Agent Orange Investigative Report Series, No. 3

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INVESTIGATIONS INTO THE ALLEGATIONS OF AGENT ORANGE IN THE CANAL ZONE AND PANAMA

Compensation Service

Department of Veterans Affairs

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31 December 2012

Mr. Michaels D. Pharr
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Compensation Service
Department of Veterans Affairs
810 Vermont Ave., NW
Washington, DC 20420

Dear Mr. Pharr,

Please find attached to this letter the Final Report on : **Investigation Into the Allegations of Agent Orange in the Canal Zone and Panama.** This report is the third of many reports that will be prepared in fulfillment of Contract VA-101-12-C-0006, *Development of an Archival Directory of Agent Orange Documents.* The goal of developing this directory is to search and identify the thousands of documents, reports, and correspondence located within our National Archives and Records Administration and other document repositories that relate to the use of "Tactical Herbicides" including Agent Orange, *outside of Vietnam.*

As in the case of the Canal Zone and Panama, the Compensation Service has not had a comprehensive search of the records that were dispersed to facilities across the United States. Thus, the Department of Veterans Affairs has been dependent on minimal documentation in determining the validity of the veterans' claims. Clearly, it is beneficial to all parties to have all the available records related to events involving possible exposure to Agent Orange.

This current report documents five allegations that were reported by US veterans stationed in the Canal Zone and Panama during the Vietnam Era. An extensive search of historical records of the United States Chemical Corps, United States Air Forces Special Aerial Spray Flight, and the Armed Forces Pest Management Board could not verify that Agent Orange had been shipped to, sprayed on, or buried in the Canal Zone or Panama.

Sincerely,

Alvin L. Young, PhD
Professor of Environmental Toxicology
Colonel, USAF (Retired)

DISCLAIMER FOR VA REPORTS

The conclusions reached in this report are based upon a comprehensive review of the historical records maintained in the publicly available files of the National Archives and Record Administration, and other archival repositories. However, the conclusions reached do not necessarily represent those of the Department of Veterans Affairs or any other Department or Agency of the United States Government.

This report is part of the Agent Orange Investigative Report Series, and should be considered as an amendable or living document. If additional authenticated documents or records are found that address the topic of this report, a re-evaluation of the conclusions may be necessary.

INVESTIGATIONS INTO THE ALLEGATIONS OF AGENT ORANGE IN THE CANAL ZONE AND PANAMA

EXECUTIVE SUMMARY

For more than 10 years there have been allegations about the testing, use, and burial of Agent Orange in the Panama Canal Zone. Recently, United States veterans who had been stationed in the Canal Zone during the years of the Vietnam War have filed claims with the Department of Veterans Affairs. These claims center on current health concerns they believe are the result of their exposure to the tactical herbicide Agent Orange more than 40 years ago. Accordingly, this investigation was initiated with the intent of examining the available historical records and scientific evidence to assist Compensation Service in making determinations of their claims.

The specific allegations related to Agent Orange in Panama and the Canal Zone included: **Allegation 1**. Agent Orange was extensively used in Panama and the Canal Zone from 1962 to 1975; **Allegation 2**. Agent Orange was shipped to Panama (100-200 drums) in 1968 to be evaluated for its effectiveness in jungle vegetation for use in the war in Vietnam; **Allegation 3**. The excess drums of Agent Orange remaining after tests and evaluations were completed, were left behind and used "casually" around various military installations in Panama for the control of weeds and shrubs; **Allegation 4**. US troops stationed in various locations in Panama observed the spraying of Agent Orange by aircraft, and many were involved in ground spraying of the herbicide in both military and civilian areas; and, **Allegation 5**. The Agent Orange drums and remaining residues were disposed of by burial.

The sources used in the search for documentation involving any possible use of Agent Orange in the Canal Zone and Panama included The Department of Army Chemical Corps Records from Fort Detrick, Maryland; The United States Armed Services Center for Unit Records Research, Springfield, Virginia; National Archives and Records Administration, College Park, Maryland; The Agent Orange Collection at the National Agricultural Library, Bethesda, Maryland; and, The Armed Forces Pest Management Board Literature Retrieval System, US Army Garrison - Forest Glen, Silver Spring, Maryland.

The findings of the investigations into each of the allegations were as follows:

1. **Allegation:** Agent Orange was extensively used in Panama and the Canal Zone from 1962 to 1975**. Findings**: Extensive reviews were conducted of Department of Defense directives on commercial use of herbicides maintained by the Armed Forces Pest Management Board, and of the records of the Army Chemical Corps on tactical herbicides. The conclusions of these reviews are that the allegations of the use of Agent Orange in Panama and Canal Zone from 1962 through 1975 are not based on any credible supporting documentation.
2. **Allegation**: Agent Orange was shipped to Panama (100-200 drums) in 1968 to be evaluated for its effectiveness in jungle vegetation for use in the war in Vietnam: **Findings**: An extensive search of historical records did not verify the testing and evaluation of Agent Orange in jungle areas of the Canal zone or Panama. The records did validate that US Army and US Air Force aircraft aerially-sprayed insecticides over jungle canopy in the Canal Zone during the period 1962 -1976.
3. **Allegation**: The excess drums of Agent Orange remaining after tests and evaluations were completed, were left behind and used "casually" around various military installations in Panama for the control of weeds and shrubs. **Findings**: An extensive search of historical records did not verify that surplus Agent Orange was used for weed and brush control in the Canal Zone. Records were found of the routine use of commercially available herbicides for unwanted vegetation control around military installations. The uses of these commercial herbicides were in accordance with the directives of the Armed Forces Pest Control Board.
4. **Allegation**: US troops stationed in various locations in Panama observed the spraying of Agent Orange by aircraft, and many were involved in ground spraying of the herbicide in both military and civilian areas. **Findings**: In the 1960s and 1970, tens of thousands of US troops (primarily Army) were stationed in the Canal Zone as part of either the US Army South Command (Fort Clayton) or while attending the US Army's Jungle Training Center at Fort Sherman. Some of the military personnel that were stationed at Fort Clayton undoubtedly participated in tests and evaluations programs/projects sponsored by the Tropic Test Center. For most troops stationed in the Canal

Zone, the exposure to indigenous diseases transmitted by insects and pathogenic microorganisms had a significant long-term impact on their health. Because of the prevalence and role of insects in the transmission of diseases, the Armed Forces Pest Control Board, in cooperation with the USDA, arranged and conducted tests and evaluations of insecticides in the Canal Zone. In addition, the various Military Medical Services coordinated the aerial and ground spraying of insecticides to control mosquitoes and other insect vectors that carried malaria, yellow fever, and leishmaniasis. The US Air Force Special Aerial Spray Flight used the UC-123 B for aerial spraying of insects in 1968 – 1976. Thus, those UC-123B aircraft observed spraying areas in the Canal Zone were on insecticide missions, NOT vegetation control missions with Agent Orange.

5. **Allegation**: The Agent Orange drums and remaining residues were disposed of by burial. **Findings**: Because the tactical herbicides were not registered nor marked with approved USDA labels, any remaining tactical herbicides had to be returned in drums to the Army Chemical Corps Laboratories at Fort Detrick, Maryland following the completion of field tests. Empty drums were not permitted to be left at the test sites. Therefore, there were no Agent Orange drums or any remaining Agent Orange residues buried in Panama or the Canal Zone.

The final conclusion of this investigation was that no credible documentation was found to support US veterans' claims that they were exposed to Agent Orange while stationed in Panama and the Canal Zone during the Vietnam Era. An extensive search of historical records could not verify that Agent Orange had ever been shipped to, sprayed on, or buried in Panama or the Canal Zone.

INTRODUCTION

For more than 10 years there have been allegations about the testing, use, and burial of Agent Orange in the Panama Canal Zone. Recently, United States veterans who had been stationed in the Canal Zone during the years of the Vietnam War have filed claims with the Department of Veterans Affairs. These claims center on current health concerns they believe are the result of their exposure to the tactical herbicide Agent Orange more than 40 years ago. Accordingly, this investigation was initiated with the intent of examining the available historical records and scientific evidence to assist Compensation Service in making determinations of their claims.

HISTORICAL BACKGROUND ON US INVOLVEMENT

During the time of the Vietnam War, the Panama Canal Zone was a leased territory under the control of the United States on the Isthmus of Panama. Ten major military installations (6 Army, 2 Navy/Marine and 2 Air Force) were located within the territory. The Canal Zone was comprised of an area extending five miles on either side of the Canal Channel and was approximately 50 miles long [1]. The coastal cities of Colon and Panama City were not within the Canal Zone. In 191l, the first permanently stationed American troops arrived in Panama to guard the construction of the canal. In 1962, the Tropic Test Center was established at Fort Clayton under the US Army Test and Evaluation Command. Prior to 1979, the annual US troop strength in Panama was 10,200, and it decreased thereafter to 4,300 until the transfer of the Panama Canal and property formerly held by the US military to the Panamanian government with the enactment of the 1977 Torrijos-Carter Treaty.[2].

In preparation for the eventual transfer of ownership, the Headquarters of the United States Army South Command (USARSO) at Fort Clayton (near the Pacific opening of the Canal) was moved in July 1999 to the United States Army Garrison Fort Buchanan, Puerto Rico [2]. On December 31, 1999, final actions were completed, and the United States transferred formal control of the canal and the various military bases surrounding it to the government of Panama. On the Atlantic side of the Isthmus, at Fort Sherman, the Jungle Operations Training Center graduated its final class in March 1999, and all remaining military units at Fort

Sherman and other Forts (e.g. Kobbe) were relocated outside of Panama. In nearly 90 years of US presence, tens of thousands of US troops were stationed around the Canal Zone [2]. Since 1999, there has been controversy related to the legacy of chemical residues and unexploded munitions that may have remained in the Canal Zone when the US military left.

ALLEGATIONS OF AGENT ORANGE TESTING AND USE

In August of 1999, *The Dallas Morning News* published a series of articles by Tod Robberson with the allegation that the US military had "conducted secret tests of Agent Orange and other toxic herbicides in Panama during the 1960s and '70s" exposing veterans and civilians [3]. The US military newspaper, *Stars and Stripes*, followed with an article in September of 1999 with the same accusation of testing and exposure [4]. The stories continued in 2003 with the printing of John Lindsay-Poland's book *Emperors in the Jungle*, and later in November 2006 with the publication of an article entitled, *Enforced Secrecy about the old Tropical Test Center* published in *The Panama News* [5, 6]. Both publications continued the idea that among chemicals tested by the US military in Panama was the tactical herbicide Agent Orange. Lindsay-Poland writes "shortly after…the [Tropical Test Center's] nerve-agent tests ends in 1968, the Army began to use another toxic agent in Panama: Agent Orange" [5]. *The Panama News* article described the test programs of the US Army Tropic Test Center (TTC) and noted "the defoliant Agent Orange…used during the Vietnam era [was] tested at TTC and Veterans assigned in Panama were sick because of toxic exposure at the facilities in the 60s and 70s" [6]. The source of the information was identified as an article in the journal *Mesoamerica* [7] that quoted the author of *Walking Away from Panama: the US Legacy in Panama* as stating "the United States had an active chemical weapons program from 1930 until at least 1969, with tests of poison gases including mustard gas, phosgene, sarin, VX agent, and Agent Orange…the program aimed to test chemical munitions under tropical conditions."

The specific allegations related to Agent Orange in Panama and the Canal Zone included:

- **Allegation 1**. Agent Orange was extensively used in Panama and the Canal Zone from 1962 to 1975;

- **Allegation 2**. Agent Orange was shipped to Panama (100-200 drums) in 1968 to be evaluated for its effectiveness in jungle vegetation for use in the war in Vietnam;
- **Allegation 3**. The excess drums of the Agent Orange remaining after tests and evaluations were completed, were left behind and used "casually" around various military installations in Panama for the control of weeds and shrubs;
- **Allegation 4**. US troops stationed in various locations in Panama observed the spraying of Agent Orange by aircraft, and many were involved in ground spraying of the herbicide in both military and civilian areas; and,
- **Allegation 5**. The Agent Orange drums and remaining residues were disposed of by burial.

SEARCH STRATEGY FOR DOCUMENTS

The following sources were used in the search for documentation involving any possible use of Agent Orange in the Canal Zone and Panama:

- The Department of Army's research on tactical herbicides was conducted primarily by the Army Chemical Corps' Plant Sciences Laboratory, Fort Detrick, Frederick, Maryland and its predecessors. A search of more than a thousand documents from the Army Chemical Corps stored at the National Archives and Record Administration (NARA) in College Park, Maryland was conducted ;
- The United States Armed Services Center for Unit Records Research (CURR), The Department of The Army, Springfield, Virginia was contacted with the assistance of the Deployment Health Support Directorate, Deputy Under Secretary of Defense (Installations and Environment), Department of Defense, Washington, DC. CURR provided numerous leads on important documents;
- The publically available files at NARA that were specifically reviewed were the Air Force Judge Advocate Agent Orange Records from 1961 – 1983;
- The Agent Orange Collection at the National Agricultural Library, Bethesda, Maryland is a collection that contains a large number of reports prepared by the US Army Chemical Corps, the 7th Air Force, and the Air Force

Logistics Command on the tests and evaluation of the tactical herbicides, their potential use outside of Vietnam, and the environmental fate, and disposition, including storage and disposal of Agent Orange;

- The Armed Forces Pest Management Board Literature Retrieval System (AFPMB-LRS), US Army Garrison - Forest Glen, Silver Spring, Maryland was carefully searched. This collection of over 130,000 documents in searchable PDF formats contains trip reports involving the pest control programs of all US military installations worldwide beginning in late 1950s through 2011. These reports document pest problems, operations concerning the use of AFPMB-approved pesticides (including herbicides), and reports of storage, approved methods for application of herbicides, and for the disposal of excess or surplus pesticides;

FINDINGS ON ALLEGATION 1: THE USE OF AGENT ORANGE IN PANAMA/CANAL ZONE 1962 – 1975

This allegation presumes that Agent Orange was used as if it were a commercial product. Furthermore, it presumes that all United States military units had access to its use to control unwanted vegetation on military installations within the Canal Zone. Neither of these presumptions is true. Although Agent Orange consisted of the two commercial herbicides, 2,4-D and 2,4,5-T, it was formulated as a "tactical herbicide" and thus, there were technical (e.g., formulation and concentrations), administrative, and legal differences between tactical and commercial herbicides used by the Department of Defense.

Commercial Herbicides: Under the Directives 5154.12 and 4150.7, the Department of Defense established the Armed Forces Pest Control Board (AFPCB), subsequently the Armed Forces Pest Management Board (AFPMB) with the authority to set pest management policy "***applicable for all Department of Defense pest management activities in any unit, at any time, in any place, even when conducted by contract operations.***" In August 1961, the Department of Defense, via a Memorandum of Understanding, established a support program with the United States Department of Agriculture (USDA) that, among other responsibilities, provided the research, recommendations, and specifications of commercial pesticides that were suitable and met the need for Department of Defense use. The significance of these Directives and Memorandum is that any

commercial herbicides used after 1961 on the Department's more than 600 installations must have been approved by the Board, must have met USDA's regulatory requirements (now the US Environmental Protection Agency, EPA), and must have been in full compliance with all the requirements of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) [8, 9].

The AFPCB adopted the policy for the Department of Defense to recommend that any pesticide formulation that had uses in civilian agencies be issued as a "Federal Specification" [10]. These types of pesticides were to be issued by the General Services Administration. Thus, all DoD agencies (including use on Air Force, Army, Navy, and Marine Corps installations) used pesticide formulations that had "Federal Specifications", with the labeling and use directions approved by the Pesticides Regulation Branch of USDA (now EPA).

With the establishment and functioning of the AFPCB, anytime a DoD Military Base, e.g., Fort Clayton, Fort Sherman, Fort Kobbe, etc, requested the use of a herbicide to control plant pests, the selection of that herbicide must have been approved by the Board. Locally purchased pesticides were to be approved by the Command Entomologist. Moreover, the application of the herbicide had to be done by a Board "certified" (trained) applicator, and with equipment that had been approved by the USDA, and under the supervision of the Base or Facilities Civil Engineer. The Department of Agriculture's Agricultural Research Service (ARS) and the Cooperative State Research Service (CSRS) provided critical support in the development of pesticides that were subsequently recommended and approved for use by the AFPCB [11, 12].

The Armed Forces Pesticide Control Board DID NOT work with the chemical companies manufacturing pesticides, rather, these materials were evaluated by ARS, the various State University Experiment Stations, and the State and Federal Extension Services. In addition, AFPCB depended upon CSRS and its University-based research and extension system to prepare and publish manuals on pesticide use, plans for certification of pesticide applicators, and the disposal of old pesticides and pesticide containers. The final statements on safety and environmental precautions on the use of herbicides commercially available to the military were determined by the agencies of the Public Health Service, and when necessary, by the United States Army Environmental Hygiene Agency [13, 14].

Tactical Herbicides: The first tactical herbicides were designed to be used for control of vegetation in active combat military environments, and were developed by the Army Chemical Corps at Fort Detrick, Frederick, Maryland. These herbicides were formulated and tested by the Army Chemical Corps. Since tactical herbicides were designed specifically for military use, they did not require regulatory approval, nor did they meet the requirements of FIFRA [9, 15]. The Agent Orange formulation was based upon "Military Specifications", and was purchased directly by the Defense Supply Agency for specific use in Vietnam [10, 15]. The only "label or descriptor information" was stenciled on the lid of the 55-gallon drum, and the presence of the colored ring around the center of the drum. The Base or Facilities Civil Engineer could purchase commercial herbicides but could not purchase tactical herbicides. The acquisition and transport of a tactical herbicide required authorization from the Army Chemical Corps, or in the case of Vietnam, by the Air Force Logistics Command. Only personnel trained within of the Army Chemical Corps (or Air Force RANCH HAND personnel in Vietnam) were authorized to spray Agent Orange [15, 16].

Conclusion: Extensive reviews were conducted of Department of Defense directives on commercial use of herbicides maintained by the Armed Forces Pest Management Board, and of the records of the Army Chemical Corps on tactical herbicide. The conclusions of these reviews are that the allegations of the use of Agent Orange in Panama and Canal Zone from 1962 through 1975 are not based on any credible supporting documentation.

FINDINGS ON ALLEGATION 2: AGENT ORANGE USED IN 1968 FOR JUNGLE TESTS AND EVALUATIONS

In early 1961, the US military initiated Project AGILE, a project designed to provide technical information on the chemical means of controlling vegetation that could be applied to military operations in South Vietnam. The tactical problem to which research was directed was the development of chemicals that could rapidly control a broad range of botanical species. The Department of the Army's Plant Sciences Laboratories at Fort Detrick was given the responsibility to determine the technical feasibility of defoliating jungle vegetation in South Vietnam [16, 17, 18].

The initial development of tactical herbicides began near the close of World War II and, as was previously noted, the responsibility of the US Army Chemical Corps at Fort Detrick [16]. This testing and development continued through the Korean War and prior to the Vietnam War, and involved tests at many US Military Installations, including Bushnell Army Air Field, Florida; Eglin Air Force Base, Florida; Fort Detrick, Maryland; Fort Ritchie, Maryland; Dugway, Utah; and Fort Drum, New York [15, 18, 19]. Recognizing the continuing mission in Vietnam for tactical herbicides, the Plant Sciences Laboratories maintained an active program of testing and evaluating chemicals for potential use in Vietnam. "Defoliation Conferences" were held in 1963, 1964, and 1965 and were sponsored by US Army Chemical Corps at Fort Detrick [20, 21, 22].

The personnel of the Plant Sciences Laboratories simultaneously conducted field tests in Puerto Rico, and at military installations in Thailand and New Brunswick, Canada. Small isolated tests were also conducted at military or government installations in the States of Alabama, Arkansas, Florida, Georgia, Hawaii, Maryland, and Texas [15, 18]. With the exception of Texas and Puerto Rico, the responsibility for the testing protocol and spray operations resided solely with US Army Chemical Corps' Plant Science Laboratories and US Air Force personnel [15, 18, 20, 21, 22, 23]. The USDA had no regulatory authority over the selection or use of herbicide formulations developed by the Department of the Army. The extensive documentation of the US Army Chemical Corps evaluations of proposed tactical herbicides did not identify a single site for such tests in Panama or the Canal Zone. The publication in 2006 "*The History of the US Department of Defense Programs to the Testing, Evaluation, and Storage of Tactical Herbicides*", by the Department of Defense did not list Panama or the Canal Zone as locations for the testing and evaluation of tactical herbicides [15].

Indeed, a review of the "*History of Chemical Weapons Programs in Panama*" made no mention of the testing of commercial or tactical herbicides or the evaluation of such herbicides for the US Army's Chemical Corps or the Armed Forces Pest Control Board [24]. Examination of the more than 500 documents in the Special Collection on Agent Orange at the National Agricultural Library, Beltsville, Maryland and the Armed Forces Pest Management Board Literature Retrieval System did NOT identify any references to the testing of tactical herbicides in Panama.

Although there were no records on herbicides being tested in jungle areas of the Canal Zone, there were records on the aerial spraying of insecticides in such environments. In 1962, the Post Engineering Section, US Army Caribbean, fabricated an L-19 aircraft for the aerial spraying of DDT, malathion, and dibrom on dense vegetation in the Jojingo Swamp and Pina Beach areas near Fort Sherman [24]. In 1969, a US Air Force C-47 aerially-sprayed ultralow volume malathion and fenthion in a large area near the Southeast border of the Canal Zone 12 miles from the city of Gamboa [25]. In 1968 and again in 1973, a UC-123B was deployed to the Canal Zone to aerially-spray malathion over major mosquito breeding areas [26, 27]. Lastly, in 1976, the Air Force Special Aerial Spray Flight deployed three UC-123K aircraft to Panama and the Canal Zone to spray more than 400,000 acres of land and wetlands in the Canal Zone [28]. [Note: C-123K, tail number 54-663 was preserved at Howard AFB, Canal Zone and later moved prior 1999 to the Costa Verde Hotel, San Jose, Costa Rica.]

Conclusion: An extensive search of historical records of the United States Army Chemical Corps, including the records of tactical herbicide development at Fort Detrick, records of the Agent Orange collection at the National Agricultural Library, and records of the Armed Forces Pest Management Board did not verify the testing and evaluation of Agent Orange in jungle areas of the Canal zone or Panama. The records did validate that US Army and US Air Force aircraft aerially-sprayed insecticides over jungle canopy in the Canal Zone during the period 1962 -1976.

FINDINGS ON ALLEGATION 3: EXCESS DRUMS OF AGENT ORANGE WERE USED IN WEED AND BRUSH CONTROL PROGRAMS

Because of Directives 5154.12 and 4150.7, the Department of Defense gave the AFPCB the authority to set pest management policy. Generally, it was the recommended policy that the most desirable method of disposing of surplus herbicide was to use it in accordance with its intended use and as approved on the "registration" label. However, cautions as listed on the registered label had to be carefully observed. Beyond this, consideration could be given to the donation of such surplus materials to other eligible agencies, or sale to the general public [29, 30]. However, in the case of Agent Orange being a tactical herbicide, administrative and legal restrictions (as it was not a registered herbicide) were

placed upon its formulation preventing it from being used by the Base or Facilities Civil Engineering organizations. This meant that Agent Orange or any tactical herbicide could not be sprayed in Panama or the Canal Zone by base personnel or their contractors at US Military Installations; nor could they be disposed of in a routine manner. The administrative and legal requirements for a tactical herbicide required that any surplus be returned directly to the Army Chemical Corps [15].

Although no records were found to validate the allegation that surplus Agent Orange was sprayed in the Canal Zone, records were found that documented the routine use of commercial herbicides for the control of unwanted vegetation [31]. This routine use was in accordance with the oversight of the Armed Forces Pest Control Board [8, 9].

Conclusion: An extensive search of historical records of the United States Army Chemical Corps, records of the Agent Orange collection at the National Agricultural Library, and records of the Armed Forces Pest Management Board did not verify that surplus Agent Orange was used for weed and brush control in the Canal Zone. Records were found of the routine use of commercially available herbicides for unwanted vegetation control around military installations. The uses of these commercial herbicides were in accordance with the directives of the Armed Forces Pest Control Board.

FINDINGS ON ALLEGATION 4: US TROOPS OBSERVED THE SPRAYING OF AGENT ORANGE

The US Army, in cooperation with military units from Canada and Australia, began tropical environmental testing in the Panama Canal Zone during World War II. Subsequently the US Army assigned more than 300 people to that mission during the Vietnam War [2]. From January 1962 through December 1968, various chemical weapons test programs were conducted in the Canal Zone at the Tropic Test Center (TTC) at Fort Clayton under the direction of the Army's Chemical Corps' Dugway Proving Ground, Utah [2]. In the 1980s, the Tropic Test Center conducted tests on protective equipment and defensive exercises [2]. None of these references provide evidence that Agent Orange was ever used in Panama or the Canal Zone. However, the control of insect-borne diseases required access to a

variety of control measures, including the treatment of large areas of lands adjacent to military populations.

Frequent and severe epidemics of leptospirosis, leishmaniasis, histoplasmosis, and amebiasis occurred in 1961 through 1969 among US troops [24, 32, 33, 34, 35]. A severe outbreak of dermatophyosis was found in 80% of US troops participating in 1962 Operation SWAMP FOX II [36]. The same men were suffering from “eye gnat”, caused by pathogenic *Staphylococci* [37]. Several outbreaks of hookworm infection and strongyloidiasis occurred in 1976 among US Forces training at the Jungle Operations Training Center at Fort Sherman [31]. Malaria and Yellow Fever were frequently diagnosed [1, 38]. All of these diseases may have had significant impact on the long-term health and welfare of the veterans diagnosed and treated.

Accordingly, Panama, and specifically Fort Sherman and Fort Clayton were locations where the Agricultural Research Service of the US Department of Agriculture (USDA), in cooperation with the Armed Forces Pest Control Board, conducted tests and evaluations on insecticides [24, 36]. In addition, the Army Medical Service, the Naval Medical Service, the Air Force Biomedical Science Corps, and the Public Health Service provided medical expertise in dealing with the numerous pathogenic diseases that were transmitted by insects or soil microorganisms to US Army troops stationed in the Panama Canal Zone [33, 34, 35].

To ensure that military installations were identifying and controlling pests detrimental to military personnel, property, projects, and programs, the AFPCB had a cadre of military and civilian personnel via supporting Agencies and Laboratories (e.g., the Epidemiology Division of the School of Aerospace, Brooks AFB, Texas; USAF Occupational and Environmental Health Laboratory, Kelly AFB, Texas; the United States Army Environmental Hygiene Agency, Aberdeen, Maryland; and, the Public Health Service) that routinely conducted pest surveys, staff visits, training programs, and special conferences on identifying and controlling pests. Reports of these surveys, visits, programs, and conferences were published by the AFPCB and widely circulated to other military installations [13, 14, 15].

As previously noted, the US Military frequently sent Survey Teams to the Canal Zone to assess the need for aerial and ground treatment of insect populations. In 1960, a survey was conducted of mosquito populations as a result of an outbreak of malaria [24]. The result of the survey was extensive insecticide treatment using truck mounted spray equipment [24]. In 1967, an Air Force C-47 sprayed a significant portion of the Canal Zone with ultralow volume aerial applications of malathion and fenthion for the control of the Anopheline mosquito [25]. In April 1968, the Special Aerial Spray Flight from Langley Air Force Base, Virginia, aerially applied 13,000 pounds of insecticide using a UC-123B aircraft (similar to those used at that time in Vietnam to apply defoliants). The operation occurred adjacent to Fort Kobbe [26] for the control of sand flies.

In March 1976, the Epidemiology Division of the USAF School of Aerospace Medicine conducted an aerial spray validation report on the need for the aerial dispersal of insecticides to control outbreaks of malaria and yellow fever [15]. Following publication of its report, the Special Aerial Spray Flight located at Rickenbacker Air National Guard Base, Ohio, dispatched three UC-123K aircraft to the Canal Zone and treated approximately 241,000 acres of land (58% of land area of the Canal Zone) and 174,000 acres of shore/shallow "wetlands" areas of water (42% of the wetland areas of the Canal Zone) [28].

Conclusions: In the 1960s and 1970, tens of thousands of US troops (primarily Army) were stationed in the Canal Zone as part of either the US Army South Command (Fort Clayton) or while attending the US Army's Jungle Training Center at Fort Sherman. Some of the military personnel that were stationed at Fort Clayton undoubtedly participated in tests and evaluations programs/projects sponsored by the Tropic Test Center. For most troops stationed in the Canal Zone, the exposure to indigenous diseases transmitted by insects and pathogenic microorganisms had a significant long-term impact on their health. Because of the prevalence and role of insects in the transmission of diseases, the Armed Forces Pest Control Board, in cooperation with the USDA, arranged and conducted tests and evaluations of insecticides in the Canal Zone. In addition, the various Military Medical Services coordinated the aerial and ground spraying of insecticides to control mosquitoes and other insect vectors that carried malaria, yellow fever, and leishmaniasis. The US Air Force Special Aerial Spray Flight used the UC-123 B for aerial spraying of insects in 1968 – 1976. Thus, those UC-123B aircraft

observed spraying areas in the Canal Zone were on insecticide missions, NOT vegetation control missions with Agent Orange.

FINDINGS ON ALLEGATION 5: AGENT ORANGE DRUMS AND REMAING RESIDUES WERE BURIED IN PANAMA/CANAL ZONE

Because the tactical herbicides were not registered nor marked with approved USDA labels, any remaining tactical herbicides following the completion of field tests had to be returned in their drums to the Army Chemical Corps Laboratories at Fort Detrick, Maryland. Empty drums were not permitted to be left at the test sites [15]. However, as previously noted, the allegation that 100 -200 drums of Agent Orange were sent to Panama and the Canal Zone for tests and evaluation is not substantiated. There are no records to show that any Agent Orange was requested by the Army Chemical Corps for tests in Panama; there are no records to show that any Agent Orange was commercially shipped or transported by the Department of Army to Panama; and, there were no reports or other documents found describing the results of tests and evaluations.

Conclusion: There were no Agent Orange drums or any remaining Agent Orange residues buried in Panama or the Canal Zone.

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