies, and [illegible] complex of inland waterways and shallow [illegible]. Tidal [illegible] the entire nature of [illegible] network [illegible] and introduce additional problems [illegible]. [illegible]

This task will develop boats and amphibious vehicles which will substantially increase military mobility in delta areas while retaining simplicity and ease of maintenance. The task will involve analysis of the performance, capabilities and limitations of vehicles in use in delta operations. It is divided into two sub-tasks: small craft and amphibious vehicles.

5. MOBILITY, AIR. The Services are actively engaged in research on aircraft for remote area operations; this project is monitoring those programs. Additionally, the STOL Caribou aircraft is under evaluation in Southeast Asia. This task is concentrated on problems of aerial delivery and pick-up in remote areas. Several sub-tasks are in progress, the major of which concerns use of the flex-wing principle for aerial delivery.

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Tab 3

Requirements and Tasks

Listed below are those major requirement areas, and the status of tasks in each area, with which this project is concerned. Succeeding sheets are summaries of the purpose and current status of each task.

1. Mobility Research

   A. Mobility Environmental Research (MERS)

   B. Mobility Research and Testing

   C. Ground Vehicle Test and Evaluation

   D. Ground Mobility

   E. Route Capacity Formula

2. Mobility, Ground and Water

   A. Delta Mobility

      (1) Small Craft

      (2) Amphibious Vehicles

   B. Sine Disc Propulsion

   C. Catamarans

3. Mobility, Air

   A. STOL Tran (Cargo Aircraft)

4. Aerial P[illegible] D[illegible]

   A. Flex Wing [illegible]

   B. [illegible]

   C. [illegible]

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Tab 3

Requirement: M[illegible]ty Research

Task: Mobility Environmental Research (MERS)

Problem: To gain basic data requisite to the construction of design parameters for use by military and civilian agencies in the development of vehicles capable of satisfactory off-road operation in remote area conflicts. Necessary information includes that on soil properties, terrain geometry, effects of climate and weather on soil and terrain, temperature and humidity ranges influencing engine and mechanical design, effects of the environment on deterioration of vehicle materials, and size and spacing of trees, rocks, vegetation, etc.

Description: A program of experimental scientific research will be conducted in selected portions of Southeast Asia on those aspects of the physical environment directly related to surface vehicle mobility. The object is to produce design parameters in consolidated or tabular form. This effort, which could continue through FY 66, will be closely coordinated with an operations research effort directed toward integrating all data into a refined design tool. Several [illegible] vehicles have been procured for use in the program.

Current Status: A short term mobility team, provided by the Army from in-house resources, [illegible] preliminary study of the environment of T[illegible] [illegible] delineated the problem areas to be studied during the long range program. P[illegible] has been initiated for the long term program [illegible] designated to head the project. A Test [illegible] Advisory Committee reviewed the planned program and suggested [illegible] vehicles, [illegible] C[illegible] [illegible] many [illegible] single track [illegible] indicate that the design [illegible] substantially greater off-road mobility [illegible] possible with wheeled vehicles.

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Tab 3

Requirement: Mobility Research

Task: Mobility Research and Testing

Problem: To conduct studies and selective tests in order to develop quantitative requirements and characteristics, in engineering terms, for the development, or acquisition for test, of an item or system of material to perform a specific military function.

Description: A program of controlled testing of selected items of equipment will be conducted over carefully defined and selected courses, to determine the value for the intended user in a given remote area of novel components, configurations, and concepts.

Current Status: Vehicles currently programmed for this task are:

Gamma Goat - Tests completed
Thiokol Trackmaster - Tests [illegible]rway
Nodwell 110D Cargo Carrier
Chance-Vought XM561 Test Rig
M274 Army Mule Unmodified
M274 Army Mule Modified
Dura-Kat Tracked Scooter
Dyna-Mite Wheeled Trail Vehicle
Dodge W-300 Power Wagon
Thiokol Spryte
XM571 Articulated Tracked Cargo Vehicle
M116 Cargo/Personnel Carrier Vehicle
JERED Asp Platform Vehicle
JERED Viper Platform Vehicle
Centipede Vehicle
Tote Goat Scooter With Trailer
XM 561

[redacted]

[redacted]

Tab 3

Requirement: Mobility Research

Task: Ground Vehicle Test and Evaluation

Problem: To test selected items or systems of material, currently available from military or civilian sources, to determine their suitability for adoption by indigenous armed forces engaged, or likely to be engaged, in remote area conflict.

Description: A program consisting of tests of selected items by and for indigenous forces in their own environment, under ARPA auspices, to determine the suitability of the items to satisfy immediately a pressing military requirement.

Current Status: CDTC-V established a requirement for a wheeled armored car to escort truck convoys. Review of available and developmental equipments, with the assistance of qualified Army development personnel, indicated the British Ferret and the newly-developed Cadillac Gage "Commando" armored cars as the two best systems for this purpose. Arrangements have been completed with the British Forces in Malaya to borrow two Ferrets, and action has been initiated to procure two Commando's. These vehicles will be evaluated in SVN, by ARVN personnel and under the supervision of CDTC V, to determine the best item to satisfy the requirement.

Additional items for procurement are presently under study.

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Tab 3

Requirement: Mobility Research

Task: Ground Mobility

Problem: To accomplish a broad study of mobility requirements for a spectrum of potential operations in Southeast Asia.

Description: An analysis to consider, in conjunction with the trafficability study being made separately under Project AGILE in Thailand, weapons and weapons systems, command, control, transportation, communication and supply problems peculiar to SEA. This will supplement MERS by defining mobility requirements more precisely from the operational standpoint.

Current Status: This study effort is ready to begin in Thailand. Implementation will be concurrent with MERS program in Thailand and will, to some extent, review data developed by MERS.

[redacted]

[redacted]

Tab 3

Requirement: Mobility Research

Task: Route Capacity Formula

Problem: To derive a route capacity formula applicable to the environment of SEA to be used by logistics planners within the Theater.

Description: Current practice within the USARPAC is to use a modification of the NATO route capacity for formula in calculating logistics requirements for SEA. This formula, developed for use within continental Europe, is not completely satisfactory for SEA; USARPAC requested ARPA to furnish a revised formula for their use in determining logistic requirements. Two employees of RAND Corporation are undertaking a study to develop a new formula for SEA. This new formula will be based on analysis of the road networks, traffic patterns, and operational necessities of the Theater. USARPAC has been consulted continuously, and is furnishing a consultant to assist in the program.

Current Status: RAND employees have completed a field study in Thailand and a preliminary report has been prepared and briefings made to CDTC-T and RTA personnel, to USARPAC and to CINCPAC representatives. Preliminary indications are that some of the reducing factors in the current route capacity formula are too conservative. The data obtained from the actual field evaluation indicates that substantially greater tonnages can be transported over the road nets in Thailand than had previously been thought possible.

[redacted]

Tab 3

Requirement: Mobility, Ground and Water

Task: Delta Mobility - Small Craft

Problem: The road network in the Mekong Delta is meager, but there is an intricate complex of rivers, canals, and creeks. A boat which can navigate a large number of these at high speeds can make a significant contribution to mobility there.

Description. A program has been initiated to perform research leading to the development of a light weight, high speed boat which can substantially increase military mobility in the Delta region of SVN. A 350 pound boat has been constructed of bonded styrofoam planks, covered with fiber glass laminations. It is 14'1" long by 6'10" wide. Powered by a 40 hp commercial outboard, it makes 20 knots carrying eight or nine persons.

Current Status: Over 200 of these boats are in SVN and the craft were used in several combat operations. Both the U.S. advisors and all ARVN units having swimmer support boats have been requested to furnish any available information regarding these operations. When received, the data will be assessed and used as a basis for future programs, if the value of such is indicated. At the request of the CDTC-V, the SVN Naval Shipyard has built a prototype V bottom boat, and conducted preliminary tests with it. The present design requires some modification, which is now underway. A program to renovate the existing R&D boats has been undertaken at the SVN Naval Shipyard.

Tab 3

Requirement: Mobility, Ground and Water

Task: Delta Mobility - Amphibious Vehicles

Problem: To improve military mobility in the Mekong Delta area, and to study operations in that area for the purpose of determining military concepts and requirements.

Description: This is an investigation of the performance of current amphibious vehicles in the Delta region, to develop desirable characteristics for future concepts.

Operations will be studied in which the M-113 has been employed. Analysis will be based on after-action reports, and investigations by both U.S. and Vietnamese personnel; study of the terrain in which the operations were conducted, by both ground and air reconnaissance; study of capabilities and limitations experienced by the M-113 vehicles under various conditions of soil, slope, and vegetation, and analysis of the vehicle's amphibious capabilities and limitations under various conditions of stream-flow, bank, and bottom conditions.

A general terrain analysis will be performed in order to determine what proportion of the overall Delta area is suitable for the operation of this vehicle.

Modifications may be recommended, where appropriate, to improve the cross-country mobility of the vehicle.

Maintenance records will be examined and frequency of repairs will be studied in order to analyze the reliability of the various components of the M-113 under local operating conditions.

Two novel vehicles under development are being monitored by ARPA; the Marsh Screw vehicle, using the Archimedes screw principle, and the air-roll vehicles.

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Current Status: Terrain analysis is underway. Interim evaluations of the M-113's performance in SVN have been conducted by the CDTC and forwarded to ARPA through COMUSMACV and CINCPAC Analysis of the M-113 operations continues and is now being conducted by JOEG-V and ACTIV.

ARVN, through the JGS, has requested the CDTC to determine the feasibility of providing the M-113 with a self-recovery capability. Alternatives were examined and a field modification incorporating a simple capstan which can be quickly installed and removed was selected. Test quantities are being procured and shipped for field evaluation. In order to test this device, and a possible means of providing better water maneuverability, CDTC has requested ARVN to provide an M-113, as a test bid, for a few months.

ARPA has also reviewed the state of the art on current and projected amphibious vehicles, in an effort to identify more promising systems. The Marsh Screw vehicle, under Navy development, and the Air-roll vehicles being tested by the USMC, are two such systems.

[redacted]

Requirement: Mobility, Ground and Water

Task: Sine Disc Propulsion

Problem: To determine the applicability of sine disc propulsion to problems of mobility in shallow, vegetation-choked streams and swamps.

Description: At this time, and in the foreseeable future, this task will involve only monitoring of Army research. If current study indicates that the concept is promising, it will be developed for application to ARPA projects.

Current Status: Under Army study.

Tab 1

Requirement: Mobility, Ground and Water

Task: Catamarans

Problem: To investigate the feasibility of developing high speed sailing craft for patrol operations in coastal and broad inland waterways. Such craft would have reduced fuel and maintenance requirements and an attendant improvement in operational capability.

Description. The catamaran appears to be a promising design principle for such a craft in that it can enjoy a pronounced speed advantage over the existing sailing junks and sampans currently in use by insurgents in Southeast Asia. Further, this design provides for a more stable weapons platform and is susceptible to local construction

Current Status: Cost estimates and manufacturers performance data have been obtained for several existing catamarans. A study is underway by the RAND Corporation to analyze the capabilities, limitations and cost effectiveness of catamarans for the above described purposes. If the conclusions warrant further work, a study will be conducted to determine the optimum armament suit for such craft and a prototype system developed.

Tab 3

Requirement: Mobility, Air

Task: STOL Troop/Cargo Aircraft

Problem: To assess the usefulness of the Caribou aircraft in the combat environment of SVN, and to test methods of improving its STOL characteristics.

Description. The Caribou is a twin-engined, high-wing monoplane designed for bush flying and military operations from short, unimproved airfields. Currently operational aircraft, designated CV-2B have a gross weight of 28,500 lbs. and carry a mission payload of just over 7,000 lbs. under standard day conditions, 134 knots speed, and 100 nautical mile radius. Cruise speed is 157 knots, and the CV-2B can operate effectively from airfields 900 feet to 1,000 feet long.

A Y-model Caribou, gross weight 28,000 lbs., loaned to ARPA by the Army, has been tested in Southeast Asia in many assorted types of landing surfaces. Tests of the Caribou's landing performance with reversible thrust propellers were carried out during August, and a report on the tests, forwarded 27 August 1962, indicates that the landing ground roll of the aircraft can be reduced approximately 50%-60% by the use of reverse thrust, the reduction being smallest on hard dry surfaces and greatest on soft wet surfaces.

Current Status The Army is now preparing to equip all operational Caribou aircraft with reverse pitch propellers based, in part, on the results of this test. ARPA and the Army are now evaluating a proposal to augment effective lift during take-off and landing of Caribou type aircraft by means of an unconventional boundary layer control system.

[redacted]

Tab 3

Requirement: Aerial Pick-up and Delivery

Task: Flex-Wing Development

Problem: To develop a series of flex-wing devices (including homing and landing system) for precision delivery of supplies to include a 300 pound payload drop glider, a 1,000 pound payload towed glider, and a man-carrying "flying jeep".

Description: After completion of the design, and subsequent production of the relevant devices, they will be tested to ascertain their utility for aerial delivery in remote areas

Current Status: A joint Army-ARPA contract has been let to Ryan Corporation for design, development, and testing of the three previously mentioned items.

Tests of the precision drop glider system started in October using an Army Otter aircraft. (Efforts are in process to obtain use of a C-47 for tests more closely resembling operational use.) The test program has been extended to provide sufficient drops with a fixed set of parameters to establish a high confidence factor. Initial problems involving transformation from a "parachute" configuration, necessary to establish orientation prior to inflating the wing, have been solved by changes in the method of reefing the wing. Similar problems resulting from exit speeds of 110 miles per hour, versus 65 MPH used in the initial series of tests, have also been solved, and 14 of the last 16 drops have been successful. No completely successful radio homing drops have yet been accomplished due to the concentration of effort on developing a performance envelope. Manually operated ground radio control has been completely successful. The present series of tests will provide additional kine-theodolite data and is to include drops made under various unfavorable conditions such as high ground winds, limited DZ area, etc.

Tests of the 1,000 pound payload towed glider are to start in early January 1963.

The flying jeep" is undergoing limited engineering tests.

[redacted]

Tab 3

Requirement: Aerial Pick-up and Delivery

Task. Anemometers

Problem: Develop a rugged, small, hand-held anemometer with an easily read dial that is visible in darkness, for use by indigenous forces in gauging wind velocities in drop zones.

Description Research is essentially completed, pending the outcome of field testing.

Current Status. The standardized military anemometer AN/PMQ-3C has been tested and found too bulky and heavy to satisfactorily meet the ARVN airborne troops requirement. A hand-held shirt pocket-size device is preferred, if one of sufficient ruggedness and reliability can be found. A commercially available hand-held pocket-size device with these characteristics is now being field tested in SVN.

Tab 3

Requirement: Aerial Pick-up and Delivery

Task: Disposable Parachutes

Problem. Develop an improved disposable parachute for aerial resupply missions, or adapt such chutes as are under service development.

Description. Perform tests on equipment developed by the Services, to determine its utility for remote area situations.

Current Status. ARPA has monitored Service developments in disposable parachutes. The primary considerations are. (1) Secure disposal of parachute items in operational areas; and, (2) Simplified recovery of bundles suspended in trees. Among the techniques considered, including burning, dissolving in water, burying, releasing a balloon to carry away canopy and harness, and use of camouflage printing on the canopy, this last is most practical. However, none solves the second problem mentioned above, the recovery of bundles from trees. Army is continuing its own research on the problem. Further, it does not appear that relaxing the present Army specification will produce an acceptable item any earlier than the 1964 date contemplated in the Army program.

Tab 4

AGILE PROJECT IV

COMMUNICATIONS SYSTEMS

PROJECT OBJECTIVE:

To develop required communications equipments, techniques and systems for friendly indigenous forces which will provide them with an effective capability for:

a Tactical communications within and among units in tactical counter-insurgency operations and for control of support aircraft.

b. Communication of alarm signals from villages, strategic hamlets, convoys, and outposts in the event of attack

c. Communications for control and operation of naval units primarily composed of junk forces.

PROJECT BACKGROUND:

Friendly indigenous forces in remote area conflict situations are generally likely to be confronted with the requirement for small unit operations against an elusive foe in difficult terrain, remote from maintenance, supply and vehicular transportation facilities. This requirement places a premium on effective ground-to-ground and air-to-ground communications through the use of ultra light-weight, rugged and operationally simple radio equipment. Furthermore, the physical nature of typical remote area conflict situations introduces severe communications problems in the form of high-levels of radio-frequency noise, heavy vegetation offering extremely high attenuation of radio waves, rugged terrain which interferes with ground-wave radio propagation, and variable conditions of soil conductivity. The physical and educational qualities, social organization, mores and governmental structure may also introduce specialized friendly indigenous communications requirements. Radio communications equipment for regular U.S. forces generally is not uniquely designed to meet these specific types of needs.

It is also contemplated that conditions of terrain and vegetation will frequently preclude the use of vehicular communications equipment below battalion or comparable level. Dispersal among units and frequent employment of long-duration patrols at distances of 20-100 KM from base or home unit, coupled with the severe attenuation of ground-wave signals in tropical mountainous and jungle environments further restrict the possibilities for using radio communications equipment standardized for U.S. field army purposes

These factors lead to the conclusion that communications equipment which in some cases is special-purpose or at least of limited applicability in conventional warfare is required by friendly indigenous forces in environmentally unique operations.

CONDUCT OF THE PROGRAM

Phase 1 - Southeast Asia Environmental Research Program

Objective.

To develop and analyze data through a comprehensive program of measurement of the parameters of electromagnetic propagation applicable to the environment of Southeast Asia, and of those operational factors which determine communications requirements, to provide a basis for development of communications equipment and systems.

Data Required:

It is intended that the environmental research program develop the following information:

a. Data on path loss for all possible propagation modes from VLF through UHF frequencies for the several types of terrain and vegetation peculiar to Southeast Asia.

b. Data on ionospheric conditions in Southeast Asia as they affect sky-wave propagation.

c. Requirements for communications traffic between and among military units, bases, convoys, patrols, aircraft and naval units.

Conduct of the Study:

The agency charged with prosecution of the environmental research program will be responsible for managing and coordinating the efforts of contractors in the measurement program and in the operations analysis. Contractor teams in Southeast Asia will operate with support of and under the general supervision of the CDTC in each host country but will receive specific direction from the ARPA agent representative.

[redacted]

Tab 4

Phase II - Test and Evaluation

Objective:

To determine the applicability of existing commercial and military developmental equipment to the requirements determined in the Phase I study.

Data Required:

a. Definition of the extent to which requirements can be met with known or existing equipment and devices.

b. Extent and nature of the specific deficiencies of equipment evaluated against requirements.

Conduct of Phase II:

In order to assure a timely improvement of existing capabilities, test and evaluation of commercial and military developmental communications equipments will be conducted concurrently with the environmental research program to provide improved interim capabilities in those cases where requirements can be postulated with some assurance. It is not intended that Phase II include extensive equipment development. These tests will ordinarily be conducted in Southeast Asia in order to assure evaluation appropriate to the environmental requirement.

Phase III

To develop and evaluate test quantities of equipment specifically designed to meet communications of friendly indigenous forces.

Conduct of Phase III:

In this phase of the program, ARPA will utilize appropriate service agencies to contract for development of required communications equipment and systems to meet specific performance characteristics derived from results of Phases I and II. Tests will be conducted in Southeast Asia to determine effectiveness, reliability, maintenance requirements and basis of issue to provide the information necessary for possible MAP procurement of the equipment.

[redacted]

Requirements and Tasks

Listed below are those major requirement areas and currently active tasks with which this project is concerned. Succeeding sheets are summaries of the purpose and current status of each task.

1. Communications Systems Research and Development
   - A. Environmental Research
   - B. Test and Evaluation
   - C. Equipment Development
2. Tactical Radio System Components
   - A. Hand-held or Pocket Sized Short Range Equipment
     - (1) Ryan Rifle Butt Radio, VHF-FM
     - (2) Motorola HD 21, VHF-FM
     - (3) AN/PRC-35 (experimental model), VHF-FM
     - (4) Hughes RS 35, VHF-AM
   - B. Man-pack Equipment
     - (1) OKI TRP-4, HF SSB
     - (2) Hughes HC 162, HF SSB
     - (3) AN/TRC-77 (modified experimental models), HF AM; HF SSB
     - (4) A-510, HF AM
     - (5) AN/PRC-25 (experimental model), VHF-FM
   - C. Other Tactical Equipment
     - (1) RFCA, HF SSB
     - (2) Collins 618-T, HF AM and SSB

3. Hamlet and Outpost Alarm Communications Equipment

   A. Chaff Rockets

   B. Radio Industries Hamlet Alarm System

   C. RCA Hamlet Alarm System

   D. Ryan Special Concealable Alarm Transmitter

4. Power Supplies for Communications Equipment

   A. Mercury Battery Tester

[redacted] CONFIDENTIAL

Tab 4

Requirement: Communications Systems Research & Development

Task: Environmental Research (1, A)

Problem: To obtain information on electromagnetic wave propagation that will serve as guidance for more efficient use of presently available radio equipment and for the design and development of new equipment to provide tactical communications in Southeast Asia, with special emphasis on operations in jungles.

Description: Path loss measurements will be made in Thailand at distances up to 300 miles and throughout the frequency range from 15 kc to 5 kmc; major emphasis will be on distances under 30 miles and in the frequency ranges 100 kc-8 mc and 30-400 mc. Investigations will include varieties of terrain, atmospheric noise levels, varieties of propagation modes and polarization, varieties of antenna types, and ionospheric soundings.

Current Status: The U.S. Army Electronics Research and Development Laboratories (USAERDL) is acting as ARPA's service agent. A contract has been let with Jansky and Bailey (J&B) to perform the electromagnetic propagation studies in Thailand, and arrangements have been made for the U.S. Army Radio Propagation Agency (USARPA) to send a mobile ionospheric sounding station to Thailand, with operations and maintenance personnel.

Jansky and Bailey have completed the literature analysis and identified the specific gaps in required knowledge which the program in Thailand is designed to fill.

USAERDL has stationed a resident engineer in Thailand to direct the performance of contractor personnel under the guidance of CDTC-T.

J&B have made a site-survey. USARPA intends to conduct site-surveys and both J&B and USARPA intend to initiate their programs in Thailand during the third quarter of FY 63. (Preliminary work under this requirement was completed during the 4th quarter of FY 62 by ACF Electronics under Project YO-YO; the report of this work has been received and distributed to interested agencies.)

[redacted] CONFIDENTIAL

Requirement: Communications Systems Research & Development

Task: Test and Evaluation (1, B)

Problem: To survey, analyze, and evaluate the environment of military operations in Thailand as it influences indigenous military communications.

Description: The capacity, reliability, and limitations of existing indigenous military communications will be analyzed and evaluated. The physical environment of the Thailand region will be studied to determine the special problems it poses for the operation of communication equipment. The physical serviceability and the performance of communication equipment in tactical military field exercises will be examined, and the importance and special problems of the human element will be studied. The results of these investigations will be used to isolate concrete equipment and systems requirements, and to derive specifications for new and modified equipment.

Current Status: The U.S. Army Electronics Research and Development Laboratories (USAERDL) is acting as ARPA's service agent. Contracts have been let with the Stanford Research Institute (SRI) and with Sylvania (EDL).

SRI intends to commence operations in Thailand during the third quarter of FY 63. The USAERDL resident engineer Thailand will direct SRI personnel under the guidance of CDTC-T.

Sylvania (EDL) is fabricating or assembling the equipment and shelters for a base laboratory facility and mobile field laboratory facilities, which will be utilized by the SRI field team and the CDTC-T in Thailand. Deliveries are scheduled to be made in Thailand during February, March and April, 1963.

Requirement: Communications Systems Research & Development

Task: Equipment Development (1, C)

Problem: To initiate the development of equipment required for tactical communications by friendly indigenous forces in remote area conflict situations.

Description: Development programs are to be initiated as needed and as permitted by the results of tasks 1A and B.

Current Status: Development efforts underway are reported under individual tasks, below. The initiation of additional specific development programs is awaiting the outcome of tasks 1A and B.

Requirement: Tactical Radio System Components

Task: Hand-Held or Pocket Sized Short Range Equipment (2, A)

Problem: To provide a highly portable radio set, extremely simple in operation for use between squad-sized elements in ambush locations, on patrol, or in other tactical situations as required.

Description: Modern solid-state circuit design offers promise of a capability to produce very small and light weight equipment which can be carried and operated by an individual soldier without interfering with his combat capability. Ranges of up to 1,000 meters in most terrain and vegetation and a capability for silent, semi-automatic transmission of simple coded alarm messages. A requirement is that the radio be compatible with standard VHF-FM portable sets.

Current Status: (1) Ryan Rifle Butt Radio VHF-FM

This FM transceiver is an encapsulated transistorized unit weighing approximately one pound, plus batteries, operating at about 70 MC. The unit receives FM transmissions with an earphone and transmits CW using a push-button key. The set will be installed in the stock of an Armalite AR-15 rifle.

The set is being developed by Ryan Electronics. Delivery of two experimental models is expected in the third quarter of FY 63.

(2) Motorola HD-21 VHF-FM

This is one of a number of commercially available hand-held VHF-FM voice only transceivers using entirely transistorized circuitry. This set weighs about 3 pounds with batteries and radiates about 1.4 W at frequencies between 25 and 54 MC.

ARPA tentatively plans to obtain models for field evaluation during the coming quarter.

(Continued)

(3) AN/PRC-35 (Experimental Model) VHF-FM

This set was developed under U.S. Army contract as a replacement for the AN/PRC-6. It has not yet been standardized by the Army. It is transistorized, weighs about five pounds, and provides FM voice at a radiated power of 0.35 watts between 47 and 55 MC.

Three sets have been obtained for field evaluation in Southeast Asia beginning in the coming quarter.

(4) Hughes RS-35 VHF-AM

This set is a very small and light weight (1 pound) AM VHF transceiver developed under a government contract. Power output is about 1/3 watt in the 28-35 MC band

ARPA is following development effort on this radio and has not yet determined whether to obtain models for test. One difficulty is that the set is AM and, therefore, not compatible with current standard field radios.

Six TRP-4 sets were purchased and have been given preliminary field tests in South Vietnam. The tests have not been conclusive as to performance characteristics of the radio. Additional tests are planned in Thailand during the coming quarter

(2) Hughes HC-162, HF SSB

This set is a completely transistorized transceiver, which weighs about 25 pounds complete with batteries. It radiates 15 watts SSB voice or CW and is tunable in 1 KC steps throughout the range 2 - 12 MC. This set was developed on Company funds by Hughes.

ARPA has contracted to buy 5 sets, and delivery is expected in January, 1963. Delivery has been held up by technical deficiencies observed during acceptance tests. Present plans call for two sets to be given engineering tests by USAERDL at Fort Monmouth.

The US Army has contracted for delivery of 4 sets, which are scheduled for tests at Fort Bragg and in Panama during January.

ARPA will schedule tests in Southeast Asia when the Hughes set demonstrates satisfactory performance.

(3) AN/TRC-77 (modified experimental models) HF AM; HF SSB

This set was developed by EDL (Sylvania) for US Army Special Forces use. It is a 10 watt AM CW set weighing about 25 pounds and operating in the range 3 - 8 MC.

ARPA has contracted for modification of 10 TRC-77's to include voice capability for evaluation in Southeast Asia.

Plans have been made to obtain 3 AN/TRC-88 which is the AN/TRC-77 modified for single sideband for evaluation in Southeast Asia.

Tests of both of these sets are expected to begin during the coming quarter in Thailand.

(continued)

(4) Australian A-510, HF AM

This set is a high frequency AM, voice and CW set which radiates less than 1 watt and weighs 43 pounds.

Three A-510 sets were provided by the Australians and will be evaluated in Thailand beginning in the coming quarter.

(5) AN/PRC-25 VHF FM

This set is a transistorized FM-VHF transceiver developed for the US Army as a replacement for the AN/PRC-10. It weighs 15 pounds complete with batteries and radiates 1.5 watts voice over the range of 30 - 76 MC.

Three AN/PRC 25 sets have been obtained from USAERDL for comparative evaluation to determine the degree of improvement over the AN/PRC-10 it provides in the environment of Southeast Asia.

Also, efforts have been underway during the past quarter to provide experimental field expedients for remoting and elevating antennas of the AN/PRC-10 to increase its range where it is used in fixed outposts. USAERDL has been requested to study this capability more thoroughly against a requirement prepared by the CDTC in Vietnam. These experiments will be applicable to the AN/PRC-25 and other VHF sets.

Requirement Tactical Radio System Components

Task: Other Tactical Equipment (2, C)

Problem: To provide improved communications equipment for use in tactical headquarters of battalion and larger units, in support aircraft, and in command junks.

Description: Battalion, regimental, and division headquarters require effective long-range vehicular communications including voice, CW and radio teletype. Such headquarters now do not have mobile equipment adequate for control of tactical formations Long-range HF equipment is also required for command junks and for support aircraft.

Current Status: (1) RFCA, HF SSB

This set, built by RF Communications Associates is a 125 watt, 50 pound, high frequency, single sideband transceiver which operates AM or SSB from 1.6 - 16 MC.

ARPA procured three RFCA sets for evaluation in the Command Junk as a long-range flotilla-to-base capability. These sets together with AN/GRC-87, AN/GRC-6, and Radio Industries TR-20 have been installed for evaluation on the junk, at Navy Headquarters in Saigon and at the CDTC Tests are underway and a report is expected to be distributed during the next quarter.

(2) Collins 618-T, HF AM and SSB

The Collins 618-T is a modern high-frequency transceiver which radiates 400 watts PEP in single sideband and 100 watts on compatible AM It has been standardized by the USAF for aircraft installation as the AN/ARC-91 A jeep installation designated as AN/MRC-95 including radio teletype has been purchased by the US Army for use in airborne units.

ARPA plans to obtain several AN/MRC-95 sets for evaluation in South Vietnam as a mobile tactical command communications capability for ARVN units of battalion and larger size It is planned to arrange for evaluation of the long-range air-ground capability of the 618-T in this environment. Several such sets are currently installed in aircraft in South Vietnam

[redacted]

Tab 4

Requirement: Hamlet and Outpost Alarm Communications Equipment

Task: Chaff Rockets (3, A)

Problem: To provide a rapid alarm capability for outposts under attack which does not rely on radio communications and accurately identifies the location of the attacked outpost.

Description: Existing installations of long-range radar provide coverage of a major portion of South Vietnam. The concept is the use of an inexpensive rocket to deliver chaff to an appropriate altitude for detection and location fixing by this radar system.

Current Status: The OSD/ARPA R&D Field Unit in Vietnam has procured 100 chaff dispensing rockets from the Hosoya Fireworks Company, Tokyo, Japan, at a unit cost of $20.82.

Tests have been conducted during the past quarter in accordance with a test plan prepared by the CDTC Vietnam. The chaff rockets are fired singly from selected locations within range of a GCI radar at a time and location unknown in advance by the radar operators. These tests have been made under varying weather conditions and at different hours.

A report of the test is expected to be available early in the next quarter. Preliminary test results are not encouraging for the present altitude and chaff capacity of the rocket tested. Analytical studies have been conducted by RAND in an attempt to determine the optimum rocket configuration, performance and probability of detection.

[redacted]

Tab 4

Requirement: Hamlet and Outpost Alarm Communications Equipment

Task: Radio Industries Hamlet Alarm System (3, B)

Problem: To provide a suitable alarm system which will permit a timely Vietnamese military reaction to guerrilla activities in villages and strategic hamlets.

Description: The system includes ten 1/2 watt alarm transmitters, ten 10 watt alarm transmitters, two relay units, and a terminal station with automatic read-out devices which operate with the Radio Industries TR-20 Village Radios being installed in large quantities by USOM in Vietnam. The system transmits a narrow band tone modulated AM signal at frequencies between 30 and 40 MC.

Current Status: ARPA has procured and shipped three complete systems to Vietnam.

CDTC-V has been conducting an evaluation of system effectiveness in the area of Ban Me Thuot in Vietnam during the past quarter. This test system consists of five 1/2 watt transmitters, five 10 watt transmitters, two read-out units, and a relay unit. Preliminary reports indicate that the system performs beyond expectations in terms of range, reliability, and ease of operation.

All three complete systems are scheduled to undergo testing in various areas of Vietnam during the coming quarter, a final report of results is expected during the quarter.

[redacted]

Tab 4

Requirement: Hamlet and Outpost Alarm Communications Equipment

Task: RCA Hamlet Alarm System (S, C)

Problem: To provide a simply operated radio alarm system to be used in villages to warn the mobile reserve forces of higher echelons in the event of insurgent attacks.

Description: The RCA system is a narrow-band FM, tone-coded system using frequency selective relays with approximately one-cycle band width. This system is expected to extend the range of communication considerably beyond that of a conventional voice system with much higher power. The system allows the transmission of five different signals from each of many remotely located transmitters to a base station receiver.

This is a completely self-contained system which was developed for use in remote area conflict situations where the USOM Village Communications System (TR-20's) is not installed. In addition, some of its components can be utilized to adapt a variety of standard military and commercial communications to alarm system applications.

Current Status. RCA is now fabricating five transmitter units and 2 receiver-display units. Delivery is expected in the third quarter of FY 63.

This system, if it operates satisfactorily, will be given a field evaluation in Southeast Asia.

One feature of the system which may have more general applicability is the provision for semi-automatic transmission of simple coded messages.

[redacted]

[redacted]

Tab 4

Requirement: Hamlet and Outpost Alarm Communications Equipment

Task: Ryan Special Concealable Alarm System (3, D)

Problem: To provide a very small alarm transmitter, compatible with the Radio Industries Hamlet Alarm System, which can readily be concealed.

Description: A transmitter approximately the size of a two-cell flashlight which radiates a 1/2 watt tone modulated AM signal is required for special purpose use in South Vietnam, as an extension of the Radio Industries Hamlet Alarm System.

Current Status: Ryan Electronics has been provided with funds by ARPA for 3 test models of concealable transmitters.

These sets will be delivered for evaluation early in the next quarter in South Vietnam.

[redacted]

[redacted]

Requirement: Power Supplies for Communications Equipment

Task: Mercury Battery Tester (4, A)

Problem: To provide field equipment suitable for determining the condition of mercury batteries.

Description: Small, dry-cell powered, battery testers have been designed and fabricated by Applied Research, Incorporated, Springfield, Virginia.

Current Status: Ten battery testers have been procured and delivered to South Vietnam, where they are now undergoing evaluation.

This task involves only a minor item of test equipment and will not in the future be reported separately.

[redacted]

AGILE PROJECT V

Combat Surveillance and Target Acquisition

PROJECT OBJECTIVE: To develop combat surveillance and target acquisition techniques, systems, and devices which will enable friendly indigenous forces in remote area conflict situations to:

a. Detect, locate and maintain surveillance of hostile units, bases, stores and supply routes.

b. Detect infiltration of borders and incipient ambushes or attacks on outposts and communities.

c. Effect rendezvous of friendly elements with each other and with supply drops or caches, and guide friendly units to the location of hostile elements.

d. Improve the degree of mobility and the effectiveness of logistic support through better navigation and point location in remote areas.

e. Exploit the knowledge of communications techniques and equipment in location of hostile bases.

PROJECT BACKGROUND:

1 General Discussion

Friendly indigenous forces in remote area conflict situations are seriously hampered by the inherent advantages of hostile elements which can attack, withdraw, ambush, receive logistic support through clandestine methods at times and places of their own choosing. This advantage is reflected by the adverse ratio of friendly to hostile forces necessary to achieve suppression of guerrillas and insurgents which has been on the order of 15:1. To offset this handicap, friendly indigenous forces urgently require the enhancement of their combat effectiveness which can be achieved through the application of superior science and technology efforts to the problem of combat surveillance and target acquisition.

[redacted]

2. Limitations on Equipment

a. Airborne and vehicular sensors and navigation equipment must be designed for mounting in vehicles or aircraft which are presently available to or to be procured for friendly indigenous forces. As general guidance, it is expected that combat operations on the ground will not ordinarily involve the use of standard armored vehicles. Aircraft will include light and medium helicopters, light tactical aircraft, medium transport aircraft, and perhaps special purpose aircraft like MOHAWK.

b. Equipment for use by ground tactical units must be man portable, rugged, and generally suited to operation in tropical maritime climates and in difficult terrain. As general guidance, such equipment should be capable of being broken down into individual loads of 40 pounds or less. Power supplies should provide for duty-cycle operation of the equipment for at least one week.

CONDUCT OF THE PROGRAM

The program is intended to be carried on in three phases as follows:

Phase I - Southeast Asia Surveillance Research

Objective

To develop and analyze data on those physical parameters of the Southeast Asia environment and of potential targets which constrain the application of particular surveillance and target acquisition techniques and influence equipment design. This study program will provide a basis for a comprehensive investigation of existing techniques and equipment for use by indigenous forces in Southeast Asia.

Specific Data Required

It is intended that this study develop the following data by search of available literature and through field measurements as necessary.

a. Acoustic and Seismic

(1) Level of acoustic and seismic intensity produced by men walking, singly or in groups in the various types of terrain and vegetation similar to those of Southeast Asia.

(2) Level of acoustic intensity of men speaking to each other.

(3) Levels of acoustic and seismic intensity produced by firing of small arms, automatic rifles and machine guns and light mortars.

[redacted]

(4) Background noise levels of accoustic and seismic intensity observable under varying weather conditions and in the several types of terrain, soil and vegetation found in Southeast Asia.

(5) Propagation attenuation and diffusion data for accoustic disturbances under varying weather, terrain and vegetation conditions applicable to Southeast Asia.

(6) Propagation of seismic disturbances in soils common to the various regions of Southeast Asia.

b. Electro-magnetic

(1) Radar echoing area as a function of radar frequency and viewing aspect for individual soldiers armed with hand-held weapons, automatic rifles and machine guns, and carrying or firing light mortars.

(2) Emission of electro-magnetic energy (detected by a micro wave radiometer), as a function of frequency, by individual soldiers armed as in Para b (1) above.

(3) Relative magnitude and frequency distribution of the doppler spectrum generated by movement of varying types of foliage and for a range of wind velocities which may be encountered in Southeast Asia as a function of radar frequency.

(4) Magnitude of the signal generated in a large current-carrying loop of wire laid on the earth by the magnetic field associated with the passage over the loop by soldiers armed as in Para b (1) above.

(5) Propagation attenuation forces for electromagnetic emissions in Southeast Asia as a function of frequency, antenna, ionospheric and atmospheric conditions, terrain profile, vegetation and climatic conditions (Joint undertaking with Project IV).

(6) Levels of background EM radiation and noise typical to the area of interest as a function of frequency.

(7) Detectability of camouflaged holes in the earth and buried caches of weapons by portable and airborne magnetometers of various types.

c. Infra-red, Optical and Visual

(1) Intensity of the flash produced by firing of small-arms weapons as a function of wavelength.

(2) Variation of optical contrast between targets of interest and typical terrain and vegetation background for a range of ambient light levels from 10^{-5} candle power to unobstructed sunlight.

(3) Apparent temperature contrast for individual soldiers armed as in Par b (1) above when viewed against typical vegetation and terrain backgrounds and for typical ambient temperatures found in Southeast Asia.

(4) Propagation and attenuation factors for the near and far infra-red through various types of foliage found in Southeast Asia both along the surface and from aircraft to ground, for a suitable range of weather conditions.

d. Chemical

(1) Chemical emanations which are characteristic of individual soldiers armed as in Par b (1) above and of cooking and heating fires.

(2) Data on detectability of the above chemical emanations as a function of range, weather conditions, vegetation and terrain applicable to Southeast Asia.

(3) Detectability, rate of dispersion, and persistence of various artificial chemical substances which may be used to contaminate enemy individuals. This data should be for weather, vegetation and terrain similar to that of Southeast Asia.

Conduct of the Phase I Study

It is recommended that the study phase be conducted in two parts as follows.

a. Part 1

The agency or agencies charged with the prosecution of the program will plan and conduct a comprehensive search of available literature and coordination with all appropriate offices and agencies of the government in order to collect all existing data applicable to the program. Part I will conclude with a submission to ARPA of a specific plan for a measurement program to fill gaps in the data.

[redacted]

b. Part II

Part II will comprise the conduct of the necessary field measurements and analysis of data. Data analysis will be directed toward identifying technique areas which have definite promise of solution of the combat surveillance and target acquisition problem

Phase II - Investigation of Techniques

Objective

To determine the applicability of specific techniques and devices to the requirements stated above using the results of the Phase I measurement program as a basis for the selection of promising techniques.

Data Required

In each case of a technique, equipment, or device investigated, this phase of the program will determine whether a particular approach can solve or partly solve a requirement. Specifically the investigation will determine by analysis and supporting field measurements the following data:

a. Definition of the extent to which requirements can be met with known or existing equipment and devices.

b Specific configuration of the equipment desired with respect to size, weight, form factor, and concept of employment.

c Applicable detailed performance characteristics to provide a basis for development of hardware.

Conduct of Phase II

It is intended that Service agencies be selected to investigate each promising technique area (radar, infra-red accoustic and seismic, etc.). These agencies will conduct the investigations of techniques and devices, with contractor assistance as required.

No actual development of equipment or devices is planned during Phase II. Every effort will be made to obtain the required information through the use of existing military or commercial equipment.

Tests will be performed in Southeast Asia only to the extent demanded by environmental conditions which cannot readily be duplicated in the U. S. or Panama. Southeast Asia testing will normally be performed by personnel of the agency designated by ARPA as Service Agent, or by contractor personnel under the general supervision and with the assistance of the CDTC.

Investigation of particular technique areas will be completed and reported upon separately in order to permit development or purchase of equipment as soon as the required information can be obtained.

Phase III - Development and Testing of Equipment

Objective

To obtain test quantities of equipment and perform a technical evaluation in the environment of Southeast Asia in order to determine that requirements have been satisfied

Conduct of Phase III

In this phase of the program, ARPA will utilize appropriate service agencies to purchase or contract for the development of devices whose characteristics have been specified in Phase II.

In some cases where enough information is available to support such action, ARPA may proceed to obtain test models of equipment or devices for test independent of the Phase II program.

All field tests and evaluations will be performed under the direction of the appropriate CDTC with the assistance of personnel furnished by Service Agents from their own resources or through contractors.

Requirements and Tasks

Listed below are those major requirement areas and status of tasks in each area with which this project is concerned. Succeeding sheets are summaries of the purpose and current status of each task.

1. Surveillance Systems Research and Development

   A. Environmental Research
   B. Tests and Evaluation
   C. Equipment Development

2. Aerial Surveillance

   A. Maximum Aerial Surveillance (transferred to COMUSMACV by Sec Def Directive)

3. Ground Surveillance and Target Acquisition

   A. Doppler Personnel Surveillance Radar
   B Image Viewer
   C TIARA
   D. Dye Stain VC Grenades and Shells
   E. Persistent Identification Chemicals
   F. Buried Metal and Subsurface Cavity Detectors

4 Navigation and Beacon Equipment

   A. Navigator, Doppler Radar, Self-Contained
   B. Identification and Location of Air-Dropped Equipment
   C. Terminal Guidance Beacon
   D. Tactical Maps
   E. Patrol Locating System

5. Security and Protection Equipment

   A Junk Blue Book (Completed--Book distributed)
   B. Patrol and outpost Intrusion Detection Devices

Tab 5

Requirement: Surveillance Systems Study

Task: Environmental Research (1, A)

Problem: To obtain and analyze data on those parameters of the environment and of potential targets which constrain the application of particular surveillance techniques and influence equipment design.

Description: Environmental research will be performed on the following areas

(1) Radiation and reflection characteristics and chemical emanations of personnel, vehicles, equipment and other possible indicators of hostile activity.

(2) Physical characteristics of the environment including transmission and attenuation parameters for electromagnetic and accoustic waves and background levels of noise and radiation.

(3) Other environmental parameters such as hostile operational characteristics and the physical, technical, and social characteristics of friendly indigenous forces.

Current Status:

(1) Special Infra-Red Measurements (TROPICAN)

ARPA/AGILE has provided funds to the U.S. Army Cold Regions Research and Development Laboratory to augment Project TROPICAN to include measurement of infra-red radiation from small fires embedded in tropical rain forests. This program was completed during the past quarter. Measurements were made with airborne infra-red sensors in Puerto Rico using as targets charcoal fires in "Hibachi" containers under typical rain forest cover. A report of the results will be prepared during the next quarter.

(2) Special Foliage Penetration Research

ARPA/AGILE has provided funds to the Reconnaissance Laboratory of ASD, USAF, to accelerate effort under a contract with Conductron Corporation to measure radar foliage penetration Details of this program have a classification higher than that of this report.

(3) Special Investigations

A contract has been in existence since 1 April 1962 with Defense Research Corporation for a Guerrilla Activities Detection Study. The contract was completed in December 1962; final report to be distributed in the next quarter. Details of this study bear a classification higher than that of this report

(4) Basic Measurements and Operations Analysis

Implementation of Part I, Phase I of the Surveillance Environmental Research Program as described in the general project description above was initiated during the quarter An order has been issued to the U.S Army Electronic Command to accomplish a literature search and develop a planned program of measurements of environmental parameters affecting the employment of surveillance devices and techniques. This work should begin during 3d quarter FY 63 and be completed in 4th quarter FY 63. It is planned to initiate the measurement program immediately upon completion of the Part I effort

[redacted] CONFIDENTIAL

Tab 5

Requirement Surveillance Systems Study

Task: Techniques Investigation (1 B)

Problem. To identify techniques for surveillance and target acquisition which are most likely to overcome limitations of the environment and those equipments or devices which most nearly permit implementation of these techniques

Description Specific technique areas which require investigation include

(1) Accoustic and seismic detectors.

(2) Passive and active infra-red surveillance devices.

(3) Radar and other active and passive electro-magnetic surveillance and detection equipment

(4) Active and passive optical viewing, image intensification and detection devices.

Current Status A program is planned, based upon the environmental research program to encompass a comprehensive survey of techniques.

This program will be implemented on a systematic basis as results of the environmental measurements indicate the possibility of success of particular surveillance techniques.

The evaluation of existing devices and techniques in an effort to find interim solutions to problems is covered under other tasks of this project.

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Requirement Surveillance Systems Research and Development

Task. Equipment Development (1, C)

Problem: To initiate the development of equipment required for combat surveillance and target acquisition purposes by friendly indigenous forces in remote area conflict situations.

Description Development programs are to be initiated as needed and as permitted by the results of tasks 1A and B.

Current Status: Development efforts underway are reported within individual tasks, below. The initiation of additional specific development programs is awaiting the outcome of tasks 1A and B.

Requirement: Aerial Surveillance

Task: Maximum Aerial Surveillance (2, A)

Problem: To determine the usefulness of maximum aerial surveillance in reduction of insurgency activities.

Description: An air surveillance schedule will be established over a selected defense sector to observe all major roads, railroads, villages, hamlets and outposts around-the-clock, with varied frequency of appearance over the same points. All unusual activity will be reported and investigated to the extent possible.

Current Status: This task was proposed originally by ARPA/AGILE as a research vehicle to determine the effect of concentrated aerial surveillance. COMUSMACV and CINCPAC considered that the effort was primarily of an operational nature. This view was confirmed by the Secretary of Defense who directed that COMUSMACV implement the program of continuous aerial surveillance.

Accordingly the task entitled Maximum Aerial Surveillance is listed as transferred to COMUSMACV and is being carried out through the use of MOHAWK aircraft.

Tab 5

Requirement: Ground Surveillance and Target Acquisition

Task: Doppler Personnel Surveillance Radar (3, A)

Problem. To evaluate available portable ground radar equipment for use by friendly indigenous forces in counterinsurgency operations.

Description: The AN/PPS-4, a US Army standard portable doppler personnel surveillance radar and other similar radars as they become available will be evaluated.

Current Status: During FY 62, 3 AN/PPS-4 radars were sent to the CDTC in South Vietnam for evaluation. A preliminary field evaluation was carried out and a report submitted in May, 1962, with inconclusive results.

MAAG Viet Nam during the past quarter has procured 10 AN/PPS-4 radars for issue to VN units.

15 US enlisted personnel qualified in this equipment have been attached to VN units to assist in operations and provide guidance to VN personnel and will also collect data on the evaluation of the radar.

CDTC personnel, augmented by an officer and enlisted man from Fort Huachuca, will assist MAAG in the proper evaluation of radar performance.

Tests are underway and are expected to continue into the next quarter. Results of this evaluation should provide a basis for determining operational suitability, effectiveness, reliability, ease of maintenance and basis of issue of man-pack personnel surveillance radar to friendly indigenous forces.

Tab 5

Requirement. Ground Surveillance and Target Acquisition

Task: Image Viewer (3, B)

Problem: To provide friendly indigenous forces with devices to assist in night surveillance and night firing.

Description: Active infra-red devices such as IR weapon sights and metascopes are currently available in CONUS. Selected items will be tested to determine their suitability for use by friendly indigenous forces.

Current Status: ARPA has procured 6 rifles with infra-red weapon sights. These devices are being evaluated at Trung Lap Ranger Training Center, South Viet Nam.

An infra-red metascope has been demonstrated to VN personnel and one has been supplied to the Trung Lap Ranger Training Center for evaluation.

A report of tests of these IR devices is expected during the next quarter.

The US Army development program for night vision devices shows promise of producing prototypes which could be useful to friendly indigenous forces. Of particular interest is the direct view image intensifier now under development. This device will be obtained for evaluation for use by VN units if a suitably small and light weight model can be developed.

Tab 5

Requirement: Ground Surveillance and Target Acquisition

Task: Dye Stain VC Grenades and Shells (3, D)

Problem: To evaluate the functional suitability of various standard ordnance shells and grenades for dispensing of flourescent VC dye stain powder.

Description: A hand or rifle grenade, or mortar shell suitable for firing from conventional weapons which contains flourescent VC powder in addition to an explosive charge is desired. This dye is intended to contaminate hostile guerrillas during combat engagements so that suspected personnel may later be screened with an ultra-violet source to identify probable insurgents.

Current Status: During FY 62, the use of Illuminating Shell, 60 mm mortar M83A1 to dispense the dye stain was evaluated. Results indicated an insufficient area of coverage and inconsistent height of burst.

This task will henceforth be reported under V. 3. E "Persistent Identification Chemicals."

[redacted]

Tab 5

Requirement: Ground Surveillance and Target Acquisition

Task: Persistent Identification Chemicals (3, E)

Problem. To obtain and provide field evaluation of suitable chemical materials which may be dispersed in areas of insurgency activity to contaminate the person or clothing of hostiles to facilitate subsequent detection, tracking and identification.

Description: Several potentially promising chemicals are known which have characteristics suitable for investigation as detection and tracking aids. These are

(1) Chemicals which flouresce under ultra-violet and thus are readily detected by screening suspects, using an ultra-violet source.

(2) Chemicals which produce a lasting discoloration of the skin which is readily detected visually.

(3) Chemicals which produce distinctive odors which are detectable by humans

(4) Chemicals which produce odors which are detectable by dogs or by chemical sensors but are not readily detectible by the human nose.

(5) Radioactive isotopes of suitably long half-life which can be detected by existing radiation detectors.

Included in this task are investigations of means for dispensing the materials and detection techniques and devices.

Current Status (1) The U.S Army Quartermaster Research and Engineering Command has been directed to conduct investigations in the use of Squalene [redacted] and identification by trained dogs

(2) It is planned to initiate a program of research and investigation during the next quarter on some of the other types of chemical detection and identification techniques discussed above. The investigation of possible materials [redacted] and already underway will be continued and [redacted]

[redacted]

Tab 5

Requirement Ground Surveillance and Target Acquisition

Task. Buried Metal and Subsurface Cavity Detectors (3, F)

Problem: To provide portable equipment for detection of buried nail boards, buried caches of weapons or other metallic equipment, and small subsurface cavities used by insurgents.

Description. Sensitive magnetometers and mine detectors have the capability of detecting very small perturbations in the earth's magnetic field caused by the presence of magnetic materials. Most types of sensitive magnetometers are large and complex instruments. This task is aimed at obtaining simple, light-weight devices for detection of buried metal and small subsurface cavities.

Current Status: Funds have been provided to the Naval Ordnance Laboratory at Corona, California, to investigate thin-film Hall effect magnetometers and to develop experimental models of portable devices suitable for evaluation in the field. This technique appears to be most promising in terms of the potential size, weight, sensitivity, and power drain of the magnetometer.

The CDTC has continued tests of the portable mine detector in S. Viet Nam during the past quarter both in training exercises and in operations. Results have been generally unsatisfactory in locating buried weapons when the depth of the weapon exceeded about two feet. At depths of less than 2 feet the detector, which weighs 36 pounds, did detect various buried metal objects. No final determination as to utility of this device has been made.

A number of commercial firms have expressed interest in the problem of designing subsurface cavity detectors in man-pack configurations. Thus far, no suitable proposal has been received

[redacted]

Requirement Navigation and Beacon Equipment

Task: Aerial Navigation System (4, A)

Problem: Friendly indigenous forces require a capability to insure that their aircraft engaged in aerial delivery firepower support, and resupply of their surface units can reach their objective area and return to base under all-weather conditions.

Description: The greater proportion of the aircraft involved are likely to be rotary-wing and sub-sonic fixed wing, making volume and weight of navigation equipment to be placed aboard of critical importance in most instances. The difficulties encountered in providing for the security of the ground-based elements of a system which must rely on a number of fixed ground stations widely dispersed places a premium on a system which is self contained aboard the aircraft. Operation, maintenance and logistics problems impose a need for a system which is usable aboard all types of aircraft likely to be involved, i.e., a universally mountable system rather than one specially tailored to each separate type of aircraft.

Current Status: The US Navy has been furnished funds and requested to procure for field evaluation in South Viet Nam three models of the RYANAV IV self contained universally mountable doppler navigator. These equipments are to be mounted in the YAC 1 Caribou aircraft on loan to ARPA from the US Army and in H-21 and H-34 helicopters in South Viet Nam. Funds have also been provided to the US Navy for purchase of an LFE doppler navigator to be evaluated at Fort Rucker, Ala. for ARPA by the US Army, provided the US Navy determines that the technical deficiencies previously observed in this system are [illegible]. This determination is to be made on the basis of [illegible] tests of the system by the US Navy during the coming quarter.

It is planned during the next quarter to investigate the feasibility of obtaining a commercially available terrain avoidance radar for field evaluation aboard rotary wing aircraft.

[redacted]

Requirement. Navigation and Beacon Equipment

Task. Identification and Location of Air-Dropped Equipment (4. B)

Problem: To provide a device which will enable indigenous forces to locate and identify air dropped equipment or supplies.

Description: The device desired is a small battery operated radio transmitting device capable of emitting a coded transmission for identification of air-dropped material. Ground troops seeking to locate the air-drop will be equipped with radio receivers having a direction-finding capability.

Current Status. An abbreviated development program has been funded with Ryan Electronics to obtain interim test models of transmitter and receiver units suitable for feasibility testing. It is planned to continue the program to obtain field test models if the preliminary phase of the development is successful.

Other possible technical approaches to the problem have been investigated. The most promising involves using a small transmitter which can be located using a DF loop antenna on standard VHF field radios such as AN/PRC-6 or AN/PRC 10. No complete yet satisfactory proposal has yet been received.

[redacted] CONFIDENTIAL

Tab 5

Requirement: Navigation and Beacon Equipment

Task: Tactical Maps (4, D)

Problem: To determine a suitable material on which to print tactical maps for use in combat operations in South Vietnam.

Description: Map paper normally available does not retain it usefulness when exposed to the climatic conditions of S.E. Asia. A high wet-strength paper or similar material is required to withstand the long exposure to dampness and high temperatures required for counter guerrilla warfare in this area.

Current Status: Preliminary investigation has established that high wet-strength paper is available at reasonable cost in Japan, and also that Vietnamese Army Engineer Map Reproduction Units are capable of printing maps on this material.

During the past quarter a sample of the Japanese paper was tested for ARPA by the US Army Map Service against US standards for high wet-strength papers. The sample failed the test and the USAMS concluded that the sample had been damaged by its treatment prior to the test and has requested additional sheets for re-evaluation.

Meanwhile 500 sheets of US high wet strength paper have been shipped to Viet Nam to determine the capability ARVN capability to print maps on the material.

[redacted]

10

Requirement. Navigation and Beacon Equipment

Task: Patrol Locating System (4, E)

Problem: To provide an improved capability for a patrol to locate itself with reliability and accuracy.

Description. In order for patrols to report position and navigate to a desired location with precision, some navigation device which is lightweight, rugged, and reliable is required.

Current Status: ARPA is following evaluation of the Bendex-Pacific PFNS system which was developed for the US Army and is scheduled for test beginning in January at Fort Huachuca, Arizona. This system has a network of fixed ground stations similar to the DECCA system and includes man-pack, vehicular, and aircraft receivers. It is tentatively planned to provide for evaluation of the Bendex-Pacific PFNS man-pack receivers in Viet Nam in conjunction with the USAF DECCA stations installed there.

[redacted] CONFIDENTIAL

Tab 5

Requirement: Security and Protection Equipment

Task. Junk Blue Book, South Viet Nam (5, A)

Problem: To provide a background of data for the problem of recognition and identification of friendly and hostile surface craft operating in coastal waters of South Viet Nam.

Description: This task involved preparation of a book describing characteristics of each basic type of junk, to include working habits of fishermen, distinctive features and operating capabilities and limitations. Photographs, sketches and sail and hull plans are included with a text in both Vietnamese and English.

Current Status: Preparation, printing, and initial distribution of the Junk Blue Book is complete. Additional copies are available on request.

This task is therefore complete.

[redacted] CONFIDENTIAL

[redacted]

Tab 5

Requirement: Security and Protection Equipment

Task: Patrol and Outpost Surveillance Detection Devices (5, B)

Problem: To obtain and evaluate devices which will facilitate detection of the approach of hostiles to a patrol or outpost perimeter.

Description: Light-weight portable intrusion detection devices are required to permit an outpost or patrol to obtain warning of the passage of a temporary defensive perimeter. This task encompasses evaluation of various detection devices which have promise in this application.

Current Status (1) Effort in development of a remotely armed seismic mine fuze actuator by Melpar for the Picatinny Arsenal has been supported by ARPA. Development of the experimental hardware is essentially complete. The device appears to be too complex and expensive for general application in counterinsurgency warfare.

(2) Action has been initiated to obtain from Scope Incorporated, models of a break-wire intrusion alarm device. The devices should be delivered during the next quarter for evaluation in S. E. Asia.

(3) It is planned to obtain models of a break wire device of a different type developed by the US Army Electronic Research and Development Laboratory for evaluation during the next quarter.

(4) NOTS, China Lake has been provided with funds to perform experiments with seismic detectors in detection of walking men. It is planned to perform field experiments in Thailand with seismic detectors as soon as suitable equipment can be obtained. Various proposals are being evaluated.

(5) Field experiments were performed in Thailand with accoustic directional microphones to determine the potential usefulness of such devices. The experiments indicated that it is possible to detect men walking and talking at ranges appreciably greater than is possible with unaided human hearing. Additional experiments with accoustic devices are planned as a part of the environmental measurements program.

[redacted]

[redacted]

Tab 6

AGILE PROJECT VI

INDIVIDUAL AND SPECIAL PROJECTS

PROJECT OBJECTIVE

The objective of this project is to improve the capabilities of friendly governments involved in remote area conflicts in those fields where military factors are interrelated with political, sociological or economic factors. The project also provides for centralized management and control of those AGILE efforts which because of sensitivity, diversity, or uniqueness of application are not included in other segments of the AGILE program. As a consequence, the project covers a wide range of requirement areas and involves varying applications of research and engineering resources, from field investigations and analyses of insurgency problems to the development in the U.S. of hardware and other items designed to fill specified indigenous needs.

While the requirements and tasks currently being pursued under this project are shown on the immediately following page, it should be emphasized that the composition of the project is, by design, flexible and subject to cha . Moreover, the tasks entail varying levels of effort both in terms of funding and manpower.

During the reporting period, requirement areas #1 (Village and Province Security), #3 (Food Control), and #4 (Military Chemistry) have been receiving major attention under the project. Under #1 a comprehensive field-based study of rural security in Vietnam has been produced, and under #4 large-scale operational testing of defoliation has been completed and technically evaluated. Activities under the other requirement areas also are described on the following pages.

[redacted]

REQUIREMENTS AND TASKS

Listed below are those major requirement areas and the status of tasks in each area with which this group of projects is concerned. Succeeding sheets are summaries of the purpose and current status of each task.

1. Village and Province Security
   - A. Vietnamese Rural Security Study
2. Human Factors Study
   - A. Anthropometric Research
3. Food Control
   - A. Crop Destruction
4. Military Chemistry
   - A. Defoliation
5. Psychological Warfare
   - A. Psychological Warfare Equipment
6. Rations for Indigenous Personnel
   - A. Tactical Ration
7. Medical Supplies and Equipment
   - A. Medical Kits
8. People Detection and Identification Equipment and Techniques
   - A. Military Dog Breeding

[redacted] CONFIDENTIAL

Tab 6

Requirement: Village and Province Security

Task: Vietnamese Rural Security Study

Problem: To identify tasks which may appropriately be undertaken with ARPA resources in support of the GVN's rural security program.

Description: A rural security study team, composed of specialists from RAND, RAC, IDA, and ARPA field personnel, conducted an intensive in-country examination and analysis of the Strategic Hamlet Program, which is the rural security program of the GVN. The team identified, on a priority basis, R&D tasks to which it felt ARPA's resources could most profitably be directed in an effort to improve the effectiveness of the program.

Current Status: The team's report, including recommendations, has been completed and will be distributed shortly. Prior to completion it was reviewed by MAAG, Embassy and USOM in Saigon.

[redacted]

[redacted]

Tab 6

Requirement. Human Factors Study

Task Anthropometric Research

Problem: To assist indigenous forces in collecting and compiling data to provide a sound basis for engineering design of individual equipment and man-operated equipment.

Description: Indigenous forces are provided the necessary anthropometrical equipment and technical advice on its utilization.

Current Status. Field collection of anthropometric data on Thai military personnel has been completed, adequate statistical samples have been obtained and data reduction is being accomplished by the US Army Quartermaster R&E Command, Natick, Mass. A similar project for Vietnam is scheduled for the spring of 1963.

[redacted]

[redacted]

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Tab 6

Requirement: Food Control

Task: Crop Destruction

Problem: To deny indigenously-grown field crops to insurgent personnel.

Description: This information has a classification higher than that of this report.

Current Status: This information has a classification higher than that of this report.

[redacted]

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[redacted]

Tab 6

Requirement Military Chemistry

Task. Defoliation

Problem: To identify the most feasible agents and systems for defoliating vegetation in order to improve road-side and jungle visibility, thus aiding friendly surveillance and reducing insurgent ambush opportunities.

Description: Involves laboratory and field efforts to improve existing, and develop new, herbicides and dissemination equipment and techniques.

Current Status: Large-scale operational testing of defoliation agents, equipment and aerial dissemination techniques has been conducted successfully and subjected to an extensive technical evaluation. Reports have been issued and circulated. Development, test and evaluation of modified and new equipments is underway in the U.S. A major R&D effort on the screening of new agents has been formulated, together with a test and evaluation program which will culminate in field testing in Thailand.

[redacted]

Requirement: Psychological Warfare

Task: Psychological Warfare Equipment

Problem: To identify and determine the most suitable solutions for indigenous psychological warfare equipment problems.

Description: New or improved items of psychological warfare equipment are tested and evaluated against indigenous requirements.

Current Status: A report is expected shortly on the results of field test and evaluation of voice amplifiers in Vietnam; preliminary testing and evaluation of mobile audio-visual units in Thailand has been completed, and similar work with a recently supplied gasoline-powered, man-portable public address system is about to commence.

Tab 6

Requirement: Rations for Indigenous Personnel

Task: Tactical Ration

Problem: Develop an acceptable, nutritionally-adequate tactical ration for indigenous forces which is light, compact, and has sufficient "shelf-life"; also devise satisfactory container(s).

Description: This task involves the development of a ration for use by indigenous Ranger-type units on special field operations lasting a maximum of ten days; the individual ration for this period should not weigh in excess of ten pounds. Indigenous tastes require, at a minimum, the inclusion of rice and sauce. In addition to component requirements, processing and container problems must be solved.

Current Status: The final report of the Scientific Director of the Armed Forces Food and Container Institute on his visits to Vietnam and Thailand has been received and is being circulated. Receipt is expected shortly of an Army proposal for an AGILE-sponsored program to accomplish component development, packaging and process design for combat rations for Vietnamese forces. In a related action, a quantity of the Army's Supplemental Individual Combat Food Packets has been provided for test and evaluation by the Royal Thai Army.

[redacted] CONFIDENTIAL

Tab 6

Requirement: Medical Supplies and Equipment

Task: Medical Kits

Problem: (1) Develop surgical kit which can be used by indigenous personnel with much less training than physicians but who must provide treatment of greater scope than that ordinarily associated with enlisted aid-men; (2) Develop an alternative for the standard first-aid packet, which does not provide sufficient items to satisfy the indige[illegible] kit requirement.

Description: (1) The medical aid-man's kit is carried in a back-pack and composed of an assortment of medical and surgical equipment for emergency treatment of most diseases and wounds normally encountered in local operations; (2) The individual aid kit contains items designed for problems ranging from water purification to simple wound bandaging.

Current Status: (1) Results of field evaluation in Vietnam of aid-man's kits, using Special Forces and medical personnel, are not yet available; (2) A quantity of specially-adapted individual aid kits now is being tested and evaluated by indigenous personnel assigned on special missions.

[redacted] CONFIDENTIAL

Tab 6

Requirement: People Detection and Identification Equipment and Techniques

Task: Military Dog Breeding

Problem: To reduce the cost of military dogs to perform patrol, tracking and sentry duties (imported dogs are very expensive), and develop a breed suited to the environment and capable of operating successfully with indigenous personnel on sentry, attack and tracking missions.

Description: All dogs presently being trained for military use in Vietnam are of predominantly German Shepherd breeding. A cross-bred Chow-German Shepherd or Phu-Quoc-German Shepherd is eventually planned in the breeding program.

Current Status: Renovation of the Dog Breeding Center at Saigon has been completed and several dozen puppies have been bred (Bloodhounds, German Shepherds, and Doberman Pinschers). Valuable data is being acquired on how to raise canines in Vietnam, some of the problems associated therewith are quite unique and several are not yet solved. A final determination of the future of this project is dependent upon an evaluation by COMUSMACV of the utility of military dogs in Vietnam. This final determination is expected in March, 1963.

[redacted]

Tab 7

AGILE PROJECT VII

TECHNICAL PLANNING AND PROGRAMMING

PROJECT OBJECTIVE

This project provides for operations research in the identification of requirements for new or improved counterinsurgency weapons and equipment. Through data acquisition, analysis, and the application of interdisciplinary scientific techniques to the analysis of military and related civil problems, this project points the way to new ideas and requirements, helps establish priorities, and helps integrate ARPA's counterinsurgency R&D effort.

PROJECT BACKGROUND

The development and validation of R&D requirements in the counterinsurgency area requires a number of broad inputs. There is general agreement that insurgent warfare as practiced today, is composed of a number of interdependent and inseparable activities to name a few: intelligence, psychological warfare, economic warfare, military operations, and political activity. Within the U. S. Government, effective coordination must be maintained among the agencies and departments concerned. It is incumbent upon those agencies of government involved in counterinsurgency to look beyond the area of counterinsurgency in which they are chartered to work and consider the effect of their actions on the other areas. In the particular case of AGILE, R&D requirements must be thoroughly researched to avoid duplication and to assure that counterproductive non-technical side effects do not occur. Moreover, since AGILE itself is organized into functional technical areas, a similar requirement exists to provide an informational interface within AGILE and to consider new requirements from an overall point of view. The mission reflecting this function for ARPA/AGILE has been assigned to the Technical Planning and Programming Project.

As the prerequisite for the identification of R&D requirements is the collection and analysis of sufficient valid data. Although much data already exists from current and past experiences in counterinsurgency operations, data collection and analysis will be a continuing task. Offensive and defensive doctrine and tactics are not fixed; an improvement or variation in one generally affects the other. Technology has a significant effect on weapons and equipment requirements. The ingredient requirements may vary from one tactical situation to another and this data must be continually brought and analyzed to provide better understanding of the [redacted] identify valid requirements for RDT&E activity. Ancillary but extremely important in this connection is the maintenance of a data storage facility which can serve as the 'collective memory' on counterinsurgency. The Technical Planning and Programming [redacted] requirements development for ARPA/AGILE

[redacted]

PROJECT DESCRIPTION

1. Data Collection and Analysis

Some of the broader and more basic activities are:

a. Environmental: This includes collection and analysis, from existing and new sources, of data on topography, soil mechanics, plant ecology, climatology and geomorphology.

b Military: This includes data collection and analysis on ambushes, military casualty statistics; firepower parameters and target analysis, transportation systems, mobility systems; airpower, boat, lake and river warfare, night operations; border security; and food control and internal security systems for their effect on R&D requirements.

c. Sociological. This includes collection and analysis of data in such areas as religious systems, value systems, group dynamics, sociological patterns, civil-military relationships, and elements of predictive behavior germane to the establishment of R&D requirements.

d. Special Studies: This includes data collection in areas not immediately relatable to any of the above discrete categories.

2 Data Storage and Retrieval

Since more and more basic data is becoming available or is being retrieved from its present locations, this project is determining those areas which may be amenable to automatic storage and retrieval.

REQUIREMENTS AND TASKS

Listed below are those major requirement areas and currently active tasks in each area with which this project is concerned. Succeeding sheets are summaries of the purpose and current status of each task.

1. Data Collection and Evaluation

   A. Survey of University Research Potential for AGILE
   B. Physical Environment Methodology and Data Storage
   C. Vegetation Effect on Munitions
   D. Field Communications Systems Performance
   E. Medical Data on JTF 116

2. Air Power

   A. Air Power Analysis

3. Ground Operations

   A. Parametric Study of Firepower Requirements

4. Insurgent Force Threat Analysis

   A. Morbidity and Casualty Studies
   B. After-Action Report Study

5. Historical Studies

   A. Symposium on Guerrilla Warfare
   B. Lessons from the Anti-Huk Campaign
   C. Algerian Study
   D. Analysis of Laotian Operations (Transferred to DA/OCRD)

6. Border Security Systems

   A. Border Surveillance and Control

7. Route Security

   A. Ambush Patterns and Counter Techniques

8. Sociological Studies

   A. Studies of Northeast Thailand

Tab 7

Requirement: Data Collections and Evaluation

Task: Survey of University Research Potential for AGILE

Problem: To survey and analyze the assets existing in the American academic community in terms of their application to AGILE's problem areas, culminating in conclusions and recommendations whereby AGILE can use such assets.

Description: RAND is to survey existing assets nationwide and make recommendations.

Current Status: RAND has undertaken the survey. The first report is due in January, 1963. A final report is due in April, 1963.

[redacted]

Tab 7

Requirement Data Collection and Evaluation

Task Physical Environmental Methodology and Data Storage

Problem Virtually every aspect of remote area conflict is influenced by the total local environment. This has been found to be especially true in the fields of geomorphology, climatology and plant ecology. The orderly scheduling of R&D effort in several hardware fields is being delayed by the lack of certain basic physical environmental data and the lack of order in such data already available. While the collection and specific processing of certain specialized environmental data for Southeast Asia (MERS SEACORE, SEASURE and Desiccation) is already under way or approved for the future, there is already a wealth of more general physical environmental data which is neither systematized, related or in many cases readily retrievable. There is at present no methodology which relates these various factors of the physical environment into a total picture usable in a specific R&D effort nor is there even a classification system which permits us to talk about two "jungles" with any degree of assurance that there is any real similarity

Description Effort will be addressed to

a. Identifying the data required for a total physical environmental description

b. Identifying the critical parameters as determined by the needs of RDT&E for friendly forces which will influence selection of key data

c. Developing a methodology which will permit the systematic collection and handling of pertinent data by whatever agency may be involved

d. Determining what is available or becoming available from existing agencies and acquiring it

e. Identifying [illegible] available [illegible] for RDT&E in support of friendly forces

[illegible]

[redacted]

f. Testing and verification of the methodology and data.

g. Establishing a data storage and retrieval system for central reference.

Current Status: A contract was let in late December, 1962 for an 18 month effort on the above task. It is expected that a series of area descriptors and a format for precise location of field data collection points will be made available to the CDTC's during the first quarter of 1963. Work on the balance of the sub-task will begin during the latter part of the first quarter of 1963.

Tab 7

Requirement: Data Collection and Evaluation

Task: Vegetation Effect on Munitions

Problem: To determine the effects of various types of vegetation on fuzes and munitions

Description: The systematic accumulation of data on the location, distribution and characteristics of specific botanical species in the forests and jungles of Thailand This study should produce data essential to the development of accurate, reliable weapon delivery systems affording optimum fuzing techniques and configurations to ensure maximum effectiveness under any given vegetation coverage. Such data also will be useful in the fields of mobility, communications and surveillance and will be incorporated in the general environmental methodology being developed under Task VII, 1, B.

Current Status. Field collection of data is proceeding well. Old forestry data is being brought up to date, and specific botanical terms are being applied to species for future exactness and continuity.

This task was initiated at the request of APGC, Eglin AFB and the analysis will be directed toward specific air munitions requirements. The data will subsequently be integrated into Task VII, 1, B.

Tab 7

Requirement: Data Collection and Evaluation

Task: Field Communications Systems Performance

Problem: To collect data on the operational usage and performance of base and tactical communication systems in use in South Vietnam.

Description: RAND personnel are to gather data on such factors as traffic distribution by precedence and time, message volume, delay time, traffic volume by station and net and station down-time, for each type of operational unit.

Current Status: Field data collection is essentially complete and analysis is under way. The final report is due in the first quarter of 1963.

[redacted]

Tab 7

Requirement. Data Collection and Analysis

Task. Medical Data on JTF 116

Problem: To obtain data from which to make a statistical analysis of the medical problems of troops moved into Thailand with JTF 116 and to obtain evidence on the influence of medical factors upon the effectiveness of a military force moved into Thailand.

Description: The individual medical records of 2611 enlisted men were examined for the period of their stay in Thailand (approximately 90 days and for a period prior to arrival (approximately 180 days). The Force included elements of the RAF, RAAF, a New Zealand Special Air Service Unit, battle units of the US Marines and of a US Army Infantry Division and a US Army Logistics Command.

Current Status: The basic findings of this study appear in Quarterly Report, CDTC Thailand, 1 October - 31 December 1962. Although the experience of JTF 116 in Thailand was atypical, a number of interesting points were developed, notably the incidence of malaria and the lack of incidence of disorders caused by heat. The diarrheal problem was acute during the initial period but came under control quickly. This study will be made available to interested U.S. and Commonwealth commands.

[redacted]

[redacted]

Tab 7

Requirement: Air Power

Task: Air Power Analysis

Problem: Air support of counterinsurgent operations in South Vietnam has been provided within a framework that may not necessarily have optimized operational effectiveness. Future operations should benefit from a carefully structured analysis of the air support function and the delineation of heretofore unexploited potential of air support resources and related counterinsurgency tactics

Description: The basic goals of the subject study are (1) to determine the effectiveness of current indigenous air operations in South Vietnam; (2) to formulate new concepts of employment of air power and; (3) to establish equipment requirements for an optimized "air power system" for Vietnamese forces These goals are elastic in that the study may consider operational elements of greater or lesser magnitude when appropriate. Air power equipment requirements will be determined in terms of required characteristics for aircraft, ordnance, support electronic and communication systems. Tactics to be developed and force requirement derivations will be designed to optimize the effectiveness of air power throughout the typical phases of CI warfare Functional areas of air power operations which must be considered in detail are reconnaissance attack surveillance, close air support, escort, interdiction, tactical troop movements by air, armed helicopters logistic support, command and control To be totally meaningful this study will have to be carried out by a group representing all of the various services who have an interest in this subject

Current Status: The air power analysis described above was originally proposed by ARPA in the Spring of 1962 Subsequently, JOEG-V was established and this analysis fell more properly into its sphere of activity. A proposed plan has been submitted to COMUSMACV by JOEG-V for the conduct of this study, and the ARPA R&D Field Unit will participate to the extent that its function of defining R&D requirements is involved.

[redacted]

[redacted]

Tab 7

Requirement: Ground Operations

Task. Parametric Study of Firepower Requirements

Problem: To determine individual and small unit weapon characteristics for ground combat in remote areas.

Description. A study of targets in SVN, current weapon inventory, analysis of firepower mechanisms, and evaluation criteria for firepower selection.

Current Status: Final reports on all phases of the project are due in March, 1963.

[redacted]

[redacted]

Tab 7

Requirement: Insurgent Force Threat Analysis

Task: Morbidity and Casualty Studies

Problem. To determine the specific causes of RVNAF casualties, as part of the analysis of weapon and armor requirements

Description. Accumulation of data on casualties with an analysis by cause and rate. This analysis will also show the effectiveness of enemy wounding agents and the value of steps taken to reduce this effectiveness. It will also indicate requirement areas for RDT&E to reduce specific types of casualties.

Current Status. After a number of delays, the proposed data collection has been approved. The RVNAF Surgeon General has directed the compilation of data from all RVNAF military hospitals for the year 1962 Analysis of the data should begin during the first quarter of 1963.

[redacted]

[redacted]

Tab 7

Requirement: Insurgent Force Threat Analysis

Task: After-Action Report Study

Problem: To design and put into RVNAF use an After-Action Report form designed to yield a variety of data readily susceptable to analyses and subsequent identification of areas requiring RDT&E attention.

Description: Structured questionaires have been designed and, after appropriate RVNAF approval, issued to units in the field.

Current Status: The first questionaire met with limited success Although the results in terms of significant data were limited, the test run did indicate several areas worthy of future effort.

A revised form has been devised and submitted to RVNAF. Other methods of data collection are being considered as a means of cross-checking data.

[redacted]

Tab 7

Requirement Historical Studies

Task: Symposium on Guerrilla Warfare

Problem: To bring together a variety of experience on guerrilla and counter-guerrilla campaigns of the past.

Description: A group of people who had active experience in such encounters as Malaya, Algeria, Kenya, Philippines in World War II and the anti-Huk campaign participated in a symposium organized by RAND to discuss their experiences and to identify counterinsurgency techniques which have been successful.

Current Status: Limited numbers of the draft report were made available in November, 1962. The final report is due in January, 1963.

[redacted]

Tab 7

Requirement: Historical Studies

Task: Lessons from the Anti-Huk Campaign

Problem: To assemble a detailed history of the Huk campaign

Description: A RAND consultant, who served in the Philippines during that period, has taken residence in the Philippines to coordinate the inputs of various Filippino assistants and to write the history He will rely heavily on Filippinos who were actively engaged in the campaign. The initial work will be to assemble a fairly detailed history of the Huk campaign emphasizing the moves and strategy of both the insurgent and government sides. Subsequent efforts will concentrate on analyzing in depth specific aspects of the conflict.

Current Status: The RAND consultant arrived in the Philippines in September, 1962. His first report is due in March, 1963. The second and third reports are due in September, 1963 and March, 1964 respectively.

[redacted]

Tab 7

Requirement. Historical Studies

Task Algerian Study

Problem: To produce an analysis of the French effort in Algeria from the level of the company sized unit.

Description: A RAND consultant who served in Algeria is to prepare a definitive report of his experiences in company level counterinsurgency activities.

Current Status: The final report is due in January, 1963.

Tab 7

Requirement: Historical Studies

Task: Analysis of Laotian Operations

Problem: To derive "lessons learned" from the U.S. military involvement in Laos over the past few years.

Description. RAC will gather relevant data from after-action reports of the White Star personnel, oral debriefing of these and other Laotian veterans, and a search of prior publications on the subject The analysis will cover broad areas of military, civic action and psychological war activities with a view to identifying particular problems of U.S. advisors and attempting to define the reasons behind good or poor performance by the Laos in this type of warfare

Current Status: Project transferred, the request of DA, to OCRD.

Tab 7

Requirement. Border Security Systems

Border Surveillance and Control

Problem: To ascertain the feasibility of effectively diminishing illicit overland traffic into and out of South Vietnam

Description. A RAND analyst spent approximately four months surveying the locale, state of the art, and possible methods of curtailing the illicit traffic problem. Given the topographical constraints and the enormous commitment of men and material required to reduce this traffic, it was tentatively concluded that no feasible system could currently be envisaged except the "inside out" theory as is being implemented under the Strategic Hamlet Program.

Current Status: RAND personnel in Vietnam are preparing a final report due in early 1963.

[redacted]

Tab 7

Requirement: Route Security

Task: Ambush Patterns and Counter Techniques

Problem: To establish a data collection and analysis system from which ambush patterns can be determined, and proper counter techniques and equipment developed. It is expected to be a continuing problem as the enemy revises ambush techniques in response to improved counter-techniques. Particular emphasis is placed on the security of vehicular convoys, although investigation of both railway and water ambushes is also being examined.

Description. Data sources in RVNAF and MAAG have been identified and preliminary data obtained. Further data will be obtained as part of the After-Action Report effort (4, B).

Current Status: The first report on convoy ambushes is in preparation and is due January, 1963. The team is in the process of collecting and analyzing in the areas of railway and water ambushes, and interim reports are expected in the 1st Quarter of 1963.

[redacted]

Tab 7

Requirement. Sociological Studies

Task Studies of Northeast Thailand

Problem. To determine most likely sources of social conflict in this area, concentrating on those local problems and attitudes which can be exploited by the Communists.

Description. A team of two to three RAND analysts who are specialists on Thai problems will spend 4 - 6 months in the Northeast part of Thailand concentrating on the following substantive problems:

1. Village views of its problems
2. Government authority at the local level
3. Contrasting view of local authorities
4. Leadership patterns

Current Status The Thai government has not been willing to have ARPA undertake this study at the present time because of a similar effort by the Thais themselves to develop this information. The ARPA field study is not precluded indefinitely, however, and hopefully a study herein outlined can get underway on an integrated basis with the Thai study in FY 64. As an interim measure two RAND personnel have completed a study based on an analysis of data available in CONUS. A report is being prepared for distribution in February, 1963.

[redacted]

AGILE PROJECT VIII

Research and Exploratory Development

PROJECT OBJECTIVE:

To provide technical support for the other tasks of ARPA/AGILE as required. In many instances, a requirement which falls within the objective of one of the other AGILE tasks cannot be met by means of extrapolations of present science and technology. In such an instance, exploratory development of one or more methods of achieving a solution to this task would be initiated under Project VIII. Similarly, where occasionally a requirement does not clearly fall under the other AGILE task objectives, but requires scientific or engineering research or development, AGILE Project VIII conducts such programs. At the present time, a series of such tasks are either underway or must be initiated.

1. Ground Mobility - In support of AGILE Project III, an investigation of the means of providing security to the railways of South Vietnam has been undertaken. The provision of a secure method of railway transportation in a country engaged in counterinsurgency warfare is a formidable problem. The very nature of a railway system, in that it is easily identifiable, represents a fixed network passing over many hundreds of miles of terrain and contains within its system innumerable mechanically vulnerable points such as bridges, culverts, switches, cuts, tunnels, etc. makes it not only a logical target for insurgent forces but one of the most difficult to defend.

2. Improved Individual Combat Equipment

A. Clothing & Footwear - This sub-task is being devoted to the research and development necessary to provide new materials suitable for clothing and footwear to be used in Southeast Asian areas. Due to the severe climatic conditions such as extreme humidity, high temperatures, wet terrain and a large number of deleterious organisms such as fungi and insects, development of new materials and methods of fabrication for combat equipment and clothing is necessary. In addition, anthropometric studies have been initiated (under Project VI) to insure that the newly developed items are tailored to the physical characteristics of the indigenous forces.

[redacted]

3. Defensive Barrier Items and Explosive Devices

Over three thousand strategic hamlets have been constructed at this time and a total of approximately eleven thousand will have been constructed when the program is complete. It is extremely important at this time to provide defensive measures for these hamlets which will enable them to successfully resist the VC pressures and yet at the same time will be sufficiently low cost to make it feasible to distribute these defensive measures throughout the entire hamlet system. Some of the measures which are being investigated are mine barriers, better hamlet area illumination and improved armor materials.

4. Special Purpose Weapons

In support of AGILE Project I, this task is intended to provide initial research and feasibility studies on new techniques and materials applicable to advanced weapons systems. Sub tasks which fall within the scope of this effort are studies of new flame producing materials, ultra high intensity sound systems and fuel-air explosives.

5. Remote Area Power Sources

This task is being established for the purpose of improving the ability of forces engaged in remote area conflict to obtain sources of electrical power for operation of communication and detection devices in areas where conventional power sources are not readily available.

6. Air Mobility

A. Assisted Take Off. This task is undertaken in support of AGILE Project III. A continuing problem in making effective use of aircraft in remote area conflict is the need to be able to use small unimproved fields subject to severe climatic conditions. A study of all possible means of assisting take-off from unprepared fields showed that there are very few means of assisting an aircraft which is better than the conventional JATO bottle. However, the problem [illegible] imposed by the necessity of maintaining on-site stores of these [illegible] difficult to solve. The investigation of some new devices which might [illegible] problem continues.

B. Remote Area Airstrip. Due to the unusually high moisture content and acidity encountered in the SE Asian area soils, the construction of airstrips is extremely difficult. This task has been established to develop improved airstrip construction methods which will be suitable to this area.

[redacted]

Requirements and Tasks

Listed below are those major requirement areas and the status of tasks with which this project is concerned. Succeeding sheets are summaries of the purpose and the current status of each task

1. Mobility, Ground

   A. Railway Security

2. Improved Individual Combat Equipment

   A. Ranger Pack

   B. Hot Weather Sleeping Gear, Clothing and Equipment

   C. Nail Field Clearing Device (Appears as T[illegible]

3. Defensive Barrier Items and Explosive Devices

   A. Village and Outpost Security

   B. Lightweight Armor Materials and Protection

   C. Camouflaged Anti-Personnel Mines

4. Special Purpose Counterinsurgency Weapons

   A. Fuel-Air Explosive (FAX)

   B. Helicopter Trap Weapon

5. Remote Area Power Sources

   A. Thermoelectric Generators

   B. Hydroelectric Generators

6. Mobility, Air

   A. Assisted Take-Off

   B. Remote Area Airstrip

[redacted]

Requirement Mobility Ground

Task Railway Security

Problem The Viet Cong are hampering the effective use of the railway both by shooting at the train crew and by destroying trackage. The disruption of the schedules comes from destroying the track, setting off mines under the rails, which also destroys the locomotive or [illegible], or from blowing up bridges.

Description: A train incident after-action format was prepared and data collected. As a result, the following were identified as being worthy of further investigation: (1) High powered radar pulses to detonate emplaced mines ahead of the train. (2) A portable detonator wire cutter for dudding mines. (3) Air surveillance.

Current Status Compilation and tabulation of railway incident data continues at the CDTC-V. The CDTC has requested through the JGS that two GVN railway security personnel be placed on TDY with the CDTC to provide needed guidance and information relative to VN rail operations.

A proposal has been received from Picatinny Arsenal on the use of high powered radar to detonate those railroad mines which use electric detonators. Information on the type and construction of railroad mines used by the VC is being collected so that criteria can be formulated for the radar performance required.

Design and engineering studies are being prepared for a portable detonating wire cutter. This wire cutter will be designed for attachment to the forward car of a train to pick up and cut electric mine detonating wires at the wire point of entry into the railroad ballast. After-action reports show the wires are either on top of the ground and lightly camouflaged or buried to a depth of 4 centimeters.

Air surveillance using the Mohawk has been sufficiently effective in its first phases so that there have been no ambushes since the maximum air surveillance was started. On one occasion the aircraft spotted a place in the railroad where the track had been removed. The aircraft was able to warn the train and stop it so that no damage occurred to the train.

Requirement: Improved Individual Combat Equipment

Task: Ranger Pack

Problem: The stature and weight carrying ability of the Southeast Asia forces differs sufficiently from that of the US soldiers to require that carrying devices be designed specifically for these forces. One such item, a pack to be used by ranger troops is being developed under this task. Three approaches to the solution of the above requirement are being investigated.

(1) The local manufacture of packs in SVN.
(2) The procurement and test of packs which are available in CONUS and might be suitable to the SVN forces
(3) The evaluation of the fundamentals of pack design and the development of new methods of load carrying.

Description: A dual-purpose pack and raft combination developed for the French Airborne Commando was obtained through U.S. Army Quartermaster R&E Command, Natick, and sent to the CDTC-V. Some experimental "hip packs" developed by Bell Aerosystems, which through the use of a fiberglass pack board, contoured to the body, permits the load to be borne by the wearer's hips. Are also being evaluated.

Current Status: An evaluation program by the CDTC V is currently underway to determine the suitability of the hip pack load carrying method. Of the ten packs on hand, nine are being used for evaluation testing and one as a model for design, engineering and anthroporietric studies for production of a pack frame suitable to the [illegible] pack has been designed and fabricated by NOTS and is currently undergoing evaluation in CONUS. The design for this pack was derived from extensive studies of the equipment and experiences of professional guides and mountaineers.

~~CONFIDENTIAL~~

Tab 8

Requirement: Improved Individual Combat Equipment

Task: Hot Weather Sleeping Gear, Clothing and Equipment

Problem. The design and evaluation of such items as sleeping gear, clothing, shoes and hats particularly suitable to the environment of Southeast Asia for indigenous forces

Description in CDTC-T: The following items will be designed and/or evaluated

(a) Boo[illegible] combat tropical (direct molded sole)
(b) Poncho permeable
(c) Liner poncho
(d) Hammock jungle
(e) Jacket and trousers lightweight
(f) Rucksack lightweight
(g) Hat, jungle
(h) Machete & machete sheath
( ) Compass lensamatic suitable for tropical use

Cloth tape and thread will be sent along with the clothing for minor modifications as the need appears. One example involves the placing of draw strings in the cuffs to prevent entry of insects. A clothing design specialist from Natick will be sent to CDTC-T to participate in the field evaluations. The clothing design specialist will make any major changes in designs proven necessary; these designs will then be fabricated locally and subsequently re-evaluated.

Current Status. An an[illegible]ropome[illegible] from Natick has spent a month during the last quarter making measurements on Thai army personnel. His report should be available in February so that clothing of the right dimensions can be procured. [illegible] Staff, Royal Thai Supreme Command Headquarters [illegible] study and selection of items for limited field testing [illegible]. This will be a joint effort in which the initial selection [illegible] will be made by CDTC staff members. After [illegible] CDTC will recommend to MOD the design of those items of [illegible] and equipment most suitable for the Thai forces.

~~CONFIDENTIAL~~

[redacted]

Tab B

Requirement: Defensive Barrier Items and Explosive Devices

Task: Village and Outpost Security

Problem: To test and evaluate devices and equipment of all types that may be employed to advantage in protecting villages and outposts from Viet Cong activity

Description: The strategic hamlet program of South Vietnam is becoming increasingly effective as the program grows. With several thousand hamlets already constructed and more underway, the power of the people to resist VC pressures has increased substantially. In order to provide increased effectiveness in protecting these hamlets against VC depredations, several approaches have been undertaken. These are:

(1) The initiation of a program to provide better mine barriers for the defense of hamlet perimeters.

(2) The investigation of cheap, easily emplaced obstacles similar to barbed wire as a defensive measure.

(3) [illegible] perimeter illumination to discourage night forays by the VC.

Current Status: Obsolete 75 mm ammunition is to be used as a mine barrier for village defense. The Harry Diamond Laboratory acting as the Service Agent for ARPA is preparing the ammunition and detonating devices for field use. Preliminary tests in CONUS using both primacord and an electric detonator appear most promising. Over three hundred rounds have been fired in the test program. Explosives and detonating equipment have been shipped to the CDTC V or held for use in the next quarter.

Passive barriers which have been considered for perimeter defense are barbed wires and [illegible] fast growing plants. Samples of a stamped barbed wire of West German manufacture have been obtained which appear to offer [illegible] storage and emplacement advantages over conventional wire. Manufacturers are being contacted to ascertain if sources in CONUS are available. The CDTC V is studying possible plant growths which might serve as effective barriers.

One hundred searchlights were received from OSD/ARPA. These lamps provide 400 candlepower emitting a beam 600 meters in length. Three lamps are being maintained and employed at the DTC V compound under controlled [redacted] to a strategic hamlet in Tay Ninh

[redacted]

Village and Outpost Security (continued)

Province. Selected members of the hamlet militia received instruction on maintenance of the lamps. Evaluation will continue.

Twenty four lamps were left with the U.S. sector advisor for evaluation at a remote outpost located near the Cambodian border in the northern section of Tay Ninh Province.

Tab 8

Requirement — Defensive/Barrier Items and Explosive Devices

Task: — Lightweight Armor Materials and Protection

Problem — To provide protection for water, land and air vehicles against penetration of .30 caliber ball ammunition and body armor for protection against spears and spikes.

Description — A research program is being instituted to relate penetration mechanics to molecular structure in order to provide the necessary information needed to make the optimum selection of armor materials. Research is also being conducted to determine the optimum geometrical configuration for composite armor in order to achieve maximum absorption and energy dissipation. While awaiting the results from these advanced programs, empirical testing is being conducted on composite material compositions in order to identify the most satisfactory currently available armor materials

Current Status — A contract is now being negotiated with Aeronutronics for the purpose of conducting the research in penetration mechanics as previously described It is expected that the contract negotiations will be completed in mid-January.

Development by NRL leading to optimum geometrical configuration of composite armor has provided for too short a time since letting the contract to be reported during this quarter.

Armor kits for H21 and HUI helicopters are being manufactured in both the U S and in Vietnam based on designs developed by the OSD/ARPA Ballistic Protection Survey Team Approximately 170 kits are currently being installed in operational helicopters in Vietnam. Evaluation of the armor systems will continue concurrently with their use in the combat environment.

Two papers prepared by the OSD/ARPA Ballistic Protection Survey Team on the subject of armor have been translated into Vietnamese and furnished to the RVNAF

Tab 8

Requirement Defensive/Barrier and Explosive Devices

Task. Camouflaged Anti-Personnel Mines

Problem This task is for the development of a new anti-personnel mine which may be either hand emplaced or air dropped and will defy visual detection because of its close resemblance to indigenous materials such as stones and sticks of wood

Description Two R&D efforts are involved in this task

(1 The development of castable, plastic bonded explosives (PBX) suitable for use in land mines which can reproduce the shape texture and color of indigenous materials.

(2 The design and fabrication of a low-cost, anti disturbance fuze for use with the PBX explosives

Current Status At the present time cast PBX mines which are shaped to resemble small stones are being made in experimental quantities by the U.S. Naval Ordnance Test Station These stones about three inches on the longest side have demonstrated the feasibility of duplicating the color and texture of native materials The PBX material developed for this process is a cold setting castable explosive which is poured into rubber molds made from a sample of indigenous SE Asian rock This process is easily adaptable to making camouflaged mines in the field when it is advantageous to simulate some thing or substance peculiar to a specific area of the world At the present time the PBX is too brittle to enable these mines to be sown from aircraft by free-fall but new PBX compounds with greater resilience are being developed Several new experimental explosives are now being tested for impact resistance.

A simple anti disturbance fuze has been developed using low cost components mostly available on the open market The present cost of this fuze is five dollars By using controlled current leakage into and out of a fuzing capacitor an arming delay of 15 minutes and a self sterilization period of 90 days has been obtained Minor changes in components can vary these times as desired Continued fuze development efforts are concentrated on obtaining additional safety by the incorporation of an out of line firing train The possibility of motivating the fuze to provide an option of night-day cyclic arming is also being studied

One hundred explosive components and fuzes for experimental evaluation

[redacted]

Camouflaged Anti-Personnel Mines (continued)

of the camouflaged mine have been shipped to the CDTC South Vietnam. Additionally, a motion picture visual aid has been made to show the assembly and arming of the mines. One copy of this film was made with English narration and two copies have been obtained with a blank sound track for narration in Vietnamese and Thai.

Tab 8

Requirement: Special Purpose Counterinsurgency Weapons

Task: Fuel-Air Explosive (FAX)

Problem: To develop improved area weapons by the use of munitions which disperse a detonatable cloud of fuel vapor mixed with air.

Description: It has been shown that when proper mixing and ignition techniques are used, a cloud of fuel vapors mixed with air may be detonated to yield high over-pressures over a wide area. This system should have marked advantages over conventional explosives as an area fire weapon. The protection from blast and shrapnel afforded personnel by slit trenches, trees, rocks and man-made barriers will be ineffective because the vapor cloud is all enveloping within its area of dispersal. At present, R&D experiments are being conducted with devices which employ ethylene oxide as fuel, lethal over-pressures within the cloud have been demonstrated

Current Status As a result of the R&D program conducted at NOTS utilizing several sizes of FAX devices, emphasis is being placed on early weaponizing of an air droppable item based on clusters of 20 lb. bomblets. These weapons and a carrying pod suitable for use on an AD 6 aircraft are expected to be ready for extensive CONUS testing in 45 days. Preliminary designs indicate that a single AD aircraft can carry 200 FAX weapons

Requirement Special Purpose Weapons

Task: Helicopter Trap Weapon

Problem To develop a weapon designed to destroy the bamboo stakes used as helicopter traps by the VC in probable landing zones of SVN

Description A recent anti-helicopter tactic employed by the Viet Cong forces is to place bamboo stakes in probable landing zones to damage the blades of the decending aircraft. Blade damage can be severe enough to immobilize the aircraft if not destroy it completely. This tactic has been employed by the Viet Cong to deny the use of some landing zones or to limit the number of areas in which helicopters can operate to the point where the VC can prepare ambushes in the likely landing areas. In order to counter this tactic, an accelerated development has been initiated at the U.S. Naval Ordnance Test Station to provide a defensive weapon capable of destroying these traps. Efforts are based on the adoption of existing expanding rod warheads designed for air-to-air weapons. Modifications will be made permitting these warheads to be dropped from helicopters or other aircraft and detonated near the ground where the expanding ring of steel can sever the bamboo poles

Current Status Design studies were initiated late in December by USNOTS Two warheads adaptable to this program were selected for further study; the 5.0" Zuni and 5.0" Sidewinder rod heads Testing began in January and initial results indicate that the Zuni continuous rod warhead will clear 100% of such obstacles to a radius of 25 feet, and 90% to 40 feet Suitable fusing fins and stabilizing devices have been selected A goal of 1 March has been established for completion of development and shipment of test quantities of this weapon.

Requirement Remote Area Power Sources

Task Thermoelectric Generators

Problem. Evaluation of thermoelectric generators in the Southeast Asia environment.

Description Thermoelectric generators are to be evaluated when used with indigenous fuels under field conditions in Southeast Asia in order to supply sources of power which do not deteriorate in storage as do batteries

Current Status. The commercially available thermoelectric generators which were shipped to Southeast Asia did not have power ratings to match equipment in the field therefore, the tests are presently underway with dummy loads. A task has been initiated which will include fabrication and testing of one or more thermoelectric generators designed for the specific purpose of burning the fuels available in remote areas such as Southeast Asia and yielding power levels from 3 to 300 watts depending upon the application for which they were designed. This program will also fund research and development on catalytic burners designed to use indigenously available liquid fuels such as the natural animal and vegetable oils.

Requirement: Remote Area Power Sources

Task: Hydroelectric Generators

Problem: To examine methods of producing power from shallow slow-moving streams.

Description: Two turbo-generators are of sufficient size to develop 50 watts in a stream of 10 inch depth running at the rate of two knots per hour. Besides their use in shallow streams these impellers are useful where tidal flow occurs which meets the velocity and depth requirements.

Current Status: A contract is now being negotiated with Sea-Space Inc by the Office of Naval Research who is acting as ARPA agent in this program. After completion of this 16-week contract period which will occur about 15 May 1963, testing of the generator will begin at the David Taylor Model Basin.

Tab 8

Requirement: Mobility, Air

Task Assisted Take-Off

Problem: To investigate assisted take-off devices to permit operation from unimproved remote airstrips

Description. The operation of aircraft in remote areas often requires landings and take-offs from small unimproved airfields. The use of rocket assistance units on aircraft operating from such fields provides additional performance capability and provides a margin of safety to enable the operation from airstrips otherwise unusable Conventional JATO units require that supplies of such units be maintained at remote fields; in many cases this is logistically unsupportable

Current Status: A detailed examination is being undertaken of potential methods of providing take-off and landing assistance

[redacted]

[redacted]

Tab 8

Requirement: Mobility. Air

Task. Remote Area Airstrip

Problem: To determine the feasibility of preparing a light aircraft and helicopter landing surface, under tactical conditions, on soils of very low bearing strength.

Description. Because of the extremely low soil density in much of Southeast Asia, a landing surface must be developed which has sufficient buoyancy to keep it from sinking of its own weight. High soil acidity also requires that the materials of construction be protected from serious corrosion effects. Such conditions make this area of the world one of the most difficult in which to construct such facilities. Previous studies and prototype methods developed by the Services and industry have not resulted in suitable methods for providing the requisite capability in Southeast Asia.

Current Status: In order to provide information for the study of methods for solving this problem, several members of the short term mobility team from the Waterways Experiment Station made field measurements of the soil properties and obtained soil samples for detailed CONUS analysis. Based on these measurements and data obtained from previous airstrip development programs, studies were made of several designs incorporating the best feature of previous work as adapted to the soil characteristics. The present program calls for the use of polyurethane foam incorporated in aluminum mat planks to give the required buoyancy as well as the strength to withstand the mechanical stresses imposed by the aircraft. Tests of this concept will be made by the Bureau of Naval Weapons, Launcher Branch acting as Service Agent for ARPA. Panels will be designed and fabricated for a helicopter landing pad which will then be tested by the Waterways Experiment Station at a field installation on the delta of the Mississippi River. If CONUS testing is successful, the pad will be shipped to South Vietnam for further tests at a suitable site.

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