Scientific Research Publishing

Open Journal of Soil Science, 2023, 13, 233-261
https://www.scirp.org/journal/ojss
ISSN Online: 2162-5379
ISSN Print: 2162-5360

Use of Agent Purple, Agent Orange and Agent Blue on Royal Thai Air Force Base Perimeters in Thailand during the Vietnam War

Kenneth R. Olson[1*], Larry Cihacek[2#]

[1]College of Agricultural, Consumer, and Environmental Sciences, University of Illinois, Urbana, Illinois, USA
[2]School of Natural Resource Sciences, North Dakota State University, Fargo, North Dakota, USA
Email: krolson@illinois.edu

How to cite this paper: Olson, K.R. and Cihacek, L. (2023) Use of Agent Purple, Agent Orange and Agent Blue on Royal Thai Air Force Base Perimeters in Thailand during the Vietnam War. *Open Journal of Soil Science*, **13**, 233-261.
https://doi.org/10.4236/ojss.2023.135010

Received: April 22, 2023
Accepted: May 15, 2023
Published: May 18, 2023

Abstract

Seven Royal Thai Air Force bases in Thailand were used by the United States Air Force (USAF) during the Vietnam War as staging hubs for operations in Laos and Cambodia. Five bases in Thailand, including Nakhon Phanom (NKP), Ubon, Korat, U-Tapao and Udorn endured sniper fire interdiction, perimeter penetration, and sapper (combat engineer) attacks. Nam Phong, an eighth Royal Thai Air Force base was used by the United States Marine Corps air operations starting in 1972. US Military personnel stationed throughout Thailand were also attacked by Communists insurgents. Two herbicides, Agent Purple and Agent Orange containing 2, 4, 5-T contaminated with dioxin (TCDD—2, 3, 7, 8 tetrachlorodibenzodioxin) and a third herbicide, the arsenic-based Agent Blue, were routinely received at these Thailand airbases in support of air missions and to keep airbases and perimeter fences clear of vegetation. Udorn Royal Thai Air Force (RTAF) base, established in the 1950s was consistently a target of enemy attacks during this period. The Thai government allowed the United States to use five bases, covertly, and two other Thai bases, openly, due to concerns that the civil war inside Laos might spread into Thailand. The US Air Force began, in 1961, to provide the air defense of Thailand and to fly reconnaissance flights over Laos. Under the United States and Thailand's "gentleman's agreement", the bases used by the USAF were considered RTAF bases under the command of Thai officers. The USAF at Udorn was under the command of the United States Pacific Air Forces (PACAF) Thirteenth Air Force and was used to temporarily store and distribute Agent Purple, Agent Orange and Agent Blue to Laos's airfields for spraying of the Ho Chi Minh Trail. Thai air police controlled access to the bases using sentry dogs, observation towers, and machine gun emplacements.

*Kenneth R. Olson is a US Army Vietnam Era veteran and professor emeritus of soil science.
#Larry Cihacek is US Army veteran and professor of soil science.

The USAF Security police assisted the Thai air police in base defense. In this study, we document the use of Agent Orange, Agent Purple and Agent Blue on Royal Thai Air Force base perimeters and grounds during the Vietnam War, potential active-duty service personnel exposure to these toxic herbicides and health impacts of the contaminant dioxin TCDD and arsenic on U.S. Vietnam Era Veterans and Vietnam Veterans. This documentation is important evidence in the "assumption of exposure" for health claims to the US Veterans Administration (VA) by veterans that served in Thailand between 1962 and 1976.

Keywords

Agent Blue, Agent Orange, Agent Purple, Thailand, Dioxin, Arsenic

1. Introduction

1.1. Royal Thai Air Force Bases in Thailand and Used during the CIA's Secret War in Laos

From 1961 to 1975, the Thai government allowed the United States Air Force (USAF) to deploy combat aircraft at seven (five covertly) major Royal Thai Air Force (RTAF) bases [1] [2] [3] (**Figure 1**). Missions were flown mainly out of the Don Muang, Korat, Nakhon Phanom, Takhli, Ubon, Udorn and U-Tapao bases [1] [2]. An eighth Royal Thai Air Force base, Nam Phong base in Khon Kaen Province, was used by the United States Marine Corps Air Operations starting in 1972.

Under the direction of US President Dwight Eisenhower, Southeast Asia Treaty Organization (SEATO) was created in September 1954 for collective defense of Thailand and containing communist aggression in Southeast Asia [2] [3]. SEATO headquarters were in Bangkok and the membership included Bangladesh, Australia, France, New Zealand, Philippines, United Kingdom Pakistan, and the United States. The alliance was formally dissolved in June 1977.

The Bangkok Post broke a story on March 10, 1967, that US warplanes were using Thai Royal Air Force bases to launch bombing raids on North Vietnam (**Figure 2**). With some difficulty the US officials kept this a secret. Approximately 35,000 US military personnel were stationed in Thailand [4] [5] where about 75% of America's aerial bombardment of Vietnam was staged.

The Bangkok Post reported on January 22, 1968, that US planes were bombing portions of the Ho Chi Minh Trail in Laos after lifting off from bases in Thailand [3] [4]. Field Marshal Thanom Kittikachorn, the Thai Prime Minister (PM), was quoted as saying "*The raids were for the defense of our country*". It was the first official admission, that the US Air Force and CIA were spraying and bombing Laos using Thai bases.

The PM also said that "*US-supplied Hawk missiles had arrived to form part of the defense of Bangkok against air raids launched from communist-infested*

areas by communist planes". The Thai government believed Pathet Lao-backed hill tribes were infiltrating the country in preparation for the communist takeover of Thailand [4] [5]. The fear that the country would be over-run by communists was widespread in the general population, and many people thought US air power was the only way to stop Pathet Lao-backed hill tribes from taking over Thailand. This goes a long way toward explaining why the Thai government was willing to allow the US to use Thai soil for military operations against Laos, North Vietnam and Cambodia.

Making the situation even more worrisome and complicated, from 1965 the Thai government was fighting a guerrilla war with insurgents primarily belonging to the Communist Party of Thailand (CPT). The CPT was active in northeastern, northern and later in southern Thai provinces. American forces were not involved in fighting against the CPT. In April 1980, after Prime Minister

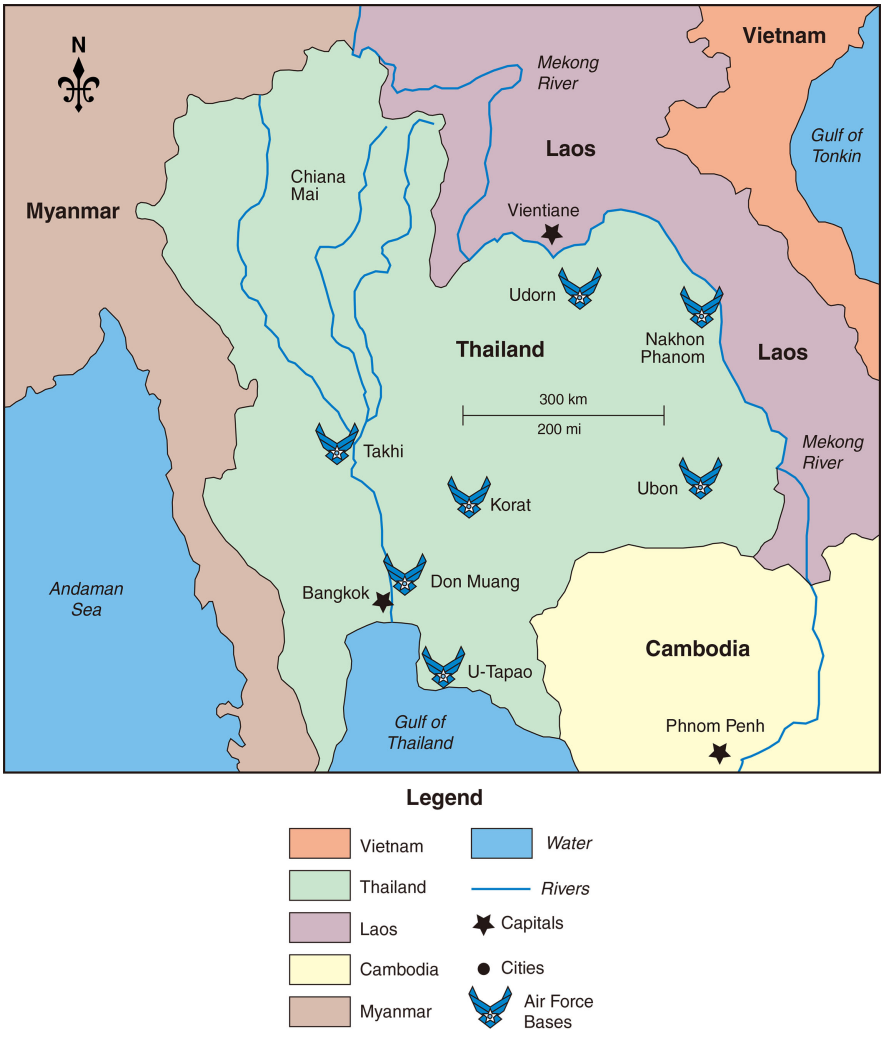

Figure 1. The location of seven of the eight Thai Royal airbases in Thailand that were used by the US Air Force. Tactical herbicides with dioxin-TCDD and arsenic were shipped to, handled, and temporarily stored at these airbases. Map by Mic Greenberg. Reprinted with permission from Editor of Open Journal of Soil Science.

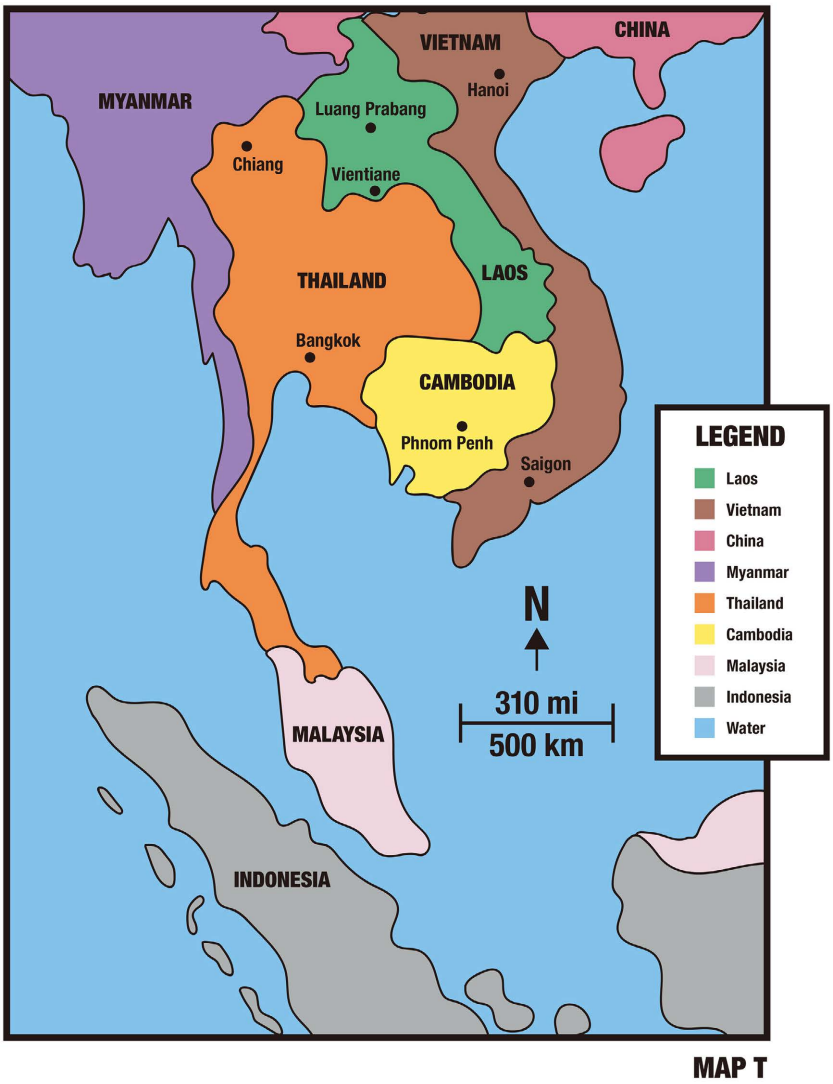

Figure 2. Thailand location in SE Asia. Map by Cruz Dragosavac.

General Prem Tinsulanonda signed a declaration of amnesty the insurgency declined and ended in 1983 [4] [5]. President Nixon and Henry Kissinger tried to prohibit the press from observing the secret CIA's war on the Ho Chi Minh Trail in Laos and Cambodia by denying media access outside South Vietnam [6]. Unsympathetic journalists were not permitted to interview American pilots and were kept off RTAF bases.

1.2. Rules of Engagement for Thailand Were Similar to Vietnam

Both Thailand and Vietnam were communist force engagement zones for deployment of US military personnel. Both countries had similar Rules of Engagement by the US and Allied Forces [2]. Most of the Air Force bases in Thailand were staging hubs for operations within Laos (the Secret CIA War) and Vietnam. US military personnel located throughout Thailand were also subjected to hostile attacks from Communists insurgents (**Figure 3**).

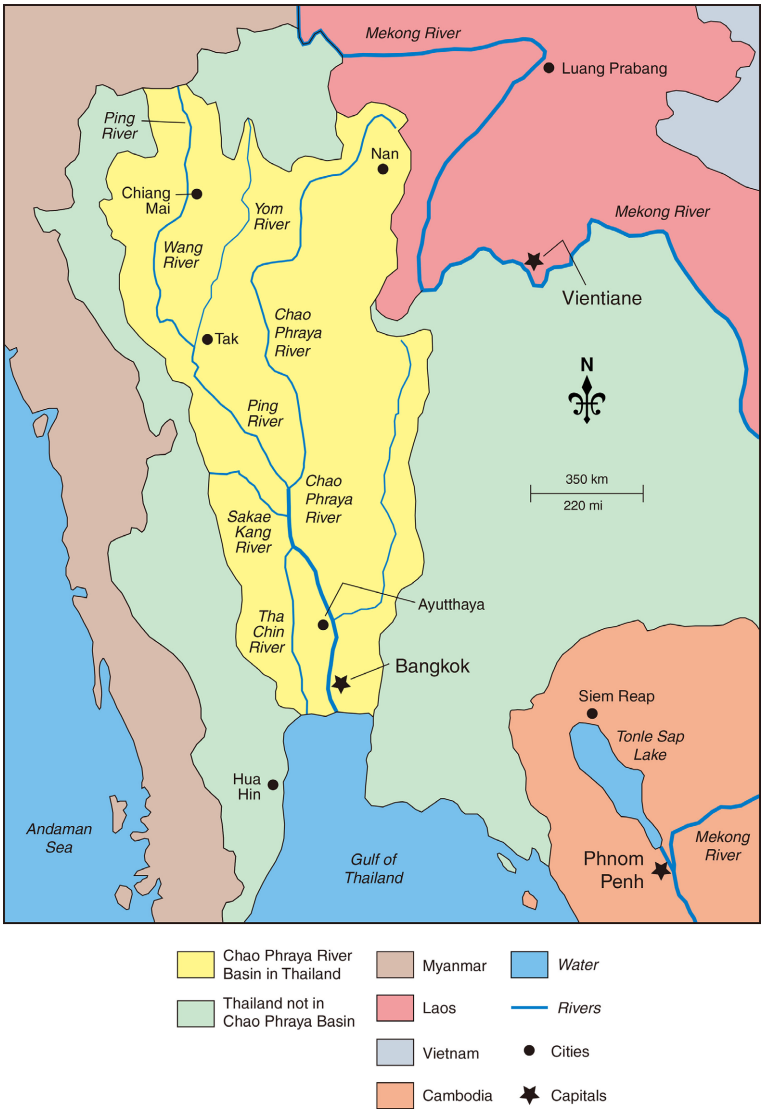

Figure 3. Thailand rivers map. Map by Mic Greenberg. Reprinted with the permission of the editor of the Open Journal of Soil Science.

Since 1962, the CIA had been secretly spraying tactical herbicides on the Ho Chi Minh Trail in Laos (**Figure 4**). Eventually the People's Republic of Vietnam (PAVN) military figured out that the aircraft, being used to spray Agent Purple (starting in 1962), Agent Blue (starting in 1962), and Agent Orange (starting in 1965), were flying out of Udorn Air Force Base in Thailand (**Figure 5**). This base was located only 80 kilometers south of Vientiane (Laos) and the international boundary the Mekong River. This was an attempt by the PAVN to stop the years of spraying of the Ho Chi Minh Trail with tactical 2, 4, 5-T herbicides contaminated with dioxin TCDD and the arsenic-based Agent Blue herbicide. The spraying was being used to eliminate the food supply adjacent to the Ho Chi Minh Trail, reduce the vegetative cover in an attempt to expose the enemy, and to enable bombing of the exposed PAVN soldiers using the Ho Chi Minh Trail to infiltrate South Vietnam [7].

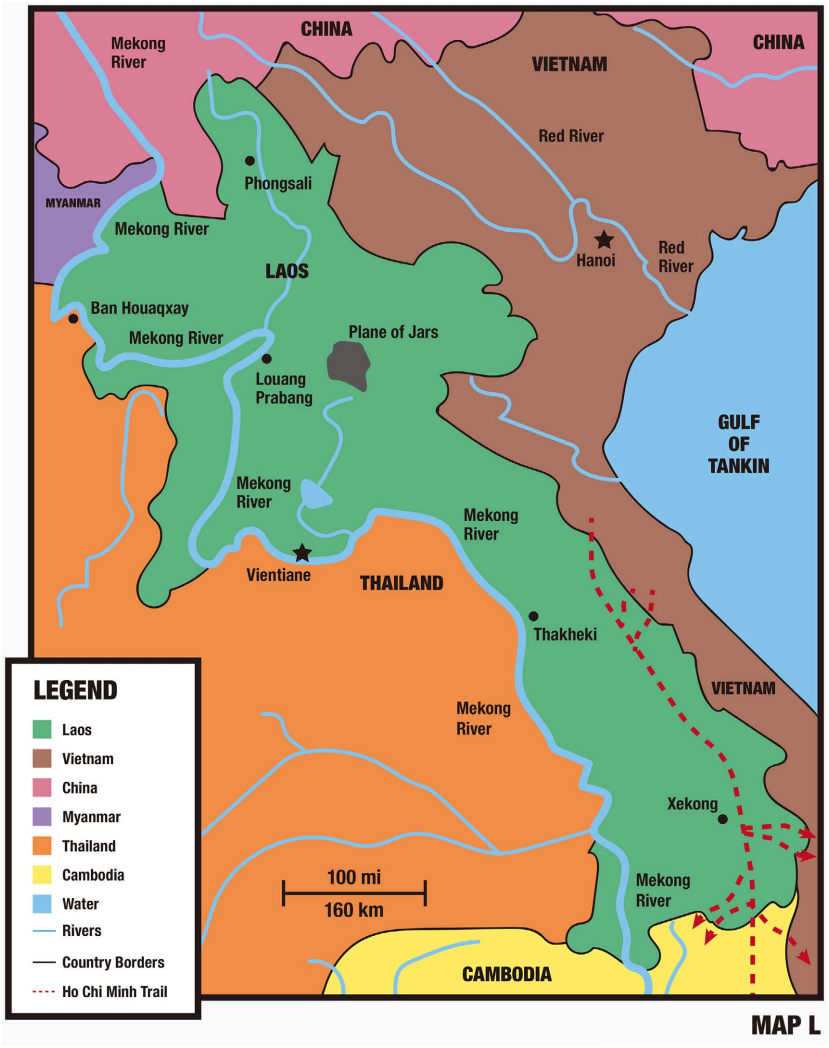

Figure 4. Laos map with Ho Chi Minh Trails in southern Laos. Map by Cruz Dragosavac.

Figure 5. Udorn Royal Thai Air Force base.

In Thailand, there were an estimated 15,500 Communist sympathizers and insurgents. From 1965 to mid-1968, insurgents conducted 1087 armed encounters and 331 assassinations [2] [3]. From 1965 to 1968, 5727 Communist insurgents in Thailand were killed, surrendered or arrested. Bases in Thailand (**Figure 1**), including Nakhon Phanom (NKP), Ubon, Udorn, Korat and U-Tapao, were subjected to sniper fire, perimeter penetration, and sapper (combat engineer) attacks. These attacks resulted in U.S., its allies and enemy causalities. The Department of Defense (DOD) had legitimate concerns about the threat to U.S., Thai personnel and equipment, which led to the decision to use herbicides outside and within base perimeters to remove vegetation as a means of preventing ambushes in Thailand [3]. In the 1968 Contemporary Historical Examination of Current Operation (CHECO) Project Southeast Asia Report: Attack on Udorn, the Air Force recognized that Thailand was a "prime target of Communist expansion, and the interest of the Communists was intensified by the USAF presence" [7].

The similarities between base defense in Vietnam and Thailand were highlighted in the 1969 CHECO Report [6] titled "7AF Local Base Defense Operations: July 1965 - December 1968". This report provides a general analysis of Air Force base operations [4] [5]. The report recognizes the heightened risk of attacks directed against air bases because they presented the enemy with a "concentration of lucrative targets". (*These Thailand Royal Air Force bases were also a source of the tactical herbicides being sprayed on the Ho Chi Minh Trail*). Additionally, the report states: "*Thailand is going through the same type of growing pains experienced in the Republic of Vietnam* (*RVN*), *but the knowledge and experience gained in the development of air base defense in RVN permit a more rapid evolution in Thailand*". Thus, similar tactics and procedures in base defense were used in both Thailand and Vietnam because the bases were facing similar threats [1] [2] [3].

The Rules of Engagement (ROE) provided authorization and limits for the employment of herbicides (**Figure 6**) throughout the Southeast Asian conflict. Military Assistance Command, Vietnam (MACV) Directive 525-1 (1966) highlighted the procedure for requesting power spray, aerial spray, and hand spray in Vietnam. The directive empowered the Commander U.S. Military Assistance Command, Vietnam (COMUSMAV), and the U.S. Vietnam Ambassador to authorize herbicide operations. The directive delegated authority to approve defoliation requests using ground-based power spray and hand spray methods [1] [2] [3]. The directive highlights U.S. assistance to local government in requesting, supplying, and planning defoliation operations.

The primary objectives of this study are to document the use of two herbicides, Agent Purple and Agent Orange which contain 2, 4, 5-T contaminated with dioxin (2, 3, 7, 8 tetrachlorodibenzodioxin) and the arsenic-based herbicide Agent Blue. All three herbicides were used on Royal Thai Air Force base perimeters during the Vietnam War and to assess potential exposure of U.S. Vietnam Era Veterans serving in Thailand to arsenic and the herbicide contaminant

Figure 6. Six tactical herbicides identified in a chart with appropriate color striped barrels. The amount of Agent Blue listed as sprayed does not include years 1962 to 1965. Reprinted with the permission of the editor of the Open Journal of Soil Science.

dioxin (TCDD) while managing vegetation on fence perimeters and around base structures while living and working on the Royal Thai Air Force bases.

2. Findings

2.1. Thailand's Strong Connection to US Air Force Operation Ranch Hand Resulted in a Steady Supply of Tactical and Commercial Herbicides

The Rules of Engagement in Vietnam and Thailand were similar due to Operation Ranch Hand activities in both countries. Throughout the Vietnam War, Ranch Hand aircraft utilized bases in Thailand. Aircraft used for Ranch Hand, UC-123s (**Figure 7**), launched from Vietnam airbases and on numerous occasions from Thailand airbases, including Udorn and Ubon, to conduct missions against targets in Laos, Cambodia and Vietnam [2].

In August 1963, the Thailand government requested aerial spraying services from Ranch Hand aircraft to assist with its locust (insecticide) problem. From December 29, 1968, to January 2, 1969, Ranch Hand aircraft (US Air Force) flew Agent Orange missions out of Udorn in support of the CIA's secret War in Laos [8]. On January 17, 1969, seven Ranch Hand aircraft flew to Ubon to conduct an attack in Laos against a special CIA selected target [4] [5]. From February 2 to 5, 1969, Ranch Hand aircraft flew Laos's missions from Udorn in addition to the CIA spray mission, which are still classified. Udorn (**Figure 5**) was again utilized August 31, 1969 to conduct an operation in which aircraft flew 28 sorties from Thailand to target Laotian food crops during a seven-day period with Agent Blue using five UC-123s. Agent Blue, the arsenic based herbicide used to kill rice, was the herbicide weapon of choice when the goal was to eliminate the Peoples Republic of Vietnam (PAVN) food supply but not to generally defoliate the jungle [4] [5].

Figure 7. C-123s Fairchild Provider aircraft that was used during the Vietnam War to spray tactical herbicides. Reprinted with the permission of the editor of the Open Journal of Soil Science.

Ranch Hand History Project records show that Air Force Sergeant Richard E. Wolf, received a letter of commendation for his Operation Ranch Hand actions and operations in Thailand [2] [3]. National Archive records also reveal that herbicide missions launched from Thailand on July 6, 1966, August 29, 1966, December 15, 1966, June 7, 1967, April 18, 1969, and March 25, 1970. Although these missions were classified, they demonstrate the close relationship between U.S. military in Thailand, Operation Ranch Hand, and the CIA's Secret War in Laos [4] [5].

Air Force documents confirm that herbicide deliveries not associated with Ranch Hand (*i.e.*, *CIA missions*) were transported to and from Thailand [2] [3] [4] [5]. National Archives records reveal that herbicides were transported from Vietnam to Takhli Air Force base (Thailand) on April 7, 1973. Moreover, the cargo load class in the record, Y4, is the same load class that was noted in a South Vietnam Operation Steel Tiger mission with the primary goal of defoliation.

These direct reports correspond to other 1973 Air Force archives documents showing that US Air Force Civil Engineers had developed a standard operating procedure for the use of herbicide on Takhli Air Force base (**Figure 8**) to avoid misuse [2]. By June 1973, the airbase was waiting for more herbicides. Hence, the records suggest the movement of herbicides to and from Thailand was not exclusively associated with Ranch Hand missions and that herbicides were used at US Air Force bases throughout Thailand. Despite this evidence, VA's position, with the support of the DOD, was that Ranch Hand aircraft and herbicides were either temporarily staged, or never staged, on Thailand bases [1]. Further documentation and sworn statements contradict that claim [2] [4] [5].

Figure 8. Takhli Royal Thai Air Force base. Photo Credit: Militaryalworks.com.

William Easterly was stationed in both Vietnam and Thailand in 1966-1967 and 1969-1970. He provided gun cover for Ranch Hand aircraft as the chief gunner on UH-1P helicopters [2] [3]. He stated "*that when the weather was bad, the crew would stay in Thailand at Ubon, NKP, or Udorn*". He stated, "*Back at our base, we would get buckets of Agent Orange and fill pump fire extinguishers with AO* [*Agent Orange*] *so we could spray around our local area*".

Because the barrels containing herbicides and the spraying equipment on Ranch Hand aircraft were known to leak, the risk of exposure, throughout the flight lines as well as storage areas on Thailand bases, was significant. John Scott, an Airman stationed at Ubon Air Force base (**Figure 9**) from 1969 to 1972, stated "*that he assisted in loading barrels of Agent Orange onto C-123s during the first part of his tour*" [2] [3]. He also noted in his sworn statement "*that the barrels were leaking all the time and the herbicide got all over his uniform and hands*".

In Ubon Air Force base veteran Ronald Switzer's appeal to the Board of Veterans' Appeals (BVA), he asserted "*that he was a material handler of Agent Orange during his time at Ubon from* 1968 *to* 1969" [1] [2] [3] [4]. He, too, stated that "*the barrels often leaked. Leakage from empty herbicide barrels* (**Figure 10**) *was also noted because it was difficult to drain the last* 7 *or* 8 *liters*". The color distortion caused by leaking barrels containing herbicides is noted in picture captions of herbicides stored on Johnston Atoll in the Pacific Ocean (**Figure 11**). The herbicides stored on Johnston Island were incinerated (burnt) at sea in 1977 [2].

2.2. The Historical Record Reveals Substantial Herbicide Use on Air Force Bases in Thailand

Due to the density and high growth rate of tropical vegetation in Thailand, mowing was seen as labor intensive and ineffective, so US military personal used

Figure 9. Ubon Royal Thai Air Force base. Photo Credit: Pinterest.

Figure 10. Agent Orange being re-barreled on Johnston Island Photo Credit: ResearchGate.

Figure 11. Tactical herbicides being stored on Johnston Island in Pacific Ocean to be incinerated in 1977.

herbicides. Furthermore, there are several reference reports admitting herbicide use throughout bases (*on the grass yards next to barracks*) in Thailand to control

vegetation in Thailand's tropical environment [2] [3] [4] [5]. More specifically, herbicides were used to improve visual observation of the base perimeter (*sprayed tactical and commercial herbicides containing TCDD and/or arsenic on both sides and in between of the perimeter fences. The spray drift and dust, during the dry season, would often enter the barracks. In addition, military personnel tracked mud contaminated with dioxin TCDD and/or arsenic into the shops, barracks, office areas, the mess hall and even the showers*).

Due to communist insurgent attacks on Thailand bases, US military leaders initially ordered the use of commercial herbicides (*commercial herbicides, including* 2, 4, 5-*T with unknown amounts of TCDD available to the Base Commander and grounds crew through the military supply catalog*). Using a 56th Special Operations Wing memo with the title "Lessons learned from the attack on Udorn, 26 Jul 68" the Deputy Commander of the 7/13th Air Force ordered base commanders in Thailand to "*review base defense plan with an eye to covering critical areas which are adjacent to the perimeter*". As a result, defense reassessments and surveys were conducted throughout Thailand, including one survey at Nakhon-Phanom (NKP) (**Figure 12**) conducted from June 23 to 30 1969, Udorn, Ubon, Korat, Takhli, and U-Tapao [2] [3] [4] [5].

Regarding base defense, the survey stated [2] [3]:

"*A continuing vegetation control program is required for cleared areas under and between perimeter security fences. The area between the fences is intended to be used as a no-man's land with additional detection and deterrent devices such as trip flares, TSSE, tangle-foot, etc. being employed within. In view of the above, a mowing operation for vegetation control will be impossible. As a result, a conscientiously controlled program of vegetation control with herbicides must be applied. Application of herbicides must be directed toward retarding growth to provide a cleared area*".

Figure 12. Nakhon Phanom Royal Thai Air Force base. Photo Credit: Wikipedia.

US Air Force leadership ordered the use of tactical herbicides because of ongoing security concerns [3] [5]. Several documents demonstrate that Agents Purple, Orange, and Blue were present in Thailand. Two C-130s from Phu Cat Airbase in Vietnam airlifted 106,000 liters of herbicides to Udorn prior to a later launched Ranch Hand missions from Udorn to targets in Laos from February 2 to 7, 1969 [2] [4]. However, per the 1971 CHECO Report [7], only 26,000 liters of herbicide, mostly Agent Orange, were dispensed in Laos. That leaves 80,000 liters of herbicide unaccounted for with their last known location in Thailand [2] [3] [5]. This directly coincides with U.S. Air Force documents stating "*that defoliation operations around the Udorn perimeter occurred during this period*". It is reasonable to assume that this remaining herbicide was used at other bases, radar and other outposts since 80,000 liters was far more than necessary for a single base. The missing tactical herbicides may also have been used in Laos. Therefore, the herbicides including Agent Orange, Agent Purple and Agent Blue were used on the perimeters of all the Royal Thai Air Force bases in Thailand (**Figure 1**).

The prevalence of herbicide use in Thailand is further demonstrated by the embassy's approval of the use of herbicides on several occasions. Vegetation control on Korat (**Figure 13**) was regarded as a serious issue in 1972 because dense growth provided the enemy with the opportunity to access the KC-135 parking ramp [2] [3]. As a result, the embassy approved the use of herbicides. Additionally, the 1973 CHECO Report states "*that soil sterilization and herbicide use was approved by the embassy in* 1969 *in accordance with the Rules of Engagement*" [4] [5].

2.3. Sworn Statements Claiming Exposure to Agent Orange, Agent Purple and/or Agent Blue by US Airmen

These admissions correlated with sworn statements provided by several aviators [2]. Mr. George Collins was assigned to the Aero Space Ground Equipment (AGE) unit in U-Tapao for seven months beginning in 1969 and ending in 1970 [2] [3]. He wrote in a sworn statement "*that he was twice assigned the task of diagnosing and repairing a Buffalo Turbine fogger/sprayer unit which sprayed the base consistently for insects and defoliated the base perimeter and other areas on the base*". He witnessed drums with orange, blue, or white bands being stored in a shed at the AGE facility surrounded by defoliated soil [2] [3]. His statements were corroborated with 1971 and 1972 documentation demonstrating the use of herbicides on U-Tapao (**Figure 14**).

Historical reports established that a squadron in 1971 "*began spraying chemical herbicides on the troublesome plants*". In 1972, the leadership at U-Tapao sought to "*expand use of herbicides*" in clearing 30 meters from the perimeter fence and invoking an "*aggressive program on vegetation control*". Together, historical reports and an airman's statement demonstrated consistent use of herbicides in which the Air Force utilized internal equipment to accomplish defoliation [2] [3].

Figure 13. Korat Royal Thai Air Force base. Photo Credit: Wikipedia.

Figure 14. U-Tapao Royal Thai Navy base. Photo Credit: Ken Schmidt.

In Command Sergeant Major (Ret.) Kenneth Watkin's statement, he attested "*to observing Agent Orange being sprayed around the barracks at Udorn in* 1970-1971" [2] [3]. This coincides with documentation demonstrating that Major George Norwood addressed the need for strong vegetation control and that the Base Civil Engineers had been requested specifically, in 1971, for vegetation control on Udorn.

In his appeal to the Board of Veterans' Appeals, Thailand veteran Ronald Switzer stated "*he was a material handler of Agent Orange and that after the* 1969 *attack on Ubon, the perimeter was pushed back and the trees lost their fo-*

liage" [2] [3]. This correlates to documents showing the recommended use of herbicides in 1969 and their subsequent use in 1970, 1971 and 1973. Photographs of Ubon's perimeter demonstrate that there was a lack of foliage. Between the old and new perimeter, the vegetation was pushed back outside the perimeter fences (**Figure 15**).

Thailand veteran Michael Williams, who was stationed at Ubon from May 1969 to May 1970, asserted "*that he was assigned to a detail that involved defoliating the perimeter of the base*" [2] [3]. During the detail, he used defoliants that were contained in 208-liter drums with orange stripes. Although he was originally assigned to the detail for 10 days, he stated "*that the detail continued for the rest of his time there*". This matches documentation of herbicide use at and after that time.

The use of herbicides on Nakhon Phanom Royal (NKP) Thai Navy base was noted in the 1973 CHECO report [7] and in a soldier's sworn statement [2] [3]. Thailand veteran Wayne Hogstad was stationed at NKP from April 1967 to April 1968 and was assigned to the police squadron. In Mr. Hogstad's statement, he said "*that he observed a C*-123 *aircraft mounted with spray equipment next to barrels with orange stripes*". He reported that "*he took time to ride with a mobile unit Security Alert Team around NKP bases perimeters, [and] while going along the east perimeter a crew from civil engineering with a truck with a tank sprayed what Mr. Hogstad believed to be Agent Orange*" [2]. His statement aligned with the CHECO report [7], which notes, "*Heavy use of herbicides kept the growth under control in the fenced areas*". Moreover, Mr. Hogstad's statement correlated with a historical record showing a request dated October 11, 1967, sought "*six C*-123 *herbicide aircraft* (**Figure 7**) *and* 60 *personnel to operate from* [*NKP*] *for a* 15-*day period*" [2] [3].

Figure 15. US military bases used herbicides to defoliate the base perimeter as a security measure to protect against surprise attacks. Picture was taken by US Army Flight Operations Specialist 4 John Crivello in 1969.

There are several additional pieces of evidence indicating that herbicides were used throughout Southeast Asia. The article "*Viet Cong—Right or Wrong* [8]", published in the National Guardsman in 1966, notes "*the Defense Department's Advance Research Project Agency* (*DARPA*) *was moving forward with defoliant improvement projects in Thailand*". This suggests that the defoliant improvement projects occurred after the herbicide testing (1964-1965). In turn, this supports veterans' statements regarding the use of herbicides to clear bases in Thailand during this period. Mr. Dennis Oliver, who was stationed in Thailand from 1966-1967, stated "*that during his assignment to the base's munition storage area, he witnessed* 208*-liter drums being stored near the revetments and observed barren land throughout the perimeter and base*" [2] [3].

The author of a 1982 article published in the Journal of Legal Medicine, titled "Agent Orange: Government Responsibility for Military Use of Phenoxy Herbicides [9]", stated that "*Every American who served in Southeast Asia was potentially exposed to Agent Orange, as the herbicide was used to clear areas before construction and to defoliate compound perimeters, landing zones, and fires bases*". For support, the author cited an appendix to the 1979 hearing on Senate Bills 741 and 196. During the Committee hearing on S.B. 741 and S.B. 196, Congress considered perimeter spraying. Similar to the Air Force base histories in Thailand, the 1979 hearing noted "*that herbicides were used around bases in order to maintain base security*" [2] [4] [5].

Ranch Hand was also not prohibited from herbicide spray missions in Thailand [3] [4] [5]. In November 1969, the Nakhon Phanom Royal Thai Navy (NKP) Base Commander requested Ranch Hand assistance to defoliate the ordnance drop area. In his request, the Commander stated: "*Application must be by air because area is overgrown and ground application would be extremely dangerous due to live munitions in the area*".

2.4. The Air Force Developed a Standard for Herbicide Use on Thai Air Force Bases

Military leadership established annual training and standard operating procedure in order to create a uniform standard for the use of herbicides [2]. Annual training was conducted on Takhli from March 17 to 21, 1969, and July 13 to 16, 1970, with grounds crew representatives from all Thailand bases. The 355th Civil Engineer Squadron and Pacific Air Force (PACAF) Command Agronomist sponsored the training [2] [3]. The training was an indicator that Air Force leadership took a cohesive approach regarding the application of herbicides on Thailand bases. On the herbicide school application, the listed purpose of the training was to "*train and certify Thailand based personnel who will be handling herbicides for chemical vegetation control*" and "*train personnel on the use, application, dangers and safe handling of herbicides*" [2] [3] [4] [5].

The class consisted of twelve non-commissioned officers [2] [3] [4]. Moreover, the application stated that select personnel would receive "*their own copy of*

the herbicide manual". Although the current whereabouts of the herbicide manual are unknown, the publication and distribution of such a manual demonstrates the regular use of herbicides throughout Thailand. A PACAF agronomist, Mr. Raymond Gross, conducted the training of the ground crews of the US military bases in Thailand (**Figure 1**), the herbicide manual was most likely employed throughout Southeast Asia [2] [4] [5].

This notion is further strengthened by the fact that the civil engineers developed a standard operating procedure (SOP) specifically for the application of herbicides due to fear indiscriminate use of herbicide could be a source of pollution. The US Air Force leadership [2] [3] [4] argued that adherence to the SOP "*should eliminate any misuse of herbicide application*" on Takhli. This statement indicates that misuse of herbicides by service members led to the necessity of establishing an SOP. It is also another indicator that herbicide use was prevalent and supports statements from Airmen regarding the use of herbicides throughout Thailand.

Command Sergeant Major Kenneth Watkin stated "*that grounds personnel informed him they were using Agent Orange* [2] [3] *when he observed them spraying around barracks*". Technical Sergeant William L. Easterly stated "*that Ranch Hand crew would use Agent Orange around their personnel area because they were not aware of the herbicide's harmful effects*". Although the SOP is not available or remains classified, the development and enforcement of the SOP highlights the concern of misuse and the prevalence of herbicide use on Thailand bases.

2.5. VA's Illusory Distinction between "Commercial" and "Tactical" Herbicides Is Unlawful and Arbitrary

The Veterans Administration (VA), with advice from the Department of Defense, constructed an arbitrary distinction between "commercial" and "tactical" herbicides [2] [10] [11]. They routinely used this "distinction" as justification for denying Thailand exposure claims. However, historical documentation shows no evidence that the military made any distinction between "tactical" and "commercial" herbicides at the time of the Vietnam War. In fact, the distinction is notably absent from records until 2009 when VA published a "Memorandum for the Record" regarding herbicide use in Thailand during the Vietnam Era [2].

The "Memorandum for the Record", which VA often cites in these cases, is outdated, contained misleading and erroneous statements, and was never intended for perimeter policy cases. Yet, VA (with the advice and support of DOD) has used this Memorandum and the so-called distinction between "commercial" and "tactical" herbicides to deny thousands of herbicide-related disability claims by Vietnam-era Thailand veterans [2] [11].

Until 2009, VA made no distinction between "commercial" and "tactical" herbicides [2] [10] [11]. The term "commercial" herbicide is notably absent from US Air Force archive documentation, including the 1973 CHECO report [7]

which specifically states "*that herbicides used in Thailand had to undergo the same embassy approval process as herbicides used in Vietnam*". The term "commercial" in reference to herbicides is equally absent from VA's internal policies and procedures and from federal regulations and statutes. The term is used only in the Memorandum for the Record and in individual cases wherein VA uses the distinction to deny benefits [2].

On May 6, 2009, the Veterans Benefits Administration (VA) issued the following directive (Fast Letter 09-20) to all VA regional Offices and Centers related to developing evidence of herbicide exposure in Haas-related claims from US veterans with Thailand Service during the Vietnam Era. The document served as a substitute for an individual response from the Agent Orange Mailbox (VAVBAWAS/CO/211/AGENTORANGE) [2]. When regional office personnel receive claims based on herbicide exposure from US veterans who served in Thailand during the Vietnam era, the VA staff were told to place the document in a claims folder rather than sending an inquiry to the Agent Orange Mailbox. The Court of Appeals for Veterans Claims, while the Haas case was pending, stayed the processing of certain disability claims based on herbicide exposure. The stay affected a large number of veteran claimants with Vietnam Era [2] [12].

Thailand was a staging area for aircraft missions over Vietnam. Many veterans, who assisted with these missions, received the Vietnam Service Medal (VSM) for their support of the war effort [12]. Disability claims from those veterans who received the VSM for Thailand service, but who did not set foot in the country of Vietnam, were placed under the Haas stay. With the lifting of the stay, these claims required development and adjudication.

In its original conception, the Memorandum for the Record was never intended to apply to all Thailand exposure claims [2] [3]. VA created the Memorandum as part of Fast Letter 09-20. Fast Letter 09-20 dealt exclusively with Haas-related claims from Thailand veterans that had been stayed. Fast Letter 09-20 states in part:

"*The stay affected a large number of veteran claimants with service in Thailand during the Vietnam era. Thailand was a staging area for aircraft missions over Vietnam, and many veterans who assisted with these missions received the Vietnam Service Medal* (*VSM*) *for their support of the war effort. Disability claims from those veterans who received the VSM for Thailand service, but who did not set foot in the country of Vietnam, were placed under the Haas stay*" [2].

Once VA lifted the stay, these claims still required adjudication. However, these stayed claims did not involve claims because of herbicide exposure around Thailand bases or their perimeters [2]. The Memorandum was an attachment to FL 09-20 which was aimed at assisting Regional Offices in completing the adjudication of the stayed Haas-related claims.

In addition to being inapplicable, the Memorandum for the Record is outdated. VA's policy on herbicide exposure around Thailand base perimeters did not even exist when FL 09-20 was issued in 2009 [1] [2]. The Thailand base pe-

rimeter policy was not issued until May 2010, when it was introduced in a Compensation & Pension Service Bulletin. The M21-1 Adjudication Procedures Manual was later amended to incorporate the perimeter policy, but the Memorandum was never corrected, amended, or removed from the Manual and VA continues to apply the outdated Memorandum to Thailand base perimeter claims.

Furthermore, the Memorandum for the Record contains erroneous and misleading statements. In the Memorandum, VA states that the 1973 CHECO Report [7] "*does indicate sporadic use of non-tactical* (*commercial*) *herbicides within fenced perimeters*". This statement is misleading because the CHECO Report never distinguishes between tactical and commercial herbicides use—it refers only to "herbicides".

VA's distinction between "tactical" and "commercial" herbicides has no basis in federal statutes or regulations. The statute that defines "herbicide agent" focuses solely on the chemical agents contained in the herbicides used in Vietnam. 38 C.F.R. § 3.307 (a)(6)(i) defines an "herbicide agent" as "a chemical in an herbicide used in support of the United States and allied military operations in the Republic of Vietnam…specifically: 2, 4, 5-T and its contaminant TCDD; 2, 4-D; cacodylic acid; and picloram" [2] [10] [11]. A substance containing any of these five compounds is an "herbicide agent" as a matter of law, regardless of its purpose or name brand. The distinction between a tactical herbicide and a commercial herbicide has no legal or factual significance [2].

During the Vietnam Era, the military made no distinction between "commercial" and "tactical" agents in their own supply system [2] [10] [11]. In approximately September 1958, 2, 4, 5-T was adopted for use by the government under Specification O-H-210 and Federal Stock Number (FSN) 6840-577-4201 for a 208-liter drum, and then later under FSN 6840-616-9159 for a 19 liter can. Chemical Corps described these products as "*expendable supply items to be available to all users*", meaning they "*were meant for use by facility engineers as an herbicide for grounds keeping* (*i.e.*, *brush and weed control*)".

Agents Blue [13], White, and Orange [14] all known to contain chemical agents outlined in § 3.307, were also available as commercial herbicides in the federal supply system [15]. In the early 1960s, military personnel had access to Agents Pink, Purple, and Green, most of which were undiluted versions of 2, 4, 5-T and therefore contained even higher levels of the contaminant TCDD [10] than Agent Orange. VA clearly cannot support its long-held position that "routine base maintenance activities" were only performed by use of "commercial" herbicides that could not satisfy the § 3.307 requirements. VA's distinction between tactical and commercial herbicides is therefore misguided, arbitrary, and contrary to law [2].

The US government made no distinction between these herbicides in the 1970s and 1980s [14]. In fact, they specifically pointed out that defoliants VA now labels as "tactical" were commercially available. In response to a 1971-72 Congressional record, an Air Force consultant wrote, "*The Air Force does not and has not used*

any defoliants that are not in general use in this country". Later, in the 1980s, the government did indeed ban the use of all 2, 4, 5-T based herbicides for the same reasons it previously stopped the use of Agent Orange (a 2, 4, 5-T based herbicide) in Vietnam—contamination with 2, 3, 7, 8-Tetrachlorodibenzo-*p*-dioxin, or TCDD.

2.6. VA Should Presume Exposure to Herbicide Agents for All Thailand Veterans? Thailand Veterans Were Exposed to the Same Agents as Vietnam Veterans

Before the PACT Act [1] [2] [16] was enacted on August 10, 2022, Veterans Administration's (VA's) application of its Thailand perimeter policy only conceded exposure for service members with a security-related military occupational specialty (MOS), such as military police, who conducted foot patrols at the perimeter. In such a strict application, VA arbitrarily ignored its own policy of conceding herbicide exposure for veterans who served near the perimeter [2] [3].

For example, many veterans on or near aircraft or near the barrels containing herbicides were exposed to the same risks as those conducting foot patrols. Lieutenant Colonel Paul Bailey, a member of Ranch Hand, noted "*that the pressurized aerial spraying tanks would leak herbicides inside the aircraft*" [2] [3]. Aircraft mechanic George Collins testified in a sworn statement "*that he worked on a Ranch Hand aircraft after it made an emergency landing in U-Tapao. While attempting to fix the aircraft, he was forced to kneel in the Agent Orange that covered the floor*". Leaking barrels also directly exposed service members to herbicides. Moreover, those members assigned to disperse herbicides by truck-mounted (**Figure 16**) or backpack systems would certainly have been exposed to spray splash or drift. Yet VA's past policy application eliminated even these veterans from receiving benefits based on their exposure to herbicide agents.

Figure 16. Tactical herbicides sprayed from a M113 Armored Tracked Personnel Carrier.

In James Trapp's affidavit [2] [3], he stated "*that during his assignment in Takhli Air Force base's warehouse, he saw barrels labeled* 2, 4, 5-*T and* 2, 4-*D*". Additionally, he stated "*the barrels had white destination labels signifying they were for the* 315*th A*/*C Sq*". Historical Air Force documents from the 315th Air Division verify that 106,000 liters (approximately 509 barrels) of Agents Orange and Blue were airlifted from Phu Cat, Vietnam, to Udorn in February 1969. This shows a strong relationship between the 315th Air Division and the movement of herbicides from Vietnam to Thailand for use in Laos [4] [5].

Sworn statements of Airmen referenced throughout this report predate the Air Force Historical Research Agency discovering and/or releasing documents showing movement of herbicides from Vietnam to Thailand [4] [5]. This significantly enhances the credibility of these statements by confirming the veterans knew that they were exposed all along even though the government continued to deny the exposure [2].

National Archives records [9] also reveal that herbicides were delivered to Takhli Air Force base on April 7, 1973. (*It appears not all the remaining tactical herbicides, after President Nixon ordered the US military to stop spraying in* 1971, *were transported back to Bien Hoa Air Force base to be processed and shipped to Johnston Atoll Island in the Pacific Ocean*). This was after all aerial herbicide spray missions in Vietnam had ceased. This delivery would have resulted in the exposure of the aircraft crew; the loading, unloading, and storage crew; the crew involved in spraying the herbicides; and the service members in and around the sprayed areas [2] [12] [13]. (*What happened to the remaining Agent Blue, Agent Purple and Agent Orange left in the Thailand supply pipeline after* 1971?)

Service members were also exposed to herbicides while constructing the perimeter fence. In Sidney Chancellor's sworn statement, he noted "*that his duties in an engineer unit from June* 1967 *to November* 1968 *included spraying herbicides along NKP's perimeter so that a fence could be installed*" [2] [3]. Mr. Chancellor reported, "*Chemicals were stored in containers with orange stripes and we mixed the chemical with diesel fuel and loaded the mixture into a large tank mounted trailer that was pulled by an air compressor truck to spray the materials*". This coincides [2] with an historical document dated December 1968 that provided an update on NKP's fence and perimeter security and stated "*grubbing* [*removal of trees and shrubs*] *is complete for the southeast corner of the base and west perimeter, and approximately* 50% *complete for the north perimeter*". Hence, evidence suggests that Airmen conducting construction around the perimeter were exposed to herbicides [2] [4] [5] [10].

Due to the concerns over the integrity of studies completed for VA, the scientific community created a unified response rebutting the reasoning behind VA's policies [2] [3]. Dr. Jeanne Stellman, an Agent Orange expert at Columbia University's Mailman School of Public Health, and Dr. Fred Berman, the director of the Oregon Health and Science University's CROET Toxicology Information

Center, along with 14 other doctors, toxicologists, and environmental scientists, signed a letter in November 2012 that refutes VA's "*boots on the ground*" approach to Agent Orange exposure [10]. The letter addresses the scientific shortcomings and erroneous assumptions of VA's position by noting "*Skin absorption is a primary occupational route of exposure for dioxin-contaminated pesticides*" [2].

Daily life on Thailand bases also exposed service members to herbicide agents. VA's previous requirement that Thailand veterans must prove their duty position entailed working on the perimeter was unreasonable [10]. U.S. Army Manual 3-3 (dated 1971) advises that a 500-meter buffer zone must be maintained to avoid damage caused by drifts while ground spraying herbicides [16]. The distance between base perimeters and other base activities was normally well below 500 meters. Soldiers lived, worked, and conducted recreational activities near the perimeter and in areas well within the 500-meter drift zone [2]. On Korat, for example, the physical training area and Non-Commissioned Officer building were located within the drift zone, and living quarters were only meters away from the perimeter [16].

Moreover, VA's previous position [1] "*that herbicides were only used along the perimeters is contradicted by documented evidence and sworn statements*". When addressing the adequacy of facility security, official documents stated "*that herbicides were applied to the fenced in area around the ammo storage, facility, around all perimeter guard towers, and the areas around runway overrun lights*". The 1973 CHECO report [7] also states that herbicides were "*used on areas within the perimeter*". Because service members were exposed to herbicides that were used inside the base, not just at the base perimeter, veterans who served in Thailand should not have to prove that their duties required them to be near the perimeter [2].

Several veterans' statements also indicate herbicides were used within the perimeters of the bases. Mr. Collins [2] [3] stated "*there were several defoliated areas within U-Tapao including around the Aero Space Ground Equipment (AGE) facility, the baseball fields, and the viewing area for the Bob Hope Christmas Show*". After the attack on U-Tapao, the 635th Security Police Squadron used herbicides to clear a 30-meter zone on both sides of the perimeter fencing.

Command Sergeant Major Witkin [2] [3] stated "*that he personally observed Udorn-based grounds personnel often spraying herbicides, including Agent Orange, on the vegetation located in and around the barracks areas and on the base perimeter*". He also stated "*the personnel spraying around the barracks told him the herbicide was Agent Orange*".

Stephen Pippenger, a dog handler stationed at Udorn from September 1968 to October 1969, stated "*that he observed Agent Orange being loaded onto the C-123 aircraft* (**Figure 7**). *He also saw an aircraft spray the kennel area, and he remembers vegetation in that area dying shortly thereafter*" [1] [2] [3]. Notably,

Mr. Pippenger's statement and the time period in which he served at Udorn coincided with official records [2] of the delivery of 106,000 liters of Agents Orange and Blue to Udorn in 1969 and the use of some of those herbicides by C-123 aircraft.

2.7. Disabled American Veterans Issue Brief: Agent Orange in Thailand during Vietnam Era

2.7.1. The Thailand Veteran Change

The Disabled American Veteran staff summarized [12] "*the current restricted VA process for Thailand veterans arbitrarily disqualified veterans who did not have a correct assigned duties during their time stationed in Thailand. Public Law* 116-23 *allows for any child of a veteran of covered service in Thailand who is suffering from spina bifida the health care, vocation training and rehabilitation, and monetary allowance associated with spina bifida. This creates a statutory inequity for Thailand veterans as their service in Thailand is not associated with Agent Orange exposure for their own benefits but their children's*".

2.7.2. The Thailand Veteran Situation

A Department of Defense (DOD) 1973 report [7], Contemporary Historical Examination of Current Operations (CHECO) Southeast Asia Report: Base Defense in Thailand 1968-1972, acknowledged "*the use of tactical herbicides* (*Agent Orange*) *on Thai Royal Air Force Bases and Thai Army Bases. The report notes the significant use of Agent Orange to remove foliage that provided cover for enemy forces on the fenced-in perimeters of military bases in Thailand*".

There are no current statutes or VA regulations to automatically concede veteran exposure to Agent Orange while serving in Thailand during the Vietnam Era [2]. VA's adjudication manual (M21-1) does recognize Vietnam-era veterans whose service involved duty on or near perimeters of military bases in Thailand anytime between February 28, 1961 and May 7, 1975 may have been exposed to Agent Orange and may qualify for VA benefits [12].

VA's manual [12] acknowledges "*the following veterans may have been exposed to herbicides*: 1) *U.S. Air Force veterans who served on Royal Tahi Air Force* (*RTAF*) *bases at U-Tapao, Ubon, Nakhon Phanom, Nam Phon, Udorn, Takhli, Korat, and Don Muang, near the air base perimeter anytime between February* 28, 1961 *and May* 7, 1975. 2) *U.S. Army veterans who provided perimeter security on RTAF bases in Thailand anytime between February* 28, 1961 *and May* 7, 1975. 3) *U.S. Army veterans who were stationed on some small Army installations in Thailand anytime between February* 28, 1961 *and May* 7, 1975. *However, the Army veteran must have been a member of a military police* (*MP*) *unit or was assigned an MP military occupational specialty whose duty placed him/her at or near the base perimeter*".

2.7.3. The Thailand Veteran Solution

Congress must enact H.R. 2201 and S.1381, as both would automatically concede

Agent Orange exposure for all veterans who served at military installations in Thailand during the Vietnam Era., regardless of the base, duty on the perimeter or military occupational specialty [1] [2] [4] [5].

2.8. In Thailand Cases, VA Faces the Same Challenges of Determining Exposure Details as with Vietnam Veterans

A key fact leading to presumptive herbicide agent exposure for Vietnam veterans was that herbicide records were incomplete, making it impossible to determine who was actually exposed [1] [2] [4] [5]. As noted in a 1986 report to the White House, "*only two percent of military records were preserved in the National Archives, and herbicide records were not regarded as a priority for retention*".

In a 1986 memorandum from an Agent Orange Working Group, the panel concluded that herbicide records were incomplete and that a "large proportion of firebase perimeter spray operations were never recorded" [1] [4] [5] [11] [14]. In a 1981 draft statement, James Stockdale, the Deputy under Secretary for Intergovernmental Affairs, noted "*that documentation regarding perimeter spraying was poor and less than* 5 *percent of all helicopter spray missions were recorded on Herbs tapes*".

The government's inability to identify exposed veterans led Congress to afford veterans the benefit of the doubt as to whether they were exposed by granting the presumption of exposure to all veterans who served in Vietnam. The 1986 Scientific Feasibility of Agent Orange Ground Troop Study noted "*that the group could not gain a clear indication from exposed verses non-exposed veterans because the records were incomplete*" [4] [5] [10]. Further, in a 1986 transcript of the Ad Hoc Subcommittee Agent Orange panel, the committee noted "*that the potential of exposure at base camps would appear to be considerable because of the regularity of spraying*". Moreover, the subcommittee determined that "*levels of exposure are likely higher from exposure in the camps than from Ranch Hand spraying*".

Before Congress granted the presumption of exposure, government records showed that determining the level of exposure was impossible [2] [4] [5]. The Agent Orange litigation team relied heavily on perimeter spraying, which is noted in its 1984 files. The team also focused on exposure resulting from procuring, shipping, storing, or loading herbicides.

Dr. Alvin L. Young's paper [1], suggested criteria for determining levels of herbicide exposure [1] [2] [10], he noted "*that groups exposed to associated dioxin contaminants were personnel assigned to support functions. These include personnel that sprayed herbicides using helicopters or ground application equipment; personnel that may have delivered the herbicide to the unit performing the defoliation missions; aircraft mechanics who were specialized and occasionally provided support to Ranch Hand aircraft*".

Several sworn statements and unit histories show there were numerous veterans who served in Thailand and would have met Dr. Young's criteria. He recog-

nized in a report "*that the number of military personnel exposed is unknown because most military bases had vehicle-mounted* (**Figure 16**) *and back-spray units available for use in routine vegetation control*". Dr. Young's documents indicate that herbicides, including Agent Orange and its counterparts, were used for routine vegetation control programs [1] [2] [10].

2.9. PACT Act Established Presumptive Service Connection for Thailand Veterans

Prior to the passage of the PACT Act, veterans could only be eligible for presumptive service connection if they served near the perimeter of specific bases [2] [3]. This often meant that the veteran needed to prove that their MOS required them to be near the perimeter of the base.

As of the enactment of the PACT Act on August 10, 2022, veterans who served in Thailand are eligible for presumptive service connection, regardless of their MOS or where on the base they were located [1] [2]. VA now recognizes that any service member with active military naval, air, or space service who served in Thailand, *at any U.S. or Thai base*, between January 9, 1962 and June 30, 1976 were likely exposed to Agent Orange [2] [3]. VA has established presumptive service connection for these veterans, meaning that VA will assume exposure to Agent Orange if veterans can prove that they served in Thailand, at any U.S. or Thai base, between January 9, 1962 and June 30, 1976.

3. Summary

During the Vietnam War, the U.S. Air Force waged a secret and unconventional phase of the air war in Laos from Udorn Air Force base located across the Mekong River from Vientiane, Laos. The American pilots involved wore midnight-black flight suits and flew camouflaged twin-engine A26 bombers without identifying insignia. Of the seven U.S. military bases in Thailand, Udorn alone was cloaked in secrecy. Inquiries about the mission of the U.S. 56th Special Operations Wing at Nakhon Phanom were met with a terse "no comment" from U.S. officials. The base was less than 5 minutes flying time from areas of technically neutral Laos where there was fighting between Communist North Vietnamese and Pathet Lao forces and Laotian forces.

U.S. officials disclosed that American pilots flew "armed reconnaissance" missions in Laos at the request of the Laotian government to prevent Communist infiltration over the Ho Chi Minh trail, which meanders several hundred kilometers down the western Laos border. These flights were permitted to shoot back if fired upon. There never has been any official admission of U.S. warplane support for ground troops in Laos. However, ground support was the mission for which most of the aircraft at Nakhon Phanom were best suited. Despite the secrecy at the base, its activities were impossible to hide from the local population. U.S. commanders were certain that the Communist guerrillas passed on word of its operations. The scope of combat in Laos never reached the level of

that in South Vietnam, but the nation, about the size of Idaho, was strategically vital for both sides.

Intelligence officers at the U.S. Embassy in Bangkok said there were about 40,000 North Vietnamese troops in Laos assisting a force of about 29,000 Pathet

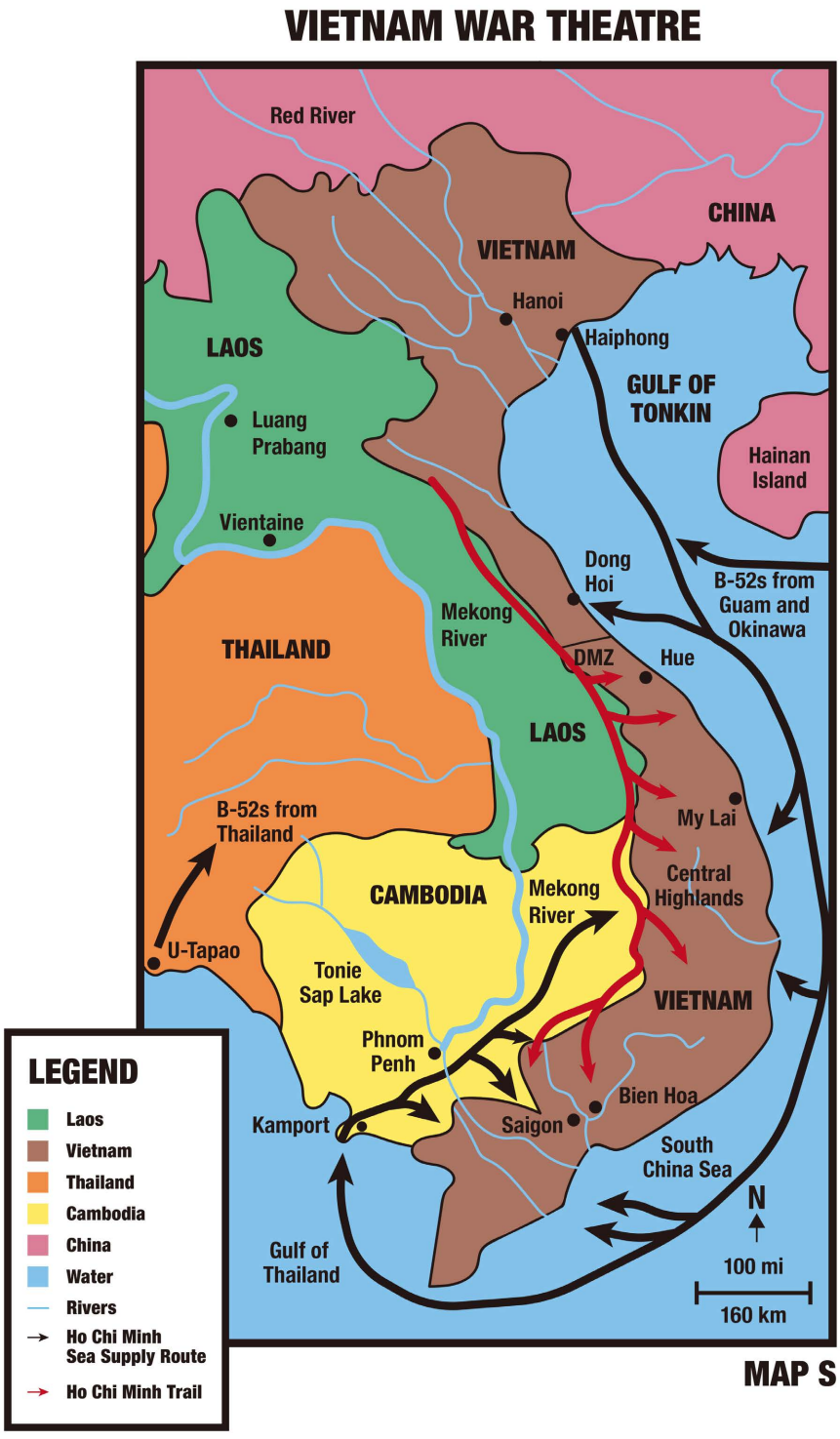

Figure 17. Map of Ho Chi Minh Sea route and the Ho Chi Minh Trail in Laos and Cambodia. Map by Cruz Dragosavac.

Lao guerrillas, the Laotian equivalent of the Vietcong in South Vietnam. Laotian officials gave the same figures. The number of troops in the Laotian army was about 75,000. In addition, there were about 10,000 neutralists fighting on the government side. Control of the Ho Chi Minh trail that ran down Eastern Laos (**Figure 17**) was the US military centerpiece of the Laotian War. However, this was not the Laotian government's strategic objective. Its Autocratic Monarchy's survival as a government required defending its capital from the Patho Laos in a different battlefield lying to the northwest of Trail. This was the Plains of Jars where the Laos military leaders focused their Laos regular and irregular soldiers and their Thai irregulars' (volunteers') efforts. These two different objectives, how to defeat the Patho Laos supported by North Vietnam versus defeating the use of the Trail because of its importance to North Vietnam as a lifeline to its troops in South Vietnam stressed the US and its Allies' military and political capacity.

The similarity of herbicide exposure situations on Thailand and Vietnam military bases merit equal protection, including the "presumption of exposure", for all Vietnam-era veterans who served in Thailand. Although the VA recognizes "there was significant use of herbicides" at numerous Thailand military bases, it only recently granted Thailand veterans the presumption of exposure afforded to Vietnam veterans with the passage of Honoring Our Promise to Address Comprehensive Toxics (PACT) Act on August 10, 2022 [2]. As a result, the VA has officially established a Thailand presumption for veterans. Now, veterans who served at any U.S. or Thai base from January 9, 1962 to June 30, 1976, without regard to the Veteran's MOS or where on base they were located are eligible for presumptive service connection.

Acknowledgements

The author wishes to acknowledge the Disabled American Veterans (DAV) issues brief and the law firm of Chisholm, Chisholm and Kilpatrick for their legal framework of the Vietnam presumptions on behalf of the Vietnam Era veterans who were exposed to either dioxin (TCDD) and/or arsenic. This research study was conducted with the support and approval of the Merry Band of Retirees Research Committee. The team includes five Vietnam veterans, two Vietnam Era veterans, two US Army veterans, and four Agricultural College Professors. Our team mission is to conduct soil, water, agricultural and natural resource management scientific research; synthesize and analyze current and historical documents and scientific evidence relevant to the legacies of war, especially the US Vietnam War; and prepare and publish peer reviewed papers of interest and value to those who lead and served in the US military, especially Vietnam Era veterans, their families and the general public. The legacies of the US Vietnam War had impacts far beyond front line veterans; encompassing civilian and military personnel who manufactured, transported and handled the arsenic based tactical herbicides Agent Blue and Agent Orange (and other 2, 4, 5-T containing

herbicides) contaminated with TCDD; those who came in contact with contaminated aircraft and other equipment; and the residual effects of these chemicals on southern Vietnam soil and water and the health of people who continue to work these lands for their living.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

[1] Young, A.L. (2023) Historical Records Fail to Support Agent Orange Exposure of Veterans Stationed in Thailand. *Advance in Social Sciences Research Journal*, **10**, 173-177. https://doi.org/10.14738/assrj.103.14230

[2] Chisholm Chisholm Kilpatrick Blog (2022) The Truth about Agent Orange and Other Herbicides in Thailand during the Vietnam War. Chisholm Chisholm & Kilpatrick LTD. https://cck-law.com/veterans-law/agent-orange-and-herbicides-in-thailand-during-the-vietnam-war/#:~:text=Several%20documents%20demonstrate%20that%20Agents%20Orange%20and%20Blue,Laos%20from%20February%202%20to%207%2C%201969.%20

[3] Glasser, J.D. (1998) The Secret Vietnam War: The United States Air Force in Thailand, 1961-1975. McFarland & Company, Jefferson.

[4] Conboy, K.J. and Morrison, J. (1995). Shadow War: The CIA's Secret War in Laos. Paladin Press, Boulder.

[5] Buckingham Jr., W.A. (2018) Operation Ranch Hand: The Air Force and Herbicides in South East Asia 1961-1971. Office of Air Force History, Washington, 132.

[6] Olson, K.R. and Speidel, D.R. (2023) United States Secret War in Laos: Long-Term Environmental and Human Health Impact of the Use of Chemical Weapons. *Open Journal of Soil Science*, **13**, 199-242. https://doi.org/10.4236/ojss.2023.134009

[7] Department of Defense (1973) Project CHECO Report Base Defense in Thailand. Headquarters Pacific Air Force, Washington, 5.

[8] Black, G. (2023) The Long Reckoning: A Story of War, Peace, and Redemption in Vietnam. ⁋Knopf, New York.

[9] Beecher, W. (1966) Viet Cong—"Right" or "Wrong"? Special Collections. USDA National Agricultural Library. https://www.nal.usda.gov/exhibits/speccoll/items/show/4585

[10] Lacey, P. and Lacey, V.A. (1982) Agent Orange: Government Responsibility for the Military Use of Phenoxy Herbicides. *Journal of Legal Medicine*, **3**, 136-178. https://doi.org/10.1080/01947648209513347 https://pubmed.ncbi.nlm.nih.gov/6979599/

[11] Olson, K.R. and Tornoe, D. (2021) Long-Term Environmental Impacts of Pesticides and Herbicides Use in Panama Canal Zone. *Open Journal of Soil Science*, **11**, 403-434. https://doi.org/10.4236/ojss.2021.119021

[12] Disabled American Veterans (2023) Agent Orange in Thailand during Vietnam Era. Life-Changing Support for Those Who Served. https://www.dav.org

[13] Olson, K.R. and Cihacek, L. (2020) The Fate of Agent Blue, the Arsenic Based Her-

bicide, Used in South Vietnam during the Vietnam War. *Open Journal of Soil Science*, **10**, 518-577. https://doi.org/10.4236/ojss.2020.1011027

[14] Olson, K.R. and Morton, L.W. (2019) Long-Term Fate of Agent Orange and Dioxin TCDD Contaminated Soils and Sediments in Vietnam Hotspots. *Open Journal of Soil Science*, **9**, 1-34. https://doi.org/10.4236/ojss.2019.91001

[15] Chisholm Chisholm Kilpatrick Blog (2019) Agent Orange Locations: Panama and Kelly Air Force Base. Chisholm Chisholm & Kilpatrick LTD. https://cck-law.com/blog/agent-orange-locations-panama-and-kelly-air-force-base/

[16] Westin, L. (2011) Vegetation Control and Other Uses of Hebicides and Toxic Chemicals at Korat Royal Thai Air Force Base 1967-1972, Tehachapi. https://www.westin553.net/batcat17.htm