DEPARTMENT OF HEALTH & HUMAN SERVICES

Office of the Secretary

The General Counsel
Washington, D.C. 20201

24 APR 1981

Mr. Martin Anderson
Assistant to the President for
Policy Development
The White House
Washington, D. C. 20500

Dear Mr. Anderson:

I am forwarding the seventh report of the Interagency Work Group to Study the Possible Long-Term Health Effects of Phenoxy Herbicides and Contaminants. Enclosed is a current assessment report on Agent Orange by the Chair of the Work Group's Scientific Panel, Dr. John Moore.

During February and March the Work Group continued to review efforts by the Department of Defense (DoD) to identify individuals among ground troops in Vietnam who were exposed to Agent Orange. Attached is a report from DoD on its records searches concerning base camp perimeter defoliation operations. DoD has also searched company-level records of five battalions and has been able to determine that certain units operated in close proximity to areas sprayed with Agent Orange. However, DoD has not been able to identify individuals or even units whose exposure to Agent Orange is or can be documented reliably. The Work Group believes that it is reasonable to presume that military personnel entered sprayed areas. However, a study based on no more than presumed exposure would represent such a serious flaw in scientific design as to be of questionable validity.

The Work Group strongly endorses DoD's recommendation that the records search efforts by DoD be reviewed by outside records search experts to insure that no means of possibly identifying individuals whose exposure to Agent Orange is or can be documented has been overlooked. The Work Group is aware that General Accounting Office personnel have reviewed DoD's efforts and it has been briefed on GAO's work. However, it is our understanding that presently GAO does not intend to prepare a formal report. Therefore, the Work Group will be discussing this matter with the Medical Followup Agency of the National Academy of Sciences-National Research Council. In addition, the Veterans Administration (VA) will explore the possibility of including such a review under the contract it will let for the design of the VA's epidemiology study.

Unless such an outside review suggests new approaches to records searches which are likely to produce sufficiently specific data, it is the Work Group's view that an epidemiology study of ground troops which is focused solely on Agent Orange exposure may be impossible to conduct with an acceptable measure of scientific validity. The Work Group continues to believe that an epidemiology study of ground troops should be broadened to focus on service in Vietnam as the exposure circumstance being studied.

Sincerely,

Juan A. del Real
Acting General Counsel and
Acting Chair, Interagency Work Group

Enclosures(3)

DEPARTMENT OF HEALTH & HUMAN SERVICES

Memorandum

Date April 21, 1981

From Chair, Scientific Panel

Subject Progress Report on Herbicide Orange

To Acting Chair, Interagency Work Group to Study the Possible Long-Term Health Effects of Phenoxy Herbicides and Contaminants

The health issue still remains broadly defined: Vietnam veterans remain concerned that as a consequence of Herbicide Orange exposure they are or may be at increased risk of a broad spectrum of health decrements that include infertility, birth defects in children, neurologic disorders, cancer, skin disease or liver disorders. While it is difficult to accept logically that a single causative factor -- Herbicide Orange -- could be responsible for such a diverse set of health effects, there is no definitive evidence that permits selective exclusion of some of these illnesses. Further, it is possible that some of these health effects are occurring as a consequence of Vietnam service but not due to exposure to Herbicide Orange. The Science Panel is not aware of any data that suggest a modification of its previous recommendation that the focus of a study of Vietnam veterans should be broadened to consider Vietnam service as the exposure factor rather than focus solely on Herbicide Orange exposure.

The Science Panel has previously concluded that the most direct and relevant means for determining if there are health effects -- and the nature of these effects -- as a consequence of Herbicide Orange exposure is a study of Vietnam veterans. The Air Force Ranch Hand Study, previously reviewed and endorsed by the Science Panel, is representative of a study of this type. The general objective of the study is to evaluate the current health status and mortality of approximately 1,100 Air Force personnel who participated in aerial spraying of the herbicide in Vietnam. Their exposure was documented, of sustained duration, and of significantly greater magnitude when compared to ground troop exposure. The need for prompt conduct and analyses of the study results is clear if we are to gain insight into the nature of the long-term health effects that may be a consequence of Herbicide Orange exposure.

The Science Panel is in receipt of data which indicate that there is at best a remote chance of accurate identification of specific ground troops who were exposed to Herbicide Orange. These data summarize the results of detailed searches by Department of Defense records experts of five battalion and company records for one year periods during which there was heavy use of Herbicide Orange. Their searches failed to establish conclusively levels of exposure for U.S. ground troops who had entered sprayed areas.

The Panel is therefore of the opinion that design of a scientifically valid Herbicide Orange study of ground troops may not be possible. 1/

If the focus of a study of Vietnam veterans is broadened to consider Vietnam service as the exposure factor, a study of ground troops is necessary and a scientifically valid study can be designed.

The study population should preferentially include those who served in the field and in combat areas which were sprayed with Herbicide Orange. Although the DoD records search failed to establish specifically certain troops at a company level who were exposed to Herbicide Orange, the records do identify units which were closely proximate to areas at the time of spraying. Based on the mission objectives of some troops, it is reasonable to presume that personnel entered sprayed areas. There should be a conscious bias to include these personnel since possible exposure to Herbicide Orange was a major factor associated with Vietnam duty. Further, there is no reason to presume that such troops were not also representatively "exposed" to other "factors" that may represent a long-term health risk.

Epidemiological methods are best applied to a study of ground troops. The inherent nature of epidemiology studies do not provide quick answers -- the process is slow and tedious, usually requiring 2-5 years for an initial result. Such studies yield data that define the degree of association between an exposure circumstance (Herbicide Orange, Vietnam service) and specific endpoints (cancer, birth defects, heart disease, suicide, diabetes, etc.). In the Vietnam issue, any positive association between exposure and long-term health effects will likely be an increased incidence of disease(s) already

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1/ The Science Panel is not composed of individuals competent to render expert opinion as to the quality of the records search. It has received briefings as to procedures employed and informal advice of persons expert in this type of work. It believes the effort has been thorough and objective. Given that these efforts are crucial to the Herbicide Orange issue, the DoD and the Science Panel urge expert review and comments as to adequacy of the records search or identification of more effective approaches. The Science Panel has undertaken steps to accomplish this review and further information will be provided as it develops.

prevalent in the human population. Should specific disease associations be found, a policy decision as to when and under what circumstances a veteran with that specific disease is eligible for compensation is required. 2/

It is not practical to perform an epidemiology study that simultaneously assesses all health parameters, yet the concerns of veterans span a wide spectrum of health effects. A critical need is the development of a logical base from which to define discrete disease endpoints for definitive epidemiology studies. A sequential epidemiological approach deserves detailed consideration. In the first phase, a proportional mortality study would compare the proportional causes of death in a Vietnam veteran population to the appropriate age and sex adjusted rates for the U.S. population. (Comparison with non-Vietnam veterans should also be considered.) If excess causes of death are detected, it would provide direction for subsequent studies. There are also limitations to proportional mortality studies: if one or more causes of death are in excess, other causes of death will by definition appear to be diminished; and it is possible that the time interval between Vietnam service and 1981 is insufficient for certain fatal diseases (such as cancer) to develop. The need for definition of disease endpoints is of sufficient magnitude for this approach to merit serious consideration, particularly if such a study could be performed relatively quickly. A proportional mortality study requires the ready availability of death certificates and a computerized file that identifies those veterans of the Vietnam era who served in Vietnam. Availability of death records in the VA files (submitted in order to collect burial benefits) must be objectively assessed. The development of a computerized file that identifies Vietnam veterans must be developed since it is essential for the conduct of any proposed ground troop study and also could significantly enhance the quality of ongoing studies. This need requires priority attention.

The second and more definitve epidemiological approach is a cohort study in which a defined population is studied prospectively and compared to an appropriate control group. Such a study clearly should include mortality as an endpoint and seriously consider

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2/ For example, the incidence of liver cancer in U.S. white males is about 2.6 per 100,000. Assume that a hypothetical result of an epidemiology study of veterans detects a rate of 10.4/100,000, a fourfold increase in risk for this tumor. The risk then would be scientifically established. Yet, for any particular veteran who develops this liver cancer, a determination cannot be made as to whether that tumor represents "normal" population background or a consequence of Vietnam service. Policy determines the government's response to a given disease in a veteran in this instance, utilizing scientific data that are useful but not so definitive as to dictate a single course of action.

morbidity (disease incidence in the living) in at least a portion of the study population. The inclusion of morbidity data strongly suggests the essential need for a concurrent control group. The proper conduct of a cohort study requires a long-term commitment (up to 20 years). Decisions as to population size and the most appropriate and meaningful endpoints to be studied should be strongly influenced by early results of the Air Force Ranch Hand Study, the CDC Birth Defects Study, and a Proportional Mortality Study. Emerging data on civilian occupational exposure to phenoxy herbicides and dioxins currently represent the best data for defining the nature of long-term health effects. Experimental toxicity data may also significantly aid in the selection of appropriate disease parameters. 3/

A health effect of major concern is the possibility of Vietnam veterans having fathered children with a higher than expected incidence of birth defects. Progress in addressing this concern has been made on several fronts. Laboratory studies in male mice, exposed to high levels of a Herbicide Orange formulation, did not detect an increased incidence of dead or malformed offspring. The Air Force Ranch Hand Study will collect data on Vietnam veterans' fertility and the incidence of birth defects in their children. The CDC Birth Defects Study, previously recommended by the Science Panel, represents a sound approach to determining if Vietnam veterans have fathered children with a higher than expected incidence of birth defects. However, this study, which is being implemented, can only establish if Vietnam service, not Herbicide Orange, is associated with malformed children. A study of ground troops should gather compatible data on offspring and other fertility parameters to augment and expand upon the CDC study.

3/ Epidemiology studies of occupational populations involve exposures of up to 30 years duration, which is sufficient time for expression of diseases that have a prolonged latency. Some occupational exposures were, by comparison to Herbicide Orange exposure, very heavy and therefore enhanced the potential for development of adverse effects. Utility of these data is exemplified by the recent Swedish studies that correlate phenoxy acid exposures to the increased risk of developing soft tissue sarcomas. It has subsequently been observed in a review of several U.S. studies that the aggregate incidence of this tumor type is also increased. Clearly, a study of Vietnam veterans should include a focus on this type of tumor. Experimental toxicity data also associated TCDD exposure to carcinogenic response with most potent effects due to tumor promotion capabilities. There is a similar correlation between experimental and occupational studies dealing with altered lipid metabolism.

In summary, several studies of an epidemiological nature are needed to best address the concern as to long-term health effects in Vietnam veterans. However, except for the Air Force Ranch Hand Study, a scientifically valid study to determine if Herbicide Orange is associated with long-term health effects may not be possible. A study which associates Vietnam service as a causal factor appears to be feasible.

Two studies are in progress; however a variety of factors are impeding progress when measured against original completion targets. Further slippage will negate the opportunity to capitalize on early results in the design of the additional studies.

Additional studies should involve ground troops. Although this type of study has not significantly progressed, ancillary activities critical to design and execution have moved forward, i.e., military records searches and evaluation of occupational exposures. It is expected that a ground troop study will be the central theme of the VA epidemiology study. Under the best circumstances, the first data will not emerge for an additional twenty-four months and forty-eight months may well be a more realistic expectation.

The results may provide data that do not establish an association between Herbicide Orange or Vietnam service and certain long-term health effects. To this extent, such study results will help define which health effects appear not to be of valid health concern. Where results are equivocal or establish an association, the policy making process is benefited by data rather than the current state of knowledge which is based on opinions that are often contradictory. Unfortunately and regrettably, relevant data remain two or more years into the future. Accordingly, it is critically important that the current and planned research proceed as expeditiously as possible, consistent with sound scientific principles.

ASSISTANT SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301

HEALTH AFFAIRS

1 April 1981

Leslie A. Platt, Esquire
Acting Chairman, Interagency Work Group
to Study the Possible Long-Term Health
Effects of Phenoxy Herbicides and Contaminents
Office of the General Counsel
Department of Health and Human Services
Washington, D.C. 20201

Dear Mr. Platt:

In accordance with our conversation at the Interagency Work Group meeting on 26 March 1981 this is to confirm that Dr. Peter Beach, of your Department may arrange for interested veterans group representatives to visit the Department of Defense records management offices (Army and Marine Corps) which have been involved in developing the battalion studies. We will endeavor to make the records fully available subject only to Privacy Act limitations on individual personal records. The records management personnel are willing to discuss the methodology used in the search process and provide access to the records searched in achieving the five battalion reports previously forwarded.

We might suggest that maximum benefit to the veterans groups would result from selection of representatives who have had a background and experience in personnel and/or administration while in the military service. Particularly beneficial would be persons having Army or Marine Corps experience in tactical unit operations and the preparation of daily operational journals at the company or battalion level of command.

The Army records office has moved from the Forrestal Building on 23 March 1981 to the Hoffman Building No. 1 in Alexandria and hence they are still in the process of moving the large complement of Vietnam operation records. We, therefore, would not be able to accept visiting groups until after the records are all transferred which is expected to be completed by 20 April 1981.

RECEIVED 4/20/81
GLC-81-37

We would appreciate at least a weeks notice (after 20 April) prior to an expected visit so that we may make the necessary records personnel and necessary battalion records readily available. My staff contact for such arrangements will be Dr. Jerome G. Bricker who may be reached by calling 697-8973.

Sincerely,

William S. Augerson
Major General, MC, USA
Deputy Assistant Secretary of Defense
(Health Resources and Programs)

ASSISTANT SECRETARY OF DEFENSE

WASHINGTON D C 20301

HEALTH AFFAIRS

2 MAR 1981

Leslie A. Platt, Esquire
Acting Chairman, Interagency Work Group
to Study the Possible Long-Term Health
Effects of Phenoxy Herbicides and
Contaminants, Office of the General Counsel
Department of Health and Human Services
Washington, D.C. 20201

Dear Mr. Platt:

Subsequent to our submission in December of the additional Army and Marine Corps Battalion Studies, the Department of the Army Records Management staff continued their search of new Vietnam records sources with the discovery of additional information pertaining to base camp perimeter defoliation operations with subsequent burning and defoliation of areas which had previously been cleared by Rome Plows. The types of defoliants employed are, however, usually omitted. Apparently the same vehicular spray and tankage was used to spray either defoliants or just diesel fuel in large quantities prior to most burning operations. (Enclosures 2 and 3)

The first capability to use high performance aircraft (Phantom F-4's) is documented in Enclosure 4. This limited capability did not come about until the early part of 1969, and we understand it was not an effective method of spraying defoliants. Further documentation is not yet available.

The U.S. Army Advisory Group Herbicide Evaluation Report (Enclosure 5) describes in considerable detail the effectiveness of various herbicide spray missions in improving tactical situations and reducing our casualties due to ambushes and operational attacks from thick jungle areas controlled by the Vietcong.

Enclosure 6 concerning the AGAVECO helicopter defoliation apparatus points out the limited helicopter spray capability available as late as 1969 and the problems incident to its operational use.

The final enclosure pertaining to Project Pink Rose also relates to an operation in which herbicides and desicants were

applied to a free strike target area (Vietcong controlled stronghold) prior to B-52 incendiary bomblet raids. The hope was to clear dense jungle enemy strongholds through the generation of a fire storm. It unfortunately proved to be a rather ineffective technique and was abandoned.

The attached report in duplicate with aforementioned enclosures is submitted for review and consideration by the Interagency Work Group.

Sincerely,

William S. Augerson
Major General, MC, USA
Deputy Assistant Secretary of Defense
(Health Resources and Programs)

Enclosures

DEPARTMENT OF THE ARMY
OFFICE OF THE ADJUTANT GENERAL
WASHINGTON, D.C. 20310

MAR 2 1981

REPLY TO ATTENTION OF
DAAG-AMR-S

MEMORANDUM FOR ASSISTANT SECRETARY OF DEFENSE, HEALTH AFFAIRS

SUBJECT: Amendment to Battalion Studies of Vietnam Units Which may have been Exposed to Agent Orange

1. Reference:

a. Memorandum from OASD (HA) dated 23 October 1980, subject: Request for additional information concerning units believed to have been heavily exposed to Herbicide Orange.

b. Memorandum for Assistant Secretary of Defense, Health Affairs dated 22 December 1980, subject: Army Units and their Possible Exposure to Agent Orange.

2. New studies of Vietnam joint services records, revealed that there was burning of defoliated vegetation areas. The 266th Chemical Platoon (DS) provided a limited ground base herbicide spray capability for the 1st Infantry Division. This support consisted of burning vegetation in Rome plowed areas, base camp perimeters and along main traffic routes. In addition, some perimeters were first defoliated and then burned (Incl 1). The 184th Chemical Platoon burned brush and grass vegetation within the perimeter of Phuoc Vinh (same location as ref b). Ground based defoliation was performed by track vehicles, mounted with 600 gallon POL pods and a 50 POL pump, and 3/4 ton trucks mounted with a 40 GPH sprayer (Incl 2). Defoliation of plants along waterways was achieved by LCM-8's and 17 foot half-pontoon boats (Incl 3). There is also reference to the utilization of F-4 aircraft in defoliation missions (Incl 4). F-4 aircraft carried 278 gallons of herbicide agents in each of two tanks.

3. In addition, we located a US Army advisory Group, Herbicide Evaluation Report, dated 3 September 1968, which provides an overview of both C-123 and helicopter herbicide operations specifically encompassing aerial defoliation.

4. Attached at Incl 6 is a MACV Chemical Operations Division Memorandum for Record, concerning helicopter defoliation apparatus. The record concerns AGAVENCO helicopter defoliation apparatus used to spray herbicide targets were allocated within MACV on the basis of two per corps advisory group headquarters, indicating that MACV conducted herbicide spraying as well as Army units.

5. A project known as Pink Rose was undertaken to determine whether it would be possible to clear large areas by first using Agent Orange and then igniting the areas with incendiary bomblets. Even though the project was unsuccessful it might account for some of the observations of burning of vegetation (Incl 7).

MAR 9 1981

DAAG-AMR-S
SUBJECT: Amendment to Battalion Studies of Vietnam Units Which may have been Exposed to Agent Orange

6. The information in this memorandum substantiates some of the issues raised at the open hearing concerning the burning of vegetation treated with Agent Orange on 22 September 1980.

FOR THE ADJUTANT GENERAL:

7 Incl
as

JOHN L. RAFFERTY
LTC, GS
Director of Admin Mgt

MAR 9 1981

DAAG-AMR-S

MEMORANDUM FOR ASSISTANT SECRETARY OF DEFENSE, HEALTH AFFAIRS

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FOR THE ADJUTANT GENERAL:

JOHN L. RAFFERTY
LTC, GS
Director of Admin Mgt

7 Incl
as

[redacted]

DEPARTMENT OF THE ARMY
HEADQUARTERS 1ST INFANTRY DIVISION
Office of the Chemical Officer
APO 96345

AVDB-CM

1 August 1969

SUBJECT: Feeder Report to Operational Report 1st Infantry Division for Period Ending 30 April 1969 (U)

1. (C) Section 1, Operations: Significant Activities

a. General:

(1) During the period 1 May 1969 through 31 July 1969, the 1st Infantry Division Chemical Section continued to perform personnel detection, defoliation, burning of vegetation and employment of CS in support of combat operations.

(2) The 242d Chemical Detachment (CBRC) assigned to augment the Chemical Section, continued to process defoliation requests, monitor the status of defoliation projects in the division TAOI and provide personnel for other chemical operations. During the period 1 May 1969 to 23 June 1969, 1LT Jon G Fisher was the detachment commander. CPT Gary L Stair commanded the detachment from 24 June 1969 to 31 July 1969.

(3) The 266th Chemical Platoon provided chemical support to the 1st Infantry Division. This support consisted of burning vegetation along stream lines where Rome Plow operations were not possible; dropping of persistent CS, employment of fougasses; defoliation and burning of base camp perimeters, and operating the airborne personnel detector on "Bloodhound" missions. During the period 1 May 1969 to 31 July 1969 the platoon was commanded by CPT William R Dias.

b. Operations:

(1) Personnel Detection Missions (Bloodhound): Missions continued to be flown for the Division G-2 on a daily basis in a large area surveillance role. A total of 235 missions were flown in this role during the reporting period. In addition, on 16 July 1969, a three man crew and detector was placed with the Air Cavalry Troop to be used in conjunction with their hunter-killer search teams. Results of this type operation are inconclusive at this time but are

expected to contribute significantly as the Air Cavalry Troop develops and improves their techniques of employment. Considerable difficulty was experienced with the take-up reel on the recorder of the XM-3 Airborne Personnel Detector. An equipment improvement report has been submitted to modify the design of the take-up reel.

(2) Riot Control Agent CS:

(a) Nonpersistent CS: A total of 45 E-158 CS clusters were dropped on 3 missions. The employment of these munitions was on post B-52 strikes after "last bomb" and on exploitation of the Bloodhound detector sensings. Although a light-fire team and hunter-killer team were over the CS targets there were no known cases of the enemy being affected by the CS. During the month of July, the "Mity Mite" was used on several occasions upon discovery of extensive tunnel and bunker complexes. Using the M7 series CS grenades with the "Mity Mite" was successful in driving unprotected personnel out from cover and in one instance asphyxiating several of the enemy with protective masks.

(b) Persistent CS: A total of 260 drums or 20,800 pounds of CS were dropped during the report period. The bulk CS was used in conjunction with the road opening and large convoy operations from SONG BE to PHUOC VINH. The CS was dropped into suspected ambush routes two days prior to the convoy movements.

[redacted] Defoliation: Only limited C-123 aerial defoliation missions were flown in the division's TAOI due to the size of the AO and the division's extensive pacification program. During this period only 244 sorties were flown. The only defoliation operations conducted by the division consisted of LAI KHE, DI AN and DAU TIENG Base Camp perimeters. These operations were conducted using a tracked vehicle mounted with a 600 gallon POL pod and 50 GPM POL pump. The same field expedient rig was used to dispense diesel fuel for burning operations where defoliation was not permitted. Approximately 120,000 gallons of diesel fuel were sprayed using this method.

(4) Personnel Marking and Identification System (PMIS): During the period 1 May 1969 to 31 July 1969 the 266th Chemical Platoon assisted Major John P Sanders, WPN DEV & ENG LAB, GML, EDG ARS, in the employment and evaluation of the PMIS with the 1st Infantry Division. The item consists of a helicopter mounted Agavenco sprayer, which sprays a suspension of zinc sulfide in mineral oil. An ultraviolet light source was available for detection of the zinc sulfide. Areas to be sprayed were VC/NVA infiltration routes and/or staging areas used by the enemy to move into villages and hamlets on food resupply and forced labor missions. These areas were remote from the villages so as not to mark innocent civilians. A desired characteristic of the area to be sprayed was low vegetation, such as grasses and low shrubs, so as to allow the zinc sulfide to settle to a level that would insure contact with personnel traveling through the area. Spray

[redacted]

AVDE-CM 1 August 1969
SUBJECT: Feeder Report to Operational Report 1st Infantry Division for Period Ending 30 April 1969 (U)

operations were planned a few days in advance of seal and search operations conducted against target villages. During the conduct of the village seal, personnel to be examined were walked into a darkened building, blindfolded and examined individually for the lime colored luminous spots of the zinc sulfide visible under the ultraviolet light. All operations were successful in identifying marked personnel. In each operation the personnel were turned over to the National Police and/or ARVN investigation channels. During the period 4 PMIS spray missions were flown and 66 persons were identified as having been in unauthorized areas. It was noted the zinc sulfide remains in an area for several weeks. Clothes laundered after contact with sprayed areas remained marked sufficiently to be detected by the ultraviolet light source.

2. (C) Section 2, Lessons Learned: Observations, Evaluation and Recommendations.

Personnel Marking and Identification System (PMIS).

a. Observation: The Personnel Marking and Identification System has been used during its test and evaluation period with the 1st Infantry Division with notable success in identifying VC suspects.

b. Evaluation : This system is effictive in marking personnel when there is a degree of isolation between enemy base camp areas and areas traversed by the general populace. A wide variety of employment means would be availableto the intelligence gathering system if this system were presently in Vietnam for use. The characteristic of this suspension remaining in the area for several weeks makes it feasible only if a system is made available for identifying when and from which area the person has been marked. This limitation is most likely to be present if regular use is made of the system in the area. If intensive interrogation of marked personnel was promptly evaluated, a large quantity of data could be made available for intelligence channels.

c. Recommendations: That a system of dye be added to the present suspension to provide a capability for continued use of this system in any area.

HERBERT JEO
LTC, CM
Division Chemical Officer

[redacted]

[redacted]

DEPARTMENT OF THE ARMY
HEADQUARTERS 1ST INFANTRY DIVISION
Office of the Chemical Officer
APO 96345

X Ch, Cml Ops Div
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[illegible]
3 May 1969
[illegible]
Cml Ops Sgt
Clerk
Clerk

AVDB-CM

SUBJECT: Feeder Report to Operational Report 1st Infantry Division for Period Ending 30 April 1969 (U).

1. (C) Section 1, Operations: Significant Activities.

a. General:

(1) During the period 1 February 1969 through 30 April 1969, the 1st Infantry Division Chemical Section continued to perform personnel detection, defoliation, burning of vegetation and employment of CS Riot Control Agent munitions in support of combat operations.

(2) The 242d Chemical Detachment (CBRC) assigned to augment the Chemical Section, continued to process defoliation requests, monitor the status of defoliation projects in the Division Tactical Area of Interest, and provided personnel for other Chemical Operations. The detachment was commanded by 1LT Jon G Fisher.

(3) The 266th Chemical Platoon (DS) provided chemical support to the 1st Infantry Division. This support consisted of burning vegetation in Rome Plowed Areas, base camp perimeters and along main traffic routes. The platoon also conducted bulk persistent CS drum drops in two major operations, Bowie Winner and Red Lightning. The platoon provided a limited ground base herbicide spray capability for the division. During the period 1 February 1969 to 10 March 1969 the platoon was commanded by 1LT Michael L Clements and from 10 March 1969 to 30 April 1969 by Captain William R Dias.

b. Operations:

(1) Personnel Detector Missions (Bloodhound): Bloodhound missions were flown daily basis for the Division G-2. A total of 267 missions were flown during reporting period. The large area surveillance technique was employed using the XM-3 Airborne Personnel Detector, one UH1-D slick and AGH1 Gunship. "Hotspots" were reported to the G-2 Air in flight for appropriate action as determined by the G-2 Air Section. Difficulty continued to be experienced in determining which sensings were produced by the numerous fires burning throughout the TAOI as opposed to sensings created by enemy activity. Because the dry season extends through the report period this problem is especially significant. The value of sensings in this type of an environment is dependent upon the skill and ability of operating personnel to isolate valid sensings through visual observation. On 10 April 1969 the Division received a new and improved version of the XM-3 Airborne Personnel Detector. Although the detection sensitivity of the new machine was greatly improved, no significant changes were made that would require a change in the operating concept or training required by operating personnel. Technical

[redacted]

AVDB-CM 2 May 1969
SUBJECT: Feeder Report to Operational Report 1st Infantry Division for Period Ending 30 April 1969.

representatives of the Limited Warfare Labratory and Edgewood Arsenal visited the division on 23 and 24 April 1969 to introduce the new modified detector.

(2) Riot Control Agent, CS:

(a) Nonpersistent, CS: A total of 99 E-158 clusters were dropped on 18 separate missions. The primary effect desired, in the use of nonpersistent CS, was to flush the enemy out from under cover into the open. There were no known incidents in the division TAOI where the use of nonpersistent CS actually caused the enemy to expose himself.

(b) Persistent, CS: A total of 730 drums or 58,400 pounds of CS were dropped during the report period. Bulk CS was employed in a persistent form to deny the enemy use of base camps and suspected storage sites. In addition bulk CS was dropped during two major tactical operations to assist in the canalizing and blocking operations. Both of these operations involved the exclusive use of Air Delivered Ammunitions. Bowie Winner was a II Field Force operation conducted in war zone "D" by the 1st Air Calvary Division and the 1st Infantry Division. During this operation the 1st Infantry Division dropped 270 drums of CS along critical trails or avenues of approach to block the enemy from the target area. A similar operation Red Lightning, was conducted in the vicinity of the Trapezoid. This involved the use of 180 drums of CS. The CS tended to canalize the enemy into the target area, disoriented him and made him more susceptable to the effects of Air Force delivered CBU munitions which were also used in this operation.

(c) 40-MM CS Cartridges: Approximately 4000, 40-MM CS Cartridge were received by the 1st Infantry Division. The 40-MM Cartridge are used primarily in a reconnaissance by fire role. They are particullarly useful in the southern portion of the division TAOI because of the population density.

(3) Defoliation: Only limited C-123 delivered defoliation has been accomplished in the division TAOI because of the size of the AO and the division's extensive pacification program. During this period approximately 90 sorties have been flown. The Chemical Section received a helicopter mounted AGAVENCO spray rig on 15 March 1969. The spray apparatus was used on a small project involving the use of six drums of defoliant. It has since been hand receipted to II Field Force Vietnam. Depending upon the availibility of aircraft, it is anticipated that it will be used to defoliate approved projects in Rome Plowed areas. The AGAVENCO spray apparatus was originally designed for spraying insecticides. However, there were no insecticide spray nozzles furnished with the equipment to give it a dual capability. The ground base spray of herbicides has been limited to the LAI KHE Base Camp perimeter. This was accomplished with the use of a 55 gallon per minute POL pump and a 600 gallon steel tank mounted on a carrier. There are no satisfactory ground base spray means available to the division. The expedient spray rig described above is unsatisfactory because there is no means of controlling the application rate of defoliants. An excessive amount of defoliant is dispensed by this system. There was little to no hand spraying of

AVDB-CM 2 May 1969
SUBJECT: Feeder Report to Operational Report 1st Infantry Division for Period Ending 30 April 1969 (U).

herbicides. A small portable power driven spray apparatus would be useful for this purpose. Herbicides could then be used on a controlled basis in built up areas.

(4) Burning of Vegetation: This reporting period covers the dry season. Consequently, considerable effort was made by the Chemical Section to burn off areas to improve security in support of tactical operations. The primary means of burning involved the use of a 600 gallon fuel tank mounted in a carrier with a 55 gallon per minute POL pump. Diesel fuel is sprayed on foliage and ignited. Approximately 115,000 gallons of diesel fuel was sprayed on vegetation by this method. Considerable difficulty is encountered in acquiring the necessary equipment to support an operation of this type.

2. (C) Section 2, Lessons Learned: Observations, Evaluation and Recommendations.

a. Airborne Personnel Detector.

(1) Observation: The Airborne Personnel Detector is being used extensively as an intelligence collecting medium and can become more useful as refinements are developed to improve its reliability.

(2) Evaluation: The original concept of personnel detection was based on the machines ability to detect human beings because of some product emitted solely by man (ammonia). Although there has been much doubt in the commanders mind concerning the reliability of the instrument, he was willing to accept it on the basis of its theoretical operating concept. A considerable effort has been made by the laboratory to disprove the basic theory of operation. Subsequently, a new model has been developed which is only more sensitive to the normal conditions that exist in a battlefield environment.

(3) Recommendation: Research should be contained in the development of a true human detector. The original theoretical concept should be explored to determine some other things that are solely peculiar to man and which can be detected by a machine.

b. Defoliants:

(1) Observation: In the Vietnam environment a considerable effort is made to rid specific areas of vegetation. This is particularly true in any area involving security such as traffic routes and defense perimeters.

(2) Evaluation: Defoliants have been used around base camps to kill vegetatic The standard defoliants available in-country do not fulfill the commanders requirements. Approved projects have been obtained to defoliate base camp perimeters. Perimeters are sprayed with a defoliant and burned off. Within 30 to 60 days almost complete regrowth occurs. In addition to the standard defoliants inability to produce semi-permanent kill to foliage there is the inherent danger of run off

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SUBJECT: Feeder Report to Operational Report 1st Infantry Division for Period Ending 30 April 1969.

or seepage into the local waterways which can cause damage to crops during the rainy season which is also the growing season.

(3) Recommendation: A contact kill chemical spray should be developed. The spray must not possess any residual effects nor present hazards to vegetation other than that to which it is directly applied..

HERBERT JEE
LTC, CM
Division Chemical Officer

[redacted]

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DEPARTMENT OF THE ARMY
HEADQUARTERS, 101ST AIRBORNE DIVISION
APO 96383

AVDG-CM

SUBJECT: 101ST AIRBORNE DIVISION CHEMICAL ACTIVITIES SUMMARY - CY 1968

TO: See Distribution

1. (U) INTRODUCTION: The purpose of this report is to present a summary of chemical operations conducted by the Division Chemical Section and attached units in support of 101st Airborne Division (Airmobile) operations during calendar year 1968. This annual report also represents the completion of one year for the Division Chemical Section in Vietnam since its arrival on 26 Dec 67.

2. (U) MISSION AND CAPABILITIES:

a. The mission of the 101st Airborne Division Chemical Section is as follows:

(1) Advise Commanding General and Staff on CBR training, equipment, employment and defense.

(2) Exercise technical supervision over CBR activities throughout the Division, to include planning and coordinating the use of CBR munitions and employment of chemical troops.

(3) Provide advice and recommendations pertaining to the use of smoke, flame, riot control agents, and herbicides in support of tactical operations.

(4) Prepare CBR portion of the training program and exercise staff supervision over CBR training throughout the command.

(5) Exercise operational control over chemical units assigned to the division.

(6) Employ and maintain personnel detection equipment (APD/MPD) used in the intelligence collection effort; advise the G2 on the proper use of this equipment and conduct the actual missions under the guidance of the G2.

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SUBJECT: 101st Airborne Division Chemical Activities Summary - CY 1968

b. As of the close of this report, the Division Chemical Section can provide support in the following areas:

(1) Flame Field Expedients: Mix, distribute and emplace flame mines and flame fougasse, to include arming, wiring and inspection of these emplacements; develop new types of flame field expedients as required.

(2) Defoliation: Operate and maintain a locally fabricated 110 gallon helicopter spray apparatus for aerial defoliation of small areas such as fire bases, perimeters and rocket belt locations; operate and maintain a 3/4 ton truck mounted 40 GPH sprayer for ground based defoliation of small areas accessible by road; monitor the Air Force "Traildust" defoliation missions flown by "Ranchhand" elements of the 7th Air Force in Da Nang.

(3) PDDA Operations: When available, provide the Power Driven Decontaminating Apparatus (PDDA) to units for showers during stand-downs in the field; fill fixed shower locations as designated by the G4; employ the PDDA as a backup fire fighting apparatus in case of emergency.

(4) Insecticide Operations: Provide an operator and the 110 gallon spray apparatus for aerial insecticide missions to fire bases inaccessible by road, as requested by the Division Surgeon; conduct ground based insecticide spray missions using the vehicular mounted 40 GPH spray apparatus at fire bases as requested by the Division Surgeon.

(5) Persistent CS, Riot Control Agent Operations: Support all units in the Division by fuzing, loading and dropping 55 gallon drums filled with RCA CS-1, from CH-47 helicopters, to restrict enemy access to base areas, lines of communications and similar targets; provide bunker seeding teams with equipment to contaminate bunker complexes with persistent CS-1. Operate the M-5 Helicopter/Vehicular Mounted RCA disperser for employing persistent CS-1 on targets suitable for this type of delivery system.

(6) Non-persistent (tactical) CS Riot Control Agent Operations: Provide operator personnel, OIC and equipment for employment of E-158 Tactical CS Canister Clusters in close air support of combat operations; operate and maintain locally fabricated grenade racks for the employment of M7A3 or XM54 CS grenades in close air support of combat operations; provide technical assistance and advice on the employment of the E-8 16-Tube Tactical CS launcher and pyrotechnic CS grenades.

(7) Combat Flame Operations: Conduct flame drops using twenty 55 gallon drums of 1% and 4% thickened fuel, slung under a CH-47 helicopter, in close air support of ground combat operations, to clear booby trapped areas, and to prepare closed fire bases for reoccupation.

expected to contribute significantly as the Air Cavalry Troop develops and improves their techniques of employment. Considerable difficulty was experienced with the take-up reel on the recorder of the XM-3 Airborne Personnel Detector. An equipment improvement report has been submitted to modify the design of the take-up reel.

(2) Riot Control Agent CS:

(a) Nonpersistent CS: A total of 45 E-158 CS clusters were dropped on 3 missions. The employment of these munitions was on post B-52 strikes after "last bomb" and on exploitation of the Bloodhound detector sensings. Although a light-fire team and hunter-killer team were over the CS targets there were no known cases of the enemy being affected by the CS. During the month of July, the "Mity Mite" was used on several occasions upon discovery of extensive tunnel and bunker complexes. Using the M7 series CS grenades with the "Mity Mite" was successful in driving unprotected personnel out from cover and in one instance asphyxiating several of the enemy with protective masks.

(b) Persistent CS: A total of 260 drums or 20,800 pounds of CS were dropped during the report period. The bulk CS was used in conjunction with the road opening and large convoy operations from SONG BE to PHUOC VINH. The CS was dropped into suspected ambush routes two days prior to the convoy movements.

(3) Defoliation: Only limited C-123 aerial defoliation missions were flown in the division's TAOI due to the size of the AO and the division's extensive pacification program. During this period only 244 sorties were flown. The only defoliation operations conducted by the division consisted of LAI KHE, DI AN and DAU TIENG Base Camp perimeters. These operations were conducted using a tracked vehicle mounted with a 600 gallon POL pod and 50 GPM POL pump. The same field expedient rig was used to dispense diesel fuel for burning operations where defoliation was not permitted. Approximately 120,000 gallons of diesel fuel were sprayed using this method.

(4) Personnel Marking and Identification System (PMIS): During the period 1 May 1969 to 31 July 1969 the 266th Chemical Platoon assisted Major John P Sanders, WPN DEV & ENG LAB, CML, EDG ARS, in the employment and evaluation of the PMIS with the 1st Infantry Division. The item consists of a helicopter mounted Agavenco sprayer, which sprays a suspension of zinc sulfide in mineral oil. An ultraviolet light source was available for detection of the zinc sulfide. Areas to be sprayed were VC/NVA infiltration routes and/or staging areas used by the enemy to move into villages and hamlets on food resupply and forced labor missions. These areas were remote from the villages so as not to mark innocent civilians. A desired characteristic of the area to be sprayed was low vegetation, such as grasses and low shrubs, so as to allow the zinc sulfide to settle to a level that would insure contact with personnel traveling through the area. Spray

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DEPARTMENT OF THE ARMY
HEADQUARTERS 1ST INFANTRY DIVISION
Office of the Chemical Officer
APO 96345

AVDB-CM

3 February 1969

SUBJECT: Feeder Report to Operational Report, 1st Infantry Division
for Period Ending 31 January 1969 (U)

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Cml Opns Off, IV
Division Opns Sgt
Clerk
Clerk

1. (C) Section 1, Operations: Significant Activities.

a. General:

(1) During the reporting period, the 1st Infantry Division Chemical Section continued to perform personnel detection and defoliation missions and employ Riot Control Agent CS. LTC Herbert P Chm served as Division Chemical Officer until 23 January 1969 when LTC Herbert Jeo assumed the position.

(2) The 242d Chemical Detachment (CMRC) assigned to augment the Chemical Section, continued to process defoliation requests, monitor the status of defoliation projects in the Division Tactical Area of Interest, and provide personnel for chemical operations. The detachment was commanded by 1LT Jon C Fisher.

(3) The 266th Chemical Platoon (DS) provided support for chemical operations. Particular emphasis was placed on ground and river defoliation and burning. The platoon was commanded by 1LT Michael L Clarents.

b. Operations:

(1) Personnel Detector Missions: During the period 200 "Bloodhound" missions were flown by the Division Chemical Section. On the majority of these missions the M-3 Airborne Personnel Detector was used. However, that instrument continued to pose problems with the valve, valve seat and at the end of the period with the electronic circuitry. The installation of a nylon valve seat cover has helped considerably. The "Bloodhound" missions continue in the main, to be large area surveillance missions. The elimination of the ammonia converter per USARV instructions makes the instrument strictly a condensation nuclei detector. Fewer sensings have been obtained since the removal of the converter probably indicating the elimination of self-generated internal noises which gave false sensings. Further, during the dry season it again becomes apparent that careful in-flight observation and detailed post mission analysis must be accomplished to exclude sensings produced by forest and grass fires not as a result of enemy activity.

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Tab #3

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AVDC-CH 3 February 1969
SUBJECT: Feeder Report to Operational Report, 1st Infantry Division for Period Ending 31 January 1969

(2) Riot Control Agent CS: (a) Non-persistent CS: Very few targets were acquired which were suitable for engagement with non-persistent CS. A total of 99 E158 clusters were employed in the "reconnaissance by CS" technique working with an air cavalry troop.

(b) A division boundary line change eliminated that portion of the Division TAOI most suited for the employment of persistent CS. However, on 19 January 1969, a 30 drum CS drop was made to test the M-925 fuze and burster system. The drop was conducted at 3200 feet and resulted in 4 drums that failed to detonate. Cause of the failures is not known. Use of the M-925 system will not be considered for tactical employment without future testing. In the remaining area, population centers and troop locations mitigate against its use because of downwind effects hazard. This problem in one case gave rise to the development of a different employment technique. In early December, an infantry battalion commander requested a CS interdiction line in the southwest portion of the TAOI. Initially it appeared that 3-4 CH-47 Helicopter sorties would be required. However, the target was only 6 kilometers from Saigon, less that 3 kilometers from a major highway and only 500-700 meters from a village involved in the pacification program. Considering the airborne downwind travel which occurs on CH-47 drops, such a delivery method could not be recommended. As a last resort, the installation of the CS interdiction line by demolition techniques on the ground was considered and accepted as the only means available. II FFV cleared the operation using these techniques. Using 10 personnel from the Division Chemical Section and the 266th Chemical Platoon transported to the site by 17 foot half-pontons operated by 1st Engineer Battalion personnel, 400 eight pound bags of CS were employed and blown on a line 1800 meters long by 60 meters wide during the period 15-17 December 1968. Feedback from the tactical commander indicated that the enemy was forced around the interdiction line into our ambushes. Based on the apparent initial success, an extension 2800 meters long by 100 meters wide using 830 bags of CS was emplaced and blown during the period 27-30 December 1968. A sketch of the interdiction line indicating details of employment is at inclosure 1.

(3) Defoliation: (a) The Catcher's Mitt area northeast of TAN UYEN continued to receive C-123 large area defoliation missions until the end of December 1968 when priority was requested and received for the Iron Triangle area west of LAI KHE. During the reporting period 429 sorties were flown in our TAOI.

(b) Defoliation of nipa palms along the waterways southeast of CHU DUC in CHA DINH province continued with a total of 74 kilometers of river bank treated. Along the larger waterways more efficient production was achieved by placing the equipment aboard an LCM-8 which could easily carry considerably more defoliant then the 17 foot half-ponton boat. Both agent [redacted] and agent [redacted] turned the palm fronds brown. However, the fronds did not fall off.

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AVLL-GC 3 February 1969
SUBJECT: Feeder Report to Operational Report, 1st Infantry Division for Period Ending 31 January 1969

Vertical observation was improved slightly and horizontal observation was improved 50%. It became obvious that the nipa palms would have to be burned. Even though the fronds were brown and apparently dry, little success was achieved in burning them even when portable flamethrowers were used. As a result of experience on base camp perimeters, attempts were made to ignite the defoliated vegetation after spraying with diesel fuel. These attempts were unsuccessful. Spraying with JP-4 and then igniting proved successful but only where the fuel was deposited. To reduce the safety hazards caused by the volatility and low flash point of JP-4 a fifty percent JP-4 - fifty percent diesel fuel mixture was used. Again the means of transport was the 17 foot half-pontons. The fuel mixture was sprayed on the vegetation using 55 gallon per minute POL pump. The spray boat then moved out of the immediate area and the sprayed area was ignited with trip flares. The nipa palm fronds burned leaving only the stalk. This was a laborious process requiring heavy application of fuel and resulting in only 200-300 meters of bank burned in a dayof operations. Because of the tactical importance of clearing the nipa palms, this operation continued in priority areas selected by the tactical unit commander until 6 January 1969 when an accident occured in which three personnel of the 266th Chemical Platoon were severely burned. There is a need for burning equipment which will provide greater safety for the operators.

(c) Ground based defoliation continued over 1043 acres of Rome Plowed jungle. One of the ground based defoliation missions was particularly interesting in that it was a joint operation with the 266th Chemical Platoon and the 5th ARVN Division Chemical Team. As Rome Plow operations continued, it became necessary to defoliate in these areas on a priority basis. The area was cleared by burning the defoliated vegetation. There are often draws or gullies which cannot be Rome Plowed and these remain as booby trap havens in the middle of a cleared area. It is these draws and gullies which are now the prime targets for defoliation and burning. In fact the direct application of diesel fuel to the vegetation and igniting it has been successful without prior defoliation. This requires a heavy logistic effort and can only be used selectively on high priority targets.

(C) Section 2, Lessons Learned: Observations, Evaluations and Recommendations.

a. Employment of Persistent CS:

(1) Observation: Persistent CS can be employed when the constraints pertaining to friendly troops, highways and population centers exist.

(2) Evaluation: It was found that when constraints bar the air drop of persistent CS, it can be emplaced by demolitions techniques in the actual

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AVDA-GC. 3 February 1969
SUBJECT: Feeder Report to Operational Report, 1st Infantry Division for Period Ending 31 January 1969

target area. This employment requires the ability to enter the target by some means of transportation, security and considerable labor. It does, however, reduce airborne effects and can be used in interdictory or denial operations in relatively large targets.

(3) Recommendations: That the employment of persistent CS by demolition techniques (Inclosure 1) in the actual target area be considered as the employment technique of choice when constraints bar the use of air drop techniques.

b. Vegetation Burning:

(1) Observation: There is a requirement in RVN for equipment to burn large areas of jungle vegetation

(2) Evaluation: It has been noted that defoliated targets must be followed by burning except where the target consists of large leafy trees. Brush, grass, bamboo and similar growths merely turn brown. Flamethrowers do not provide sufficient area coverage. Field expedient techniques such as pumping and igniting diesel fuel on the target foliage are successful but are laborious and time consuming. Additionally there are occasions where grass and undergrowth are required to be removed without destroying rubber trees or other money crops. It appears that small, rough terrain grass and brush cutters are required for the latter areas and high production brush burners where constraints do not exist.

(3) Recommendations: (a) That a rough terrain grass and brush cutter be investigated.

(b) That a high production brush burner system be investigated.

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HERBERT J. [illegible]
LTC, CE
Division Chemical Officer

[redacted]

HEADQUARTERS
UNITED STATES MILITARY ASSISTANCE COMMAND, VIETNAM
APO SAN FRANCISCO 96222
Chemical Operations Division

MACJ3-09

19 April 1969

MEMORANDUM FOR RECORD

SUBJECT: High Speed Defoliation (U)

1. (C) On 25 Mar LTC Holder, Office of Director of Air Operations, HQ 7th Air Force, briefed the Chemical Operations Division on the Air Force's capability to spray herbicides from high performance aircraft.

2. (S) The system uses F4 aircraft. Standard 370 gallon F4 wing tanks are modified at a cost of $406.00 each. No modification of the aircraft is required meaning the aircraft can switch from herbicide to conventional use by merely dropping the modified tanks. When in the herbicide role the center portion of the tank is not used so capacity is 278 gallons of agent in each of two tanks. Planes fly at 500 knots and 200' above the vegetation. Herbicide is expended in one minute and ten seconds covering an area of ten miles by sixty to 100 feet wide. Rate of application is approximately 4.3 gallons per acre. Missions are controlled by a FAC in another F4.

3. (S) The Air Force prefers to run three ship missions which results in an average swath width of 240 feet. Aircraft range is 150-175 miles. There are currently eight tanks modified with work progressing to bring that number to 20. 7th Air Force has authority to modify up to 100 tanks. F4's are currently available at DaNang and Cam Ranh Bay with employment at Phu Cat expected in mid April.

4. (C) LTC Holder was apprised of the control over herbicide operations maintained by J3-09 and requested to work within 7th Air Force to assure adequate reporting to HQ MACV of herbicide operations conducted by the high performance system.

Graham F. Byrnes

GRAHAM F. BYRNES
Major, USA
Cml Opns Officer

Cy furn:
Cmdr 12SCS

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J3-S. 1761-69

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HEADQUARTERS
US ARMY ADVISORY GROUP, IV CTZ
ADVISORY TEAM 96, APO 96215

201-30(1) 68
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03 SEP 1968

ON CD 3-69

MACV-IVC-3

SUBJECT: Herbicide Evaluation (U)

COMUSMACV
ATTN: COC-7
APO 96222

1. (C) Reference: COMUSMACV msg 23818, DTG 150805Z AUG 68 (S).

2. (C) Referenced message requests a one-time evaluation of the effect of defoliation on allied combat operations to include specific examples as appropriate.

3. (C) This report will encompass aerial defoliation conducted within IV Corps and covers the period 1965 through 20 August 1968. Both helicopter and C-123 defoliation operations are discussed.

IVC-002291-68
201-30(1)

4. (C) In early 1961, the Republic of Vietnam Combat Development Test Center was established. This was supported by a United States Research and Development Field Unit of the Office of the Secretary of Defense/Advance Research Projects Agency (OSD/ARPA). Among the projects assigned this unit, were Task 2 and 20, which dealt with the evaluation of crop destruction and defoliation materials and techniques. Based on the promising results of early tests, approval was sought for expanded aerial defoliation trials. Approval was granted and C-123 aircraft made available in December 1961. Tests were conducted in January and February 1962, and an evaluation report submitted in May 1962. Following Department of Defense and State Department approval, aerial defoliation operations began in Cau Mau, An Xuyen Province. These trials began on 3 September 1962, and were completed on 11 October 1962. Based on the results of this operation, action was taken to establish an aerial herbicide operational capability in the Republic of Vietnam.

5. (C) Since the inception of aerial herbicide operations, the results have proven favorable and the yearly frequency of these operations has greatly increased. The purposes of these aerial herbicide operations in IV Corps are manifold:

a. Clear the vegetation bordering jungle roads, paths, trails, and waterways, thereby reducing possible sites from which friendly forces may be ambushed.

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MACV-IVC-3 0 SEP 1967
SUBJECT: Herbicide Evaluation (U)

b. Clear the vegetation from fields of fire and avenues of approach.

c. Significantly reduce vegetation growing in minefields and wire barriers.

d. Clear the vegetation surrounding critical installations, communication complexes, air defense sites, railroad and pipeline rights-of-way, petroleum warehouses, bridges and air fields.

e. Clear field training firing ranges and mark the boundaries of firing lanes and impact zones.

f. Clear "kill lanes" which channalize enemy approach and withdrawal during attacks.

g. Clear large areas of dense vegetation for major construction projects or for health and sanitation reasons. Herbicides may be used to mark areas in jungle terrain through which roads are to be built.

6. (C) The proximity of friendly populations and the abundance of food crops in IV Corps makes crop destruction operations undesirable in IV Corps. For that reason, no crop destruction missions have been conducted in this Corps area. Defoliation operations conducted by fixed or rotary wing aircraft are designed to eliminate foliage along friendly or enemy lines of communication and in areas used by the Viet Cong such as base camps, infiltration routes, training centers, prison stockades, supply and ammunition caches, and communication-liaison routes. The result of these IV Corps defoliation operations has been the exposure of Viet Cong routes and storage areas to aerial observation and surveillance which has thus had a tremendous effect on the enemy's activity and his freedom of movement.

7. (C) In IV Corps, defoliation is usually complete in less than two weeks and lasts from 9 to 12 months. The psychological effects of these operations on the enemy is increased by his own propaganda that the herbicide is harmful to humans. Occasional unintentional crop damage is the only adverse effect on the friendly civilian population. These incidents have been infrequent and result from unusual meteorological conditions.

8. (C) Some of the earliest defoliation (C-123 aerial defoliation code name TRAILDUST) missions were flown in Vinh Binh Province, Long Toan district. Initial planning began in the first quarter of 1966 and approximately 7.2 square kilometers of vegetation in a known VC base area was sprayed in November 1966. Vinh Binh Province requested aerial spray missions for the districts of Chau Than, Cau Ke, Tieu Can and Cang Long. Cau Ke and Tieu Can missions were directed at 10.4 square kilometers of dense vegetation along canals in known Viet Cong storage and base areas. A total of 2.1 square

Kilometers of foliage was sprayed along a district road and the adjacent canal in the South Western portion of Chau Thanh District. These missions in Vinh Binh Province, completed during the month of February 1967, represent 20% of the total areas sprayed in 1967 in the 9th ARVN Infantry Division area of responsibility.

9. (C) The Cang Long base area of Vinh Binh Province at this time began to draw increasing interest of Division and Province officials. Viet Cong harassment and interdiction was becoming more intense and large numbers of GVN-oriented civilians became refugees in Cang Long, Tieu Can and Tra Vinh cities in their escape from the VC. Cang Long District received the first mission in the month of March, spraying a total 12.3 square kilometers (of the total 21.2 km^2) of vegetation in a VC base area. An infiltration route and base area of 13 square kilometers was sprayed in the Cau Ngan District along the Co Chien River. Missions in Long Toan District during the month of March produced a total sprayed area of 42 square kilometers. The targets consisted of VC rest and base areas and infiltration, supply and communication routes. The result of the missions flown in Vinh Binh during March 1967 represented 50% of the total area sprayed in the calendar year 1967. The total sprayed area (78 km^2) in Vinh Binh Province represents 70% of that accomplished in 1967. Until regrowth of sprayed areas began in mid-1968, incident rates in Cang Long were reduced by 50%.

10. (C) In December 1967, 13 square kilometers were sprayed in Chau Thanh district, Vinh Binh Province, North East of Tra Vinh city along the Co Chien River and on Long Hoa Island at the mouth of the Co Chien. As an added note, during January 1968, the defoliation program in Vinh Binh continued with additional spray missions for the area previously mentioned along the Co Chien and Long Hoa Island. The Viet Cong had been able to take advantage of the dense and impenatrable undergrowth along the Co Chien River. Water shipments were stopped, taxed, and confiscated. River traffic was reduced to almost 10% of normal. After defoliation by C-123, horizontal visibility was increased to 100 meters and sniper fire and Viet Cong initiated incidents were greatly reduced.

11. (C) In Duc Tou District, Sadec Province almost 5 square kilometers of overgrown canal was sprayed in January 1967. This area in western Sadec Province was completely closed to civilian traffic by the Viet Cong and had been declared a free-fire zone for more than 10 months prior to defoliation. The Viet Cong had installed .50 caliber machine guns in the area and shot down one (1) jet fighter and two (2) UH-1D helicopters from this sanctuary.

12. (C) The "Y" canal base area was originally requested for spraying in March 1967, but due to the backlog of C-123 aerial defoliation in IV Corps and in the RVN, this spray mission was not possible until 10 months after

being requested. Because of the request backlog for C-123 defoliation, this delay is not unusual. In asking for the initial defoliation mission for this VC base area, Mr. James T. Smith, Province Senior Advisor wrote: "The requested area includes the most active areas of VC activity in Sadec Province. There are daily sightings and agent's reports of VC units in these areas and these free-fire zones absorb by far the greatest percentage of airstrikes flown in the Province. The approval of this request will have a great impact on the success of the Sadec Province Pacification Plan for 1968. By defoliating this target, our Ap Doi Moi's for 1968 will not be affected directly by the defoliant but the main access for the enemy into the Revolutionary Development areas will be taken from him thus protecting the American and GVN investment in terms of money and lives."

13. (C) A significant helicopter defoliation mission was conducted on 6 August 68. This operation was conducted in the "Triangle" base area, center of mass WS7842, Duc Thinh District, Sadec Province. The target area consisted of five main converging canals which formed one of the strongest VC base areas in the 9th ARVN Infantry Division area. This area was sprayed with approximately 735 gallons of the herbicide WHITE and over 90% of the area was defoliated in less than two weeks. Because of the danger to low flying aircraft, 4 Battalions of ARVN troops and a light fire team (2 Cobra gunships) were necessary to secure the target for this one day spray operation. From this base area, the VC were constantly launching assaults against surrounding GVN-oriented hamlets and towns and caused the migration of pro-government civilians. This had caused a refugee problem in the city of Sadec. The operation was successfully conducted and negligible drift damage to surrounding vegetation outside the target area was observed. Since the time of defoliation, there has been no VC provoked incidents in the entire area and VC presence has decreased to the point that only resident RF/PF forces are now necessary for local security.

14. (C) On 9 July 1968, a base area in Duc Ton District, Sadec Province was defoliated, again using the AGAVENCO helicopter-mounted system. 770 gallons of herbicide WHITE was used to spray an area where three canals converged. The vegetation in the target area was extremely dense and horizontal visibility was reduced to 10-15 meters. Horizontal visibility was almost nil from the canal edge into the wooded area for more than 200 meters, providing excellent cover for storage of POL and ammo, and supplies. This "Triangle" area has been the scene of numerous bloody battles over the last five years. In each case, the ARVN troops involved were the victims of booby traps and murderous ground fire coming from the all but invisible camouflaged bunker and trench systems constructed by the Viet Cong. Again, in less than 12 days the area was opened to aerial observation and horizontal visibility has been increased to more than 100 m. CPT Allen Mason, Ranger Bn Senior Adv, came to

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AVCV-IVC-3
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IV Corps Headquarters on 25 July 68 to express his thanks and appreciation to the G-3 staff who had assisted in this defoliation mission. He stated at that time that his Ranger Battalion has just been in the "Triangle" base area for a three day operation and had not had to fire one shot in self-defense. The Ranger Battalion had also stayed overnight in this base area for the first time in memory without attack. All of the previously camouflaged bunkers were exposed to view and aerial observers orbiting overhead were able to trace the movement of ground troops for the first time. For the next six months, only local security forces (RF/PF) should be necessary for hamlet security.

15. (C) The Mang Thit-Nicholai Canal forms one of the most important North-South water routes in IV Corps. It is situated south of Vinh Long city in Vinh Long Province. Due to VC taxation and ambushes, this important waterway had fallen into disuse. Both the CG, IV Corps and the Province Chief of Vinh Long were concerned that this canal route to Saigon and III Corps would be closed completely in the near future. The target area was 4 km of the canal in Tam Binh-Tra On Districts, Vinh Long Province. The canal in this area is heavily wooded and overgrown to a depth of 300 meters on both sides. The VC were using B-40 rockets and machine gun fire to harrass and interdict water traffic. Because of the narrowness of the canal, boats taken under fire were usually destroyed. This situation continued until early May 1968, at which time the Executive Officer of the Can Tho based VN RAG was wounded in an ambush in the target area. In addition, 4 VN RAG EM were killed, 1 US KIA, 5 US WIA, 13 VN RAG EM WIA, and 2 RAG boats damaged. On 3 May 1968, the CG, IV Corps ordered an emergency defoliation mission to reduce the VC cover and concealment on this area on the Mang Thit Canal. An operation was organized and a HFT (4 HueyCobra gunships) and 1 ARVN Bn and 4 companies of PF troops were used to provide ground security. Even with this concentration of troops on the ground, the spray plane came under intense enemy ground fire. This action resulted in award of the VN Cross of Gallantry with Silver Star to two US Advisors and 3 VN Officers. 500 gallons of the herbicide ORANGE were used and 95% of the target was covered before darkness and rain caused a halt to the mission. Within 10 days vertical visibility was almost perfect and horizontal visibility was increased to more than 100 meters as contrasted to an original 5-10 meters before defoliation. Incident rates which averaged 3-4 per week before defoliation have dropped to zero. Only local PF troops now are used in this area. The success of this mission caused the District and Province officials in Vinh Long to submit 32 additional canal targets for defoliation operations in that province. TAB A.

16. (C) A 4 km section of National Highway 4 adjacent to the village of Long Thanh in Phong Dinh Province was the site for a defoliation operation on 24 June 1968. Since January 1968, a series of ambushes were conducted against GVN convoys and troop movements which resulted in the following casualties: 20 KIA, 71 WIA, 6 missing in action, 10 trucks destroyed, 2 APC's destroyed and 10 weapons missing. Because of the total inability of ground troops to keep

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this area clear of Viet Cong, a defoliation mission was requested by Phong Dinh Province Chief. This area was sprayed using 685 gallons of the herbicide WHITE. The target area consisted of coconut palm and banana trees that had been abandoned by their owners for several years. During this period of abandonment, the vegetation had become so dense that convoy security elements were not able to see more than 5 meters into the underbrush and had to rely on reconnaissance by fire to discover the hidden enemy. This method of protection had proved ineffective. 3 RF/PF companies with US advisors were used to secure the target for the helicopter operation in addition to an Armored Cavalry troop. As usual, troops remained on the ground during the spray mission with the chemical spray cloud drifting over the troops with no damage being done to clothing, skin, or weapons. Since the completion of this defoliation mission, convoys have used this highway 2-3 times per week without attack or harrasment. Only one PF platoon has remained in the area to provide local security to the hamlet and highway.

17. (C) The My Thanh River forms the border between Ba Xuyen and Bac Lieu Provinces. During the period from January 1968, to 30 June 1968, more than 21 RAG personnel have been WIA and 2 KIA. In addition to the loss of lives, boats, tugs, and RAG barges have been sunk or damaged. Neither Province nor the 21st ARVN Infantry Division have been able to provide adequate security for these weekly convoys. Additionally, more than $200,000 worth of ammunition is being expended each month in reconnaissance by fire along the canal sides. This reconnaissance is largely ineffective and has not reduced the ambush incident rate. Both the Province Chiefs from Ba Xuyen and Bac Lieu Province have requested a defoliation mission in this area. This request has been reinforced by the CG, 21st ARVN Inf Div and CG, IV Corps in addition to the CO, VN RAG, IV Corps. The target area from Ben Pha to Vam Leo is now scheduled to be done by the USAF C-123 aircraft and has the highest priority in IV Corps. It is expected that when this project is completed, convoys will enjoy freedom from attack as has happened in other Provinces in IV Corps. A significant savings in money and lives will be the result. See Fact Sheet, TAB B.

18. (C) Without exception, successful defoliation missions have led to a deluge of requests for other areas in a given Province. Each successful mission on the average has caused the submission of 4-5 other targets for C-123 and helicopter defoliation in IV Corps. At the present time, in June 1968, more than 108 helicopter targets were pending in IV Corps in addition to more than 20 C-123 projects.

19. (C) Tropical vegetation in the IV CTZ appears to be more resistant to herbicide sprays than are the temporate climate species found in the continental United States. This resistance of tropic vegetation has challenged the creative talents of scores of military and industrial plant physiologists, biochemists, formulators, and spray system designers for the last decade and a half. Little vegetation analysis and species identification

has been done in Southeast Asia, and only one pioneering study has attempted to relate genera and species response to chemical application in SEA. A need exists both for quicker acting herbicides and for agents that will kill or defoliate a broader spectrum of tropic species at low concentrations.

20. (C) The butyl esters of 2,4-Dichlorophenoxyacetic acid and 2,4,5-Trichlorophenozyacetic acid are the most effective on the tropic species of IV Corps. These esters are, however, diesel oil soluble and will dissolve and destroy the paint of Army helicopters. For this reason only, the amine ester of 2,4-Dichlorophenoxyacetic acid (code name WHITE) is being used in helicopter spray work in IV Corps. There is, however, a marked resistance of several dominant species to this water soluble ester(viz. Nipa palm). Nipa palm is notoriously resistant to WHITE and little or no kill results. A requirement exists for a herbicide in the Republic of Vietnam which contains the esters of 2,4-D and especially 2,4,5-T which will not harm the finish of metals and paint surfaces of the US Army UH-1B/D series of helicopter.

21. (C) The natural dense vegetation in jungle areas of Southeast Asia is ideal for the illusive hit, run, and fade-away tactics of the guerrilla. If this dense growth can be defoliated, he may then be pursued by friendly forces and destroyed by aerial and/or ground means. The guerrilla is known to habitually leave a treated target area even before the effect is visible on the plants. The defoliation operation then has some immediate effect. The Viet Cong experience with defoliation operations in the Republic of Vietnam is so extensive that the guerrilla does not wait for the inevitable effects of the defoliation mission. He begins an immediate removal of supplies and manpower to more remote locations. In addition, his propaganda that the agents used are poisonous has back-fired on his own troops and the Viet Cong soldier is afraid to stay in a sprayed area or eat food affected in any way by the spray materials.

22. (C) Defoliation operations have proved to be a useful tool in Vietnam. Herbicides have deprived the Viet Cong of cover and concealment, safeguarded waterways and highways, improved outpost security, and cleared fields of fire around fixed installations. It has also significantly reduced the need for large numbers of troops in areas adjacent to sprayed areas. In certain dense Viet Cong base areas, for example An Xuyen Province, defoliation operations provide virtually the only GVN pressure on the Viet Cong because of the lack of ARVN mobility, high water, and density of vegetation which makes ground military operations prohibitive in terms of manpower losses and assets required to sustain an operation.

MACV-IVC-3
SUBJECT: Herbicide Evaluation (U)

Defoliation operations are able to concentrate the Viet Cong and restrict him to more accessible areas where the ARVN can find, fix, and destroy the guerrilla.

FOR THE SENIOR ADVISOR:

Jerry L. Hammons

JERRY L. HAMMONS
1/LT, ARMOR
Act Asst AG

2 Incl
TAB A - Map of Vinh Long Defol Area
TAB B - Fact Sheet on My Thanh Project

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HEADQUARTERS
UNITED STATES MILITARY ASSISTANCE COMMAND, VIETNAM
APO SAN FRANCISCO 96222
Chemical Operations Division

MACJ3-09

4 February 1969

MEMORANDUM FOR RECORD

SUBJECT: AGAVENCO Helicopter Defoliation Apparatus (U)

1. (C) The AGAVENCO helicopter defoliation apparatus is used to spray herbicide targets which are too small for spray by C-123 aircraft. Eight AGAVENCO's are allocated within MACV on the basis of two per corps advisory group headquarters; however, at present only five of these units are on hand. The I CTZ has never received an AGAVENCO; II CTZ has two; III CTZ has one; IV CTZ has two, only one of which is operational. The two units programmed for I CTZ were lost in transit. A third unit, which was to be transferred from III CTZ to I CTZ, also was lost in transit. I CTZ and III CTZ have requisitioned replacements for their lost units.

2. (C) On 5 Jan 69 SA I CTZ requested the loan of one AGAVENCO from one of the other corps advisory groups (Incl 1). On 12 Jan 69 HQ MACV responded by requesting the SA II CTZ to transfer one AGAVENCO to the SA I CTZ (Incl 2). This decision was based on the need for a helicopter defoliation capability in I CTZ, and the fact that of the other corps, only II CTZ had two operational units. Due to a country-wide lack of spare parts, one of these units was operational only because of a locally fabricated replacement for a missing spray boom. This field expedient has worked satisfactorily. The apparatus is under the operational control of the DSA II CTZ who had further loaned it to the US 4th Inf Div. The field expedient spray boom was fabricated by the 4th Div and it is the intention of the DSA II CTZ to transfer the AGAVENCO without this boom since the 4th Div plans to use it again. SA IV CTZ has an extra field expedient boom which could be furnished to I CTZ to use with the AGAVENCO.

3. (C) On 22 Jan 69 the DSA I CTZ, who would ultimately have operational control over the transferred unit, refused the AGAVENCO offered by SA II CTZ, stating that it was unserviceable because of the missing spray boom, and requesting that the transfer be cancelled (Incl 3).

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MACJ3-09 4 February 1969
SUBJECT: AGAVENCO Helicopter Defoliation Apparatus (U)

4. (C) On 26 Jan SA I CTZ dispatched a message to MACV stating that the AGAVENCO was unserviceable and requested further assistance in obtaining a helicopter defoliation capability (Incl 4). In addition to the two AGAVENCO's due in to fill the DSA I CTZ requisition, 21 AGAVENCO's are now scheduled to be received by US Army units throughout RVN within the next 60 days. A portion of these will go to units operating in I CTZ; this will provide SA I CTZ a helicopter spray capability. In addition, the 101st Abn Div currently has an operational field expedient helicopter defoliation apparatus (not an AGAVENCO) which is available to SA I CTZ.

Harold C. Kinne, Jr.

4 Incl
as

HAROLD C. KINNE, JR.
Colonel, USA
C, Cml Opns Div

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS SEVENTH AIR FORCE (PACAF)
APO SAN FRANCISCO 96307

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REPLY TO ATTN OF: DPLR

5 MAY 1967

SUBJECT: Final Report of the Operational Evaluation of Project Pink Rose (U)

TO: See Distribution List

The enclosed report is the final 7th Air Force evaluation of Project Pink Rose conducted in Southeast Asia between October 1966 and April 1967, and is forwarded for your information.

FOR THE COMMANDER

a L Hilpert

A. L. HILPERT, Colonel, USAF
Deputy Chief of Staff/Plans

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FINAL REPORT

OPERATIONAL EVALUATION

OF

PROJECT PINK ROSE

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ACKNOWLEDGEMENTS

Project Pink Rose required extensive planning and coordination with many organizations between October 1966 and April 1967. Specific acknowledgement of the support, work and effort contributed by the many individuals associated with this program is impossible. Indicative of the professional functioning of a skillful team is the fact that at the designated time each of three targets was saturated with incendiary bomblets. In each case, all prestrike preparation was complete; all strike support was available as requested; and poststrike follow-up was accomplished according to plan.

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ABSTRACT

An operational evaluation known as Project Pink Rose was conducted in South Vietnam to determine the feasibility of clearing a typical Southeast Asia forest by use of fire. Three free strike target areas were treated with herbicides and a desiccant to induce drying. Ignition was accomplished by incendiary bomblets dropped from B-52 aircraft. A poststrike ground reconnaissance team evaluated each of the three strike areas. It was concluded that the technique of a planned forest fire using this specific method is ineffective as an operational method for clearing forest areas in South Vietnam.

1. Background:

a. History of Concept: In September 1965, CINCPAC recommended to the Joint Chiefs of Staff that an immediate requirement be established to develop a capability to destroy by fire large areas of forest and jungle growth in Southeast Asia. This request was approved by the Joint Chiefs of Staff and the Director of Defense Research and Engineering directed the Advanced Research Projects Agency (ARPA) to accomplish the required research tasks. The Forest Service, U. S. Department of Agriculture, was requested by ARPA to undertake this research task. A test operation, HOT TIP, was conducted at Chu Pong mountain near Pleiku on 11 March 1966. A fifteen plane B-52 strike dropped incendiaries on a defoliated area. Results were inconclusive but sufficient fire did develop to indicate that this technique might be operationally feasible.

b. Pink Rose: In May 1966, COMUSMACV was requested by CINCPAC to plan for a similar test, PINK ROSE, in early 1967. This operation was to be conducted in conjunction with existing planned defoliation programs. On 6 November 1966, three specific free strike target areas were selected - one in War Zone D and two in War Zone C. Each target box was a square seven kilometers on a side. The target areas chosen were heavily covered with two and three canopy forest.

2. Target Preparation: The three target areas designated in the Pink Rose Test Plan were defoliated on schedule by Ranch Hand aircraft of the 12th Air Commando Squadron according to the procedures specified by the Chemical Division, MACV-COC7. Coverage was complete and aerial reconnaissance indicated results were equal to or better than expectations. Those areas actually inspected by ground parties showed good drying throughout the forest. However, many areas lacked the desired fuel between the ground layer and the canopy crown necessary to carry the fire upward. Also, ground litter was relatively sparse. It should be emphasized that approximately 255 sorties and 255,000 gallons of herbicide/desiccant were expended. No operational problems were encountered during this phase.

3. Target Ignition: Target C was ignited between 14:10H and 14:46H on 18 January 1967; target A was ignited between 14:10H and 14:46H on 28 January 1967; and target B was ignited between 14:00H and 14:12H on 4 April 1967. The order and dates of strikes were changed to properly phase Pink Rose operations with concurrent ground operations. Thirty B-52 aircraft from the 3d Air Division on Guam were used on each of the first two strikes. On the third strike, the B-52 force

was reduced to fifteen aircraft and the target box was compressed to provide a density of incendiary bomblets three times greater than that used on the first two strikes. Coordination of Arc Light (B-52) strike requests between Seventh Air Force, MACV Combat Operations Center and 3d Air Division was excellent and was accomplished with no operational complications. All strike aircraft arrived on target as planned and were properly spaced and time-phased by MSQ-77 Combat Skyspot radar. MSQ-77 control was alternated between the Bien Hoa and the Dalat sites to provide minimum time-spacing between B-52 cells. Targets were adequately saturated by incendiary bomblets within the time interval requested.

4. Effectiveness of Burn:

a. Target C: Burn in this area was ineffective. The only free burning outside the immediate vicinity of the incendiary bomblets was in well-drained grass areas. Most fires did not spread farther than two feet from the ignition source. Intense smoke emanated from the target and topped out at approximately 5,000 feet. During subsequent visual observations of the target area from the air, it was difficult to determine that the area had ever been saturated with incendiaries.

b. Target A: Poststrike reconnaissance was limited to close-in aerial observations from helicopters. No landings were made as ground fire was encountered and the landing zones appeared to be booby-trapped. Open areas had burned well--approximately 75%. Under double canopy, fire spread only about six feet on either side of ignition source--3 to 5% of the area. Under single canopy, fire spread in ground litter for about fifteen feet--9 to 12% of the area. Crown canopy removal was negligible. Smoke was very intense and a strong convective column was established early and rose to 9,000 feet. Excluding the open burned-out areas, it was again difficult to note any canopy change during subsequent visual observation flights.

c. Target B: Bomblet spacing was very tight, varying from three feet between impacts to fifty feet. About 50% of the ground fires met each other; however, ground cover was very thin and fire did not carry upward. Fire spread in ground cover appeared to stop for no apparent reason. Upper canopy was dead and dry but unburned. Crew of infrared reconnaissance aircraft reported that a towering cumulus developed over target and that its estimated height was 50,000 feet. Many dead trees, both fallen and upright, burned but the overall effectiveness of burn was negligible.

5. Probable Causes of Ineffectiveness: This subject will be thoroughly analyzed by technical personnel assigned to the Forest Service, U. S. Department of Agriculture, and will be the subject of a technical report to be published by them. However, the following observations and the associated reasoning for the lack of effective burn are presented as possible causes:

a. Target C: Incendiaries were dropped at a time when target was covered by a thick, high overcast. Overcast clouds create stable air conditions which prevent effective radiation drying during the day. Also, the target area appeared to have a high natural moisture content.

b. Target A: Prestrike and strike weather criteria were tightened and six days of 3/8 or less cloud cover provided as nearly optimum conditions for burn as can reasonably be expected in Vietnam. This target was better than average in vertical fuel continuity and it had been effectively defoliated with visually satisfactory results. Incendiary spacing was adequate to produce reinforcing fires. From an operational viewpoint, failure to remove crown canopy can only be attributed to ineffectiveness of the Pink Rose technique. Possible causes could be: (1) moisture content in twigs and leaves is still too high; (2) even more dense incendiary spacing is required; and (3) insufficient fuel exists between ground and canopy crown to carry fire.

c. Target B: Density of bomblets was increased by a factor of three. Two additional months of maximum drying were provided. Timing between B-52 cells was reduced from four to three minutes to provide a more nearly simultaneous ignition. Reasons for the failure under these optimum conditions to achieve a crown fire will be left for explanation by the technical experts. Every known possibility from an operational capability was exploited to achieve a crown fire and every approach failed.

6. Support:

a. Defoliation: Target areas were properly prepared by Ranch Hand aircraft of the 12th Air Commando Squadron under the direction of the MACV Chemical Division, CCC7.

b. Strike Aircraft: Incendiary patterns and density were more than adequate and were accurately placed within the designated target boxes as scheduled when temperature was at a maximum and relative humidity was at a minimum. Coordination of Arc Light requests between 3d Air Division, the MACV Control Center and SACADVON was excellent. The coordination, command and control of these missions in-country was accomplished by 7th Air Force Tactical Air Control Center.

c. Weather: For the last two strikes, weather conditions were considered to be optimum. In retrospect, it can be logically deduced that the overcast, stable weather conditions was not a major factor in preventing effective burn in the first strike area. The support rendered by the 1st Weather Group and its associated squadrons and detachments was complete and timely.

d. Documentary Photography: Photography (color motion picture and color and black and white still) was accomplished professionally by the 600th Photographic Squadron when and where it was requested.

e. Technical Assistance: Highly qualified representatives from the OSD/ARPA Washington office and their Research and Development Field Unit-Vietnam provided invaluable technical assistance both during the planning phase and the operational phase. Each of the members of the field team from the Forest Service, U. S. Department of Agriculture, repeatedly demonstrated his expertise and provided invaluable assistance.

f. Reconnaissance: Crews and aircraft from the 460th Tactical Reconnaissance Wing provided complete and professional aerial reconnaissance. Black and white infrared photography, simultaneous color and camouflage detection photography, and infrared recordings were furnished as requested before, during and after each strike. All of this information was processed efficiently and delivered rapidly by the 13th Reconnaissance Technical Squadron.

g. Forward Air Controller Operations: Support provided through III DASC from Xuan Loc and Tay Ninh East based O-1 aircraft enabled documentary photographers to perform their mission.

h. Reentry Ground Reconnaissance: The 5th Special Forces Group provided outstanding support to the technical teams which entered the strike areas each day following the strikes. The B Team at Bien Hoa and the A Teams at Xom Cat and Trai Bi Special Forces Camps provided complete security in a highly professional manner for the technical teams. In addition, the A Team at Trai Bi provided facilities and security for Forest Service personnel gathering fuel samples in the field.

i. Airlift: The Army Concept Team in Vietnam provided a U-6A aircraft during Pink Rose I and II for transportation of combat photographers and technical personnel between Tan Son Nhut and remote Special Forces camps. This same support was provided by Army Aviation under MACV for Pink Rose III. This support was an invaluable aid in meeting tight schedules.

7. Operational Conclusions:

a. The Pink Rose technique is ineffective as a means of removing the forest crown canopy.

b. The Pink Rose technique is too restrictive for use as a normal operational tactic because:

(1) Target area must be chosen 2 - 3 months prior to strike.

(2) Target area must be prepared by expenditure of excessively large quantities of herbicide/desiccant and associated Ranch Hand sorties.

(3) Drying and ignition are restricted to a few months of the year and, even if effective, proper burn would be overly dependent upon actual local weather.

c. In terms of resources expended, results do not warrant further exploitation of this specific technique.

d. A similar technique may be useful in other applications such as:

(1) Small incendiary raids against dried grass areas similar to the A Shau valley.

(2) Small incendiary raids against areas of low, thick and dry vegetation.

(3) Small incendiary raids in mountainous areas that have been defoliated (DMZ).

e. This technique may be feasible and have an operational application at some other location -- one where conditions are less favorable than the California pine forests but more favorable than the Vietnam hardwood forests.

8. Recommendations:

a. Further testing of the Pink Rose technique in South Vietnam under the existing concept be terminated.

b. Research should be continued on a small scale to determine other geographical areas where this technique (without defoliation) might be successful.

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United States Army

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