

28 February 1982

Sir:

Enclosed please find a copy of the paper I will be presenting at the 20 March meeting. For your information, I am including a very brief Vita below. I look forward to the session and to your comments.

Respectfully,



Vita

Born 3 July 1934 in Hutchinson, Kansas.

Attended school at the University of Kansas, Oklahoma State University, Mississippi State University, Southwest Texas State University, and Texas A&M University.

BS in Occupational Education from Southwest Texas State University (1975).

MA in History from Southwest Texas State University (1977).

All but dissertation complete for Ph.D. in American History from Texas A&M.

Served over 20 years in the United States Air Force. Retired in 1974 as a Lieutenant Colonel.

Served two tours in Vietnam, including duty with the 12th Air Commando Squadron (RANCH HAND) in 1967. 1068 combat missions.

Taught US History survey courses 1975-1981, at Southwest Texas and at Texas A&M. Also have lectured in US Military History, the History of Sea Power, and the History of Modern Germany.

Presently historian, RANCH HAND Vietnam Association, Ft. Walton Beach, FL.

DEFOLIATION IN VIETNAM:
THE CONTROVERSIAL WEAPON¹

One of the most debated tactics used in the Vietnam conflict was the use of chemicals to defoliate trees and to destroy crops. Although herbicide use as a weapon lasted less than a decade, 1962 to 1971, it aroused intense controversy, both in United States government circles and around the world. Initially the debate raged over the questions of environmental impact and long-term ecological effects of repeated chemical use. Later, issues of genetic modification and of physical injury to human beings became the main concern of those opposing chemical weaponry. More recently, the controversy has been reborn following claims of some American veterans of Vietnam service that contact with certain herbicides has resulted in various physical disabilities. The subject is further confused by current accusations that the Soviet Union has used toxic chemicals in Laos, Kampuchea, and Afghanistan.² Not since the use of atomic weapons in Japan during World War II has a weapon of war aroused so much public interest.

Chemical weapons are not new to warfare. The Spartans created poisonous, choking chemical fumes by burning wood saturated with pitch and sulphur during the Peloponnesian Wars, and the Syrian Callinicus helped save the Eastern Roman Empire during the eighth century A.D. with an inflammable chemical known as "Greek fire," a predecessor of the 1942 invention of napalm.³ The best known chemical weapons, of course, are the poison gases of World War I.

(ka-LIN-e-kus)

Nor is the idea of using chemical defoliants as a combat weapon a new concept. During World War II, United States' forces in the Pacific theater used phosphorus munitions to expose Japanese cave and tunnel entrances by burning away natural and artificial vegetable cover. Army chemical experts at Camp Detrick, Maryland, also experimented with the use of plant growth-regulating compounds, although none were used in combat due to official concern that the United States might be accused of conducting chemical warfare, in violation of President Roosevelt's pledge that we would not be the first to do so. In the chemical equivalent of "swords into plowshares," one of the Camp Detrick developments, the highly effective 2,4-dichlorophenoxyacetic acid (2,4-D), found wide application in the postwar agricultural market as a weed control agent.⁴

Not until the 1960s, did the World War II line of experimentation produce an effective military weapon. In 1961, the government of South Vietnam was engaged in an increasingly difficult civil war with insurgent forces known as the Viet Cong, a pejorative term coined by the government to refer to communist-backed forces in particular, and to anti-government opposition in general. The heavily forested terrain of Vietnam afforded the Viet Cong excellent concealment, allowing rapid movement of men and supplies with virtual impunity. Because the Viet Cong needed forests to hide base camps, infiltration routes, and ambush sites, the Diem government asked for American assistance in developing a chemical program to clear lines-of-communications, expose enemy strongholds, and destroy Viet Cong food supplies. Forerunner of this

proposal was the limited defoliation and food control program used by the British in their 1948-1962 campaign against terrorists in Malaya.⁵

Following a brief trial program under the Joint US/Vietnamese Combat Development and Test Center in mid-1961 (Project Agile), President Kennedy authorized a limited number of specially modified Air Force C-123 transports to go to Southeast Asia for operational evaluation, under the code-name RANCH HAND. The defoliant chemicals to be used were highly concentrated mixtures of common herbicides already in extensive use in American agriculture and forestry, including 2,4-D. The aircraft and crews, however, were restricted to defoliation missions only; Vietnamese planes and pilots would fly the crop destruction sorties.⁶

For the next two years, RANCH HAND suffered a "stop and go" existence as one committee after another evaluated the program. Finally, in mid-1964, RANCH HAND was changed from a temporary organization to a permanent unit within the Pacific Air Forces structure, indicating acceptance of the spray concept. Almost immediately afterwards, the spray detachment was assigned primary responsibility for the formerly all-Vietnamese crop destruction mission, and additional aircraft and crews were programmed into the unit. Ground force commanders enthusiastically accepted the increased visibility and protection offered by defoliant operations, while government officials cited Viet Cong food shortages as evidence of the effectiveness of the crop destruction program. Requests for herbicide missions soared as increasing numbers of United States ground combat forces were committed to the Southeast

Asian conflict.⁷

From a modest sixty sorties dispensing less than fifty-thousand gallons of herbicides in 1962, RANCH HAND flights grew at an annual rate of nearly 300 percent for the next five years. Herbicide operations finally peaked in 1967 with over 6800 sorties dispensing almost five million gallons of chemicals. During this period, the spray unit grew from a minimum of two aircraft to an over-sized nineteen-plane organization, the 12th Air Commando Squadron. Because the UC-123s flew at treetop level and minimum airspeed, they were particularly vulnerable to enemy groundfire. One measure of the effectiveness of the herbicide program was the enemy's efforts to stop the spray planes; by the end of 1967, spray planes had been hit by enemy fire over 2700 times and the unit had lost six aircraft. Seventeen RANCH HANDs were killed and a high percentage of crew members were wounded at least once—RANCH HAND became known as the most shot at Air Force unit in Vietnam.⁸

Forecasts for 1968 and subsequent years predicted annual herbicide consumption of at least ten million gallons, an amount in excess of existing industrial capacity. The Department of Defense was forced to take steps to preempt the entire United States production of 2,4-D and 2,4,5-T under the Defense Production Act of 1950, ~~over the objections of the Department of Agriculture and the farm lobby.~~ A 1967 program evaluation indicated that a minimum of thirty-two modified C-123s would be needed to meet planned objectives for the next two years; even so, field requirements for herbicide operations exceeded capacity by

55 percent.⁹

Instead of the expected increase, 1968 saw a reduction in RANCH HAND operations. Part of the reason for the decrease was diversion of spray aircraft to an airlift role for several weeks during the Viet Cong's Tet offensive, but more influential was the American government's reaction to increasing political pressure concerning its participation in crop destruction. By late 1968, the emphasis away from ~~crop~~^{food} targets became evident as 95 percent of the sorties were expended on defoliation missions, a ratio maintained during the following year. Total sorties in 1969 continued to decrease, despite an organizational expansion which peaked at thirty-three aircraft.¹⁰

In November 1969, phase-down of RANCH HAND began with the permanent transfer of nineteen aircraft to airlift units. The squadron was further reduced to eight spray planes when MACV's (Military Assistance Command, Vietnam) \$27 million request for fiscal year 1971 herbicide funds was cut to only \$3 million by the Secretary of Defense in early 1970. Also affecting the RANCH HAND mission was the April order suspending use of the primary defoliant chemical, herbicide "orange." Within two months, the supply of the alternate defoliant, "white," was nearly exhausted; with herbicides no longer being procured, the remaining "white" and a limited stock of "blue," the anti-crop chemical, were reserved for only high priority targets. The final Air Force herbicide mission was flown in Vietnam on 7 January 1971, exactly nine years from the time that the first UC-123 arrived for duty at Saigon's Tan Son Nhut Airport.¹¹ The termination of the herbicide weapons system,

however, did not end the controversy over its use.

Not everyone ^{had} agreed with the ^{original} 1961 decision to send American spray planes to Vietnam. Senior officials in both the State and Defense Departments opposed the program, primarily on the grounds that it would provide the communist world with an excellent propaganda vehicle —predictably accusing the United States of chemical warfare. The American Ambassador to Saigon, Frederick E. Nolting, suggested disquising the spray planes as civilian aircraft and having the Air Force crew members wear "civies," a suggestion rejected by Deputy Defense Secretary Roswell Gilpatric. Roger Hilsman, Deputy Secretary of State for Far Eastern Affairs, and General Lyman L. Lemnitzer, Army Chief of Staff, felt that no advantage could be gained by crop destruction unless the Viet Cong could be totally isolated from the civilian community. Later, when the United States took over the crop program from the Vietnamese, Hilsman warned that "the underfed people of South East [sic] Asia would never understand this act by a country with surplus food."¹²

When the spray planes were finally dispatched to Vietnam, Defense Department officials went to great lengths to avoid publicity, even to the extent of parking the aircraft in the access-limited security area of the Vietnamese Premier's "anticoup" squadron at the Saigon airport. American crewmen had to sign a statement promising not to divulge their mission and they were briefed that in event of their capture, the American government would deny their status. American aircraft on crop destruction missions ^{were} ~~were~~ ^{equipped with} Vietnamese Air Force insignia rather

than their own. Again, Hilsman disagreed with the secrecy policy, arguing that the United States was too concerned about the political costs of a justified violation of the Geneva Accords and that the President was too concerned about adverse press reaction. Secretary of State Dean Rusk also urged that the mission be publicized, although he wanted the announcement to come from the Vietnamese government, emphasizing that the herbicide program was under their control and at their request.¹³

Not unsurprisingly, the strongest initial reactions came from those elements against whom the operation was directed, the Viet Cong and their supporters, the North Vietnamese. The United States and South Vietnam were accused of "'impairing [the] health of tens of thousands of people' by chemical warfare."¹⁴ English language broadcasts from Hanoi regularly reported that "poison sprays" were causing skin eruptions, hemorrhaging, paralysis, blindness, and even death among exposed animals and people. At various "world conferences," North Vietnamese experts testified to the adverse physical and environmental effects of the chemicals used. In 1966, "Joseph Mary Ho Hue Ba, Catholic representative of the National Liberation Front, charged that the U.S. use of defoliants and herbicides was killing newborn babies."¹⁵

The Soviet Union echoed the accusations against the United States. The Soviet newspaper Izvestia frequently reported that the United States Air Force was using "poison gas" in South Vietnam and Tass, the Soviet press agency, called for an international investigation of American use of poisonous substances against civilians. Cuba's criticisms were

graphically illustrated by issuing a series of postage stamps entitled "Genocide in Vietnam." One of the stamps showed the bodies of several Vietnamese, presumably dead or dying due to chemical warfare by the United States.¹⁶ Russian propaganda peaked in 1971 when Soviet Engineer Major L. Nechayuk claimed that during the "perfidious operation . . . massive spraying killed all forms of life—plants, birds, animals, and even human beings." Calling them "barbarians," Nechayuk charged the Americans with flagrant violation of the elemental standards of human conduct and international law, citing the Geneva Protocol of 1925.¹⁷

Not all the criticism of American policies came from individuals in the communist bloc countries. Lord Russell of Great Britain compared the use of napalm and herbicides in Southeast Asia to the illegal and immoral warfare of Germany and Japan in World War II. The head of the Japanese Science Council's Agronomy Section, Yoichi Fukushima, claimed that "appalling inhumane acts" had ruined over 3.8 million acres of land, destroyed more than 13,000 livestock, and killed over 1,000 peasants in Vietnam.¹⁸ In 1966, Lord Russell sponsored an "international war crimes tribunal" to "try" American political leaders in absentia for various crimes, including "the use of poison chemicals against innocent victims."¹⁹ The trial, paneled by leading world leftists, served merely as a reiteration of communist propaganda. "Documentary evidence" promised by Russell proved to be no more than unsubstantiated statements by several Vietnamese and the diary of a North Vietnamese "doctor."²⁰

Reports of the trial, however, helped refocus the attention of

American scientists on the herbicide issue. The 1962 publication of Rachel Carson's Silent Spring had aroused widespread apprehension over the biological and ecological impact of pesticides, but she also warned of unknown consequences of using weedkillers—"The full maturing of whatever seeds of malignancy have been sown by these chemicals is yet to come."²¹ Carson was referring to common domestic weedkillers, but two of the chemicals she specifically mentioned, 2,4-D and 2,4,5-T, were primary ingredients in the military herbicides used in Vietnam.²²

By 1966, the American scientific community was becoming equally concerned over the extensive use of herbicides, particularly in Vietnam. Numerous articles and letters appeared in publications such as Scientific Research, Scientific American, Environment, and the Bulletin of the Atomic Scientists. Both the American Association for the Advancement of Science (AAAS) and the Society for Social Responsibility in Science sent investigatory teams to Vietnam. The subsequent reports of these teams were critical of the impact of herbicidal use in Southeast Asia, and the AAAS Herbicide Assessment Commission recommended further in-depth, long-range study.²³

The United States government also funded several special herbicide investigations. In response to the growing world-wide controversy, the Department of Defense contracted for an assessment of the ecological impact of herbicides by the Midwest Research Institute in 1967. This study, however, only involved state-of-the-art knowledge review, without actual visitation to Vietnam or experimental duplication of effects.²⁴ MRI also apparently was not privy to most of the current,

classified data available from actual operations in Vietnam. As a result, MRI's report provided little new information.

In February 1968, Dr. Fred H. Tschirley of the Department of Agriculture made a trip to Vietnam to study the ecological results of the defoliation program. Although Tschirley observed some ecological damage, he recommended a scientific long-range study as the only method of accurately evaluating results.²⁵ The agriculture expert's trip did not include any investigation of the biological aspects of human exposure to herbicides.

In 1969, continuing reports that some birth defects among Vietnamese women could be attributed to contact with defoliation agents led the National Cancer Institute to commission a special study of possible carcinogenic (cancer-producing) and teratogenic (fetus-deforming) properties of herbicides. This investigation indicated that in the manufacturing process of one of the defoliant chemicals, 2,4,5-T, the active ingredient produced a trace contaminant which could be associated with a significant increase in fetus abnormalities among laboratory animals. As a result of this initial study, the Defense Department directed that herbicide "orange," which contained this chemical, be limited to use only in "areas remote from population."²⁶ When a following study by the National Institute of Environmental Health Sciences supported the Cancer Institute's findings, the use of "orange" was suspended indefinitely. While the remaining herbicides used in Southeast Asia did not contain 2,4,5-T, the unfavorable press associated with the birth defect issue, coupled with the generally

unfavorable political view of the war overall, caused the Defense Department to withdraw the entire aerial spray operation within the year.²⁷

Ordinarily, elimination of the program would have been the end of the story, except for scholarly studies by historians and ecologists. By the mid-1970s, however, American veterans of Vietnam began complaining in increasing numbers of various physical and genetic problems, which they attributed to exposure to 2,4,5-T, popularized in the media as "Agent Orange." Initially, the Veterans Administration denied these disability claims, but the numbers of claimants and widespread publicity eventually forced recognition that a problem might exist.²⁸ The resolution of the issue depended on two things: scientific determination of the long-term health effects of exposure to "Agent Orange" and adequate documentation of the nature and degree of this exposure on the part of individual veterans. The former was difficult and requires an extended period of time; the latter was almost impossible.

Spurred on by the filing of several lawsuits by various veterans groups, hearings have been held by Congress, epidemiological studies have been mandated, and a White House interagency work group formed to coordinate and monitor the agency efforts. These efforts continue today. The most promising study is the review of the health and physical state of the nearly 1200 RANCH HAND veterans, whose herbicide exposure can be reasonably well documented. Also underway are Veterans Administration screening tests, a study of birth defects by the Center for Disease Control, development of an epidemiological study of

veterans by the UCLA School of Public Health, and a number of follow-up investigations of various industrial accidents resulting in herbicide exposure of workers.²⁹

None of these efforts will provide an immediate answer to the questions which have been raised; indeed, it is likely that science will not be able to answer all of the questions. Regardless of the eventual findings, some will dismiss them as biased, irrelevant, or inconclusive. More than ten years after the last lumbering transport plane laid a fine mist of chemicals over the Vietnam jungle, the public controversy shows no sign of abating. Perhaps more importantly, media headlines about "chemical warfare" and "Agent Orange" may have obscured the topic of military effectiveness. Ecological concerns over the death of trees or denuding of acreage have masked the question of how many American and Vietnamese lives were saved by the project. It is ironic that a unique weapon of war, designed to cause neither wounds nor death to people, should have generated so much controversy. The issue of herbicides as a weapon, like the Vietnam War itself, has been clouded by emotionalism, propaganda, and politics, and can be expected to so continue for the foreseeable future.

Notes

¹ This paper presents material related to the author's dissertation, "RANCH HAND: Herbicide Operations in Southeast Asia," currently in preparation. The term "defoliation" is used in the broader sense to include both systemic and desiccant chemical actions on vegetation. The author is indebted to Professor Roger A. Beaumont of Texas A&M University for comments on an earlier draft of this paper.

² Richard Burt, before the Subcommittee on Arms Control, Oceans, International Operations, and Environment of the Senate Foreign Relations Committee, 10 November 1981, "Use of Chemical Weapons in Asia," reprinted in US, Department of State, Bureau of Public Affairs, Current Policy No. 342, [1].

³ Thucydides, History of the Peloponnesian War, 4 vols., trans. by C. Forester Smith, Leob Classical Library (New York: G. P. Putnam's Sons, 1919-1923), 1:401, 2:385; John B. S. Haldane, Callinicus: A Defense of Chemical Warfare (New York: E. P. Dutton, 1925), 8.

⁴ Wesley F. Craven and James L. Cate, eds., The Army Air Forces in World War II, vol. 5: The Pacific: Matterhorn to Nagasaki: June 1944 to August 1945 (Chicago: University of Chicago Press, 1953), 614-17; David E. Lilienthal, The Journals of David E. Lilienthal, vol. 2: The Atomic Energy Years, 1945-1950 (New York: Harper & Row, 1964), 199; Gale E. Peterson, "The Discovery and Development of 2,4-D," Agricultural History 41 (1967), 246-252.

⁵ "Trip Report - South Vietnam, December 1961, by Dr. J. W. Brown," in US, Department of the Army, Chemical Corps, "Vegetational Spray tests in South Vietnam, Supplement," Project 4B11-01-004, April 1962, 55-57; For references to defoliation in Malaya, see Mark C. A. Henniker, Red Shadow Over Malaya (Edinburgh: Wm. Blackwood & Sons, 1955), 180; Richard L. Clutterbuck, Long, Long War: Counterinsurgency in Malaya and Vietnam (New York: Praeger, 1966), 160; Anthony Short, The Communist Insurrection in Malaya, 1948-1960 (New York: Crane, Russak & Co., 1975), 375, 455-56.

⁶ Oral History Interview with Carl W. Marshall, first commander of the RANCH HAND, 1961-62, by author, 10 October 1981, Fort Walton Beach, Florida; History of the Tactical Air Command, January-June 1962, 1:645-46, K417.01, USAF Collection, Albert F. Simpson Historical Research Center, Maxwell AFB, Alabama (hereafter cited as AFSHRC); James W. Brown, "Vegetation Spray Information," February 1962, in US, "Vegetational Spray Tests," 115-24.

⁷ George T. Adams, typescript of RANCH HAND operations, 1961-64, [August 1964], personal files of John R. Spey, Fort Walton Beach, Florida; Interview, Carl Marshall; History of the 2d Air Division, July-December 1964, 2:49-51, K526.01, AFSHRC.

⁸ Data extracted from unit historical reports, 1962-1967, in History of the 315th Air Commando Wing, K-WG-315-HI, and History of the 834th Air Division, K-DIV-834-HI, AFSHRC. See also, applicable dates in K-SQ-A-CMDO-12-HI and K-SQ-A-CMDO-309-HI, AFSHRC. Almost every newspaper article about RANCH HAND after 1964 mentions the high rate of "hits" taken by the aircraft. It is estimated that the spray planes are fired on between ten and twenty times for each "hit" actually taken.

⁹ "Ranch Hand Herbicide Operations in SEA," 13 July 1971, prepared by Captain James R. Clary, 24-25, M-38245-47a-S, Classified Documents Collection, Air University Library, Maxwell AFB, Alabama; 834th Air Division Study, "Ranch Hand Study FY's 68-69-70," 12 September 1967, 6, CH-4-12, AFSHRC; "USMACV Year-End Review of Vietnam, 1968," 60, CH-16-1, AFSHRC; Robert A. Shade, "Management of Department of Defense Vietnam Herbicide Program" (M.S. thesis, George Washington University, 1969), 48-51.

¹⁰ Data extracted from 834th Air Division Reports, Subject: Tactical Airlift Performance and Accomplishments, for applicable dates, History of the 834th Air Division.

¹¹ 834th Air Division Report, June 1970; Message, subject: Herbicide Operations, CSAF to CINCPAC, 022006Z Feb 70; Message, COMUSMACV to 7AF, subject: Herbicide Operations, 170300Z Apr 70; History of the 310th Tactical Airlift Squadron. "A" Flight, 1-31 January 1971, in K-WG-315-HI, AFSHRC.

¹² American Embassy Saigon, Telegram No. 448, 7 October 1961, National Security File, Countries, Vietnam, Vol. I, Box 193-94, John F. Kennedy Library, Boston, Massachusetts (hereafter cited as JFK); Memorandum for the President from Roswell Gilpatric, 21 November 1961, National Security File, NASM 115, Defoliant Operations, Vietnam, Box 332, JFK; Roger Hilsman, To Move A Nation: The Politics of Foreign Policy in the Administration of John F. Kennedy (Garden City, NY: Doubleday, 1967), 442-43; Memorandum for General Taylor from General L. L. Lemnitzer, Chairman, JCS, 12 October 1961, reprinted in The Pentagon Papers: The Defense Department History of United States Decisionmaking on Vietnam, 4 vols. (The Senator Gravel Edition, Boston: Beacon Press, 1971), 2:650; Telegram, GENEVA 15 to CINCPAC, 3 PM, 9 July 1962, cited in CINCPAC Command History, 1962, 185-86 (quotation), K712.01, AFSHRC.

¹³ Message, PACAF to 5th AF, "Defoliant Project," 300134Z Nov 61, copy in Fifth Air Force in the Southeast Crisis (A Sequel), 30 January 1962, prepared by Arthur C. O'Neill, K730.04-22, AFSHRC; Interview, Carl Marshall; Joint State/Defense Outgoing Telegram No. 556, 7 November 1961, National Security File, Countries, Vietnam, Vol. II, Box 194-96, JFK.

¹⁴ New York Times, 9 April 1963, 12.

¹⁵ Broadcast extracts, in Appendix C, US., Department of the Navy, Commander in Chief Pacific, Scientific Advisory Group, "A Review of the Herbicide Program in South Vietnam," by William F. Warren, Scientific Advisory Group Working Paper No. 10-68, August 1968, M-42294-1, AFSHRC; Seymour M. Hersh, Chemical and Biological Warfare, America's Hidden Arsenal (New York: Bobbs-Merrill, 1968), 154 (quotation).

¹⁶ Ibid., 145; "Washington Rebuts Poison Gas Charge," New York Times (Western Edition), 11 March 1963, 4; "USSR Calls for International Probe of Reports of Chemical Warfare: US Says Chemicals Used to Destroy Foliage are not Injurious to Man," New York Times, 27 April 1963, 2; "Issued by Cuba," New York Times, 9 December 1966, 4.

¹⁷ L. Nechayuk, "Weapons of 'Civilised' [sic] Barbarians," Soviet Military Review 8 (1971), 52-53.

¹⁸ Editorial, "Vietnam Policy Protested, Russell Holds Our Aim is to Block Economic Reform," New York Times, 8 April 1963, 46; Fukushima quoted in Carnegie Endowment for International Peace, The Control of Chemical and Biological Weapons (New York: Carnegie Endowment, 1971), 40.

¹⁹ "Sartre on Panel to 'Try' U.S. Leaders," New York Times, 3 August 1966, 2. In addition to Russell and Jean Paul Sartre, French Playwright and novelist, the panel included Simone de Beauvoir, French author; Lelio Basso, Italian lawyer and editor of International Socialist Journal; Lazaro Cardenas, former President of Mexico, 1934-1940; Dr. Josue de Castro, former head of the United Nations Food and Agriculture Organization; and eleven other lesser-known leftists from around the world.

²⁰ "Russell Defends War Crimes Trial," New York Times, 6 October 1966, 46; Dana A. Schmidt, "Genocide is Laid to U.S. at 'Trial,'" New York Times, 8 May 1967, 8.

²¹ Rachel Carson, Silent Spring (Greenwich, Conn.: Fawcett Publications, 1962, 1966), 201.

²² Herbicide "orange" contained an approximately 50/50 mixture of the n-butyl esters of 2,4-D and 2,4,5-T. "Orange II" was the same except for substitution of the isooctyl ester for the n-butyl ester of 2,4,5-T. "Purple" contained roughly 50 percent n-butyl ester of 2,4-D, 30 percent n-butyl ester of 2,4,5-T, and 20 percent iso-butyl ester of 2,4,5-T. "White" was made up of a 1:4 mixture of the trisopropanolamine salts of 4-amino-3,5,6-trichloropicolinic acid (picloram) and 2,4-D. The color code-names were a result of a colored identification stripe painted around the shipment barrels the chemicals came in.

²³ Representative of the articles are Gordon H. Orians and Egbert W. Pfeiffer, "Mission to Vietnam," Scientific Research 4 (9 June 1969), 22ff and (23 June 1969), 26ff; George R. Harvey and Jay D. Mann, "Picloram in Vietnam," Scientist and Citizen (later, Environment) 10 (September 1968), 165-71; Phillip M. Boffey, "Herbicides in Vietnam: AAAS Study Finds Widespread Devastation," Science 171 (1971), 43-47.

²⁴ William B. House, et al., "Assessment of Ecological Effects of Extensive or Repeated Use of Herbicides," Final Report, 15 August-1 December 1967, MRI Project No. 3103-B (Kansas City: Midwest Research Institute, 1967).

²⁵ Fred H. Tschirley, "Defoliation in Vietnam," Science 163 (1969), 779-86.

²⁶ Bryce Nelson, "Herbicides: Order on 2,4,5-T Issued at Unusually High Level," Science 166 (1969), 978; Robert Reinhold, "Scientists Call for Ban on 2 Vietnam Defoliants," New York Times, 31 December 1969, 10.

²⁷ "U.S. Curbs Sale of a Weed Killer," New York Times, 16 April 1970, 29; Nancy Gruchow, "Curbs on 2,4,5-T Use Imposed," Science 168 (1970), 453; William Beecher, "Use of Defoliants in War Suspended," New York Times, 23 June 1970, 1; History of the 310th Tactical Airlift Squadron, "A" Flight, 1-31 January 1971, in K-WG-315-HI, AFSHRC.

²⁸ As of November 1981, 65,000 veterans had undergone Veterans Administration medical screenings and 10,500 had filed for disability. Jerry Harkavy, "VA Offering Free Medical Tests for Agent Orange," Houston Chronicle, 16 December 1981, 2.

²⁹ Alvin L. Young, "Agent Orange at the Crossroads of Science and Social Concern," Research Report No. 2750-81, Air Command and Staff College, Air University, Maxwell AFB, Alabama, May 1981; US, Department of Defense, Assistant Secretary of Defense for Health Affairs, "Department of Defense (DOD) Herbicide Orange Status Report," Press Release, [11 October 1980].

1

DEFOLIATION IN VIETNAM: THE CONTROVERSIAL WEAPON¹

One of the most debated tactics used in the recent Vietnam War, 1961-72, conflict was the use of chemicals to defoliate² trees and destroy crops. Although the herbicide weapons system lasted less than a decade, 1962 to 1971, it aroused intense controversy, both within United States government circles and in the community around the world. Initially the debate raged over the questions of environmental impact and long-term ecological effects of repeated chemical use. Later, the issues of genetic modification and physical injury to human beings became the main concern of opponents.³ More recently, the controversy has been reborn following claims of some American veterans of Vietnam service that contact with certain herbicides has resulted in various physical disabilities. The subject is further confused by current accusations that the Soviet Union has used intentionally toxic chemicals in Laos, Kampuchea, and Afghanistan. Not since the use of atomic weapons in Japan during World War II has a weapon of war aroused so much public interest.

2

Chemical weapons are not new to warfare. The Spartans created poisonous, choking chemical fumes by burning wood saturated with pitch and sulphur during the Peloponnesian Wars, and the Syrian Callinicus helped save the Eastern Roman Empire during the eighth century A.D. with an inflammable chemical known as "Greek fire," a predecessor of the 1942 invention of napalm.³ The best-known chemical weapons, of course, are the poison gases of World War I.

3

Nor is the idea of using chemical defoliants as a combat weapon a new concept. During World War II, United States' forces in the Pacific theater used phosphorus munitions to expose Japanese cave and tunnel entrances by burning away

4 natural and artificial vegetable cover. Army chemical experts at Camp Detrick, Maryland, also experimented with the use of plant growth-regulating compounds, although none were used in combat due to official concern that the United States might be accused of conducting chemical warfare in violation of President Roosevelt's pledge that we would not be the first to do so. In the chemical equivalent of "swords into plowshares," one of the Camp Detrick developments, the highly effective 2,4-dichlorophenoxyacetic acid (2,4-D), found wide application in the postwar agricultural market as a weed control agent.⁴

5 Not until the 1960s did ^{that} ~~the~~ ^{line of} ~~World War II~~ experimentation ^{produce a} ~~lead to~~ a ~~viable~~ military weapon. In 1961, the government of South Vietnam was engaged in an increasingly difficult civil war with insurgent forces known as the Viet Cong, a pejorative term coined by the government to refer to communist-backed forces in particular, and to ~~all~~ anti-government opposition in general. The heavily forested terrain of Vietnam afforded the Viet Cong excellent concealment, allowing rapid movement of men and supplies with virtual impunity. Because the Viet Cong depended ^{used} ~~upon the~~ forests to hide ~~th~~ir base camps, infiltration routes, and ambush sites, the Diem government asked for American assistance in developing a chemical program to clear lines-of-communications and expose enemy strongholds. Forerunner of this proposal was the limited defoliation and food control program used by the British in their 1948-1957 campaign against terrorists in Malaya.⁵

6 Following a brief trial program under the Joint US/Vietnamese Combat Development and Test Center in mid-1961, President Kennedy authorized a limited number of specially modified Air Force C-123

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transports to go to Southeast Asia for operational evaluation, under the code-name RANCH HAND. The defoliant chemicals they would use were highly concentrated mixtures of common herbicides already in extensive use in American agriculture and forestry, ^{including} 2,4-0. The aircraft and crews, however, were restricted to defoliation missions only; Vietnamese planes and pilots would fly the crop destruction sorties.

10
For the next two years, RANCH HAND suffered a "stop and go" existence as one committee after another evaluated the program, to see if it was effective. Finally, in mid-1964, RANCH HAND was changed from a temporary duty organization to a permanent unit within the Pacific Air Forces (PACAF) structure, indicating acceptance of the spray concept. Almost immediately afterwards, the spray detachment was assigned ^{primary} responsibility for the formerly all-Vietnamese crop destruction mission, and additional aircraft and crews were programmed into the unit.

11
~~In the first three years, From 1962 through 1964, the United States herbicide effort in Vietnam had increased at a slow, but steady rate—60 sorties in 1962, 107 in 1963, 223 in 1964. In 1965, however, sorties soared to 696 and in 1966 to 2759~~

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Ground force commanders enthusiastically accepted the increased visibility and protection offered by defoliant operations, while government officials cited Viet Cong food shortages as evidence of the effectiveness of the crop destruction program. Requests for herbicide missions soared as increasing numbers of United States ground combat forces were committed to the Southeast Asian conflict.⁷

From a modest sixty sorties dispensing less than fifty-thousand gallons of herbicides in 1962, RANCH HAND flights grew at an annual rate of nearly 300 percent for the next five years. Herbicide operations finally peaked in 1967 with over 6800 sorties dispensing almost five million gallons of chemical. During this period, the spray unit grew from a minimum of two aircraft to an over-sized nineteen-plane squadron, the 12th Air Commando Squadron. Because the UC-123s flew at treetop level and minimum airspeed, they were particularly vulnerable to enemy groundfire. One measure of the effectiveness of the herbicide program was the enemy's efforts to stop the spray planes. By the end of 1967, spray planes had been hit by enemy fire over 2700 times, and the unit had lost six aircraft. Seventeen RANCH HANDS were killed and a high percentage of crew members were wounded at least once—RANCH HAND became known as the most shot at Air Force unit in Vietnam.⁸

Forecasts for 1968 and subsequent years were predicting annual herbicide consumption⁹ in excess of 10 million gallons, an amount in excess of existing industrial capacity. The Department of Defense was forced to take steps to preempt the entire United States production of 2,4-D and 2,4,5-T under the Defense Production Act of 1950, over the objections of the Department of Agriculture and the farm lobby. A 1967 program evaluation indicated that a minimum of thirty-two modified C-123s would be needed to meet planned objectives for the next two years; even so, field requirements for herbicide operations exceeded capacity by 55 percent.¹⁰

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Not everyone agreed with the 1961 decision to send American spray planes to Vietnam. Senior officials in both the State and Defense Departments opposed the program, primarily on the grounds that it would provide the communist world with an excellent propaganda vehicle—predictably accusing the United States of chemical warfare. The American Ambassador to Saigon, Frederick E. Nolting, suggested disguising the spray planes as civilian aircraft and having the Air Force crew members wear "civies," a suggestion rejected by Deputy Defense Secretary Roswell Gilpatric. Roger Hilsman, Deputy Secretary of State for Far Eastern Affairs, and General Lyman L. Lemnitzer, Army Chief of Staff, felt that no advantage could be gained by crop destruction unless the VC could be totally isolated from the civilian community. Later, when the United States took over the crop program from the Vietnamese, Hilsman warned that "the underfed people of ^{South} East sic Asia would never understand this act by a country with surplus food." ¹²

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The Soviet Union echoed the accusations against the United States. The Soviet newspaper Izvestia frequently reported that the United States Air Force was using "poison gas" in South Vietnam and Tass, the Soviet press agency, called for an international investigation of American use of poisonous substances against civilians. Russian propaganda peaked in 1971 when Soviet Engineer Major L. Nechayuk claimed that during the "perfidious operation . . . massive spraying killed all forms of life—plants, birds, animals, and even human beings." Calling them "barbarians," Nechayuk charged the Americans with flagrant violation of the elemental standards of human conduct and international law, citing the Geneva Protocol of 1925.¹⁶

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Reports of the trial, however, helped refocus the attention of the American scientific community on the herbicide issue. The 1962 publication of Rachel Carson's Silent Spring had aroused widespread apprehension over the biological and ecological impact of pesticides, but she also warned of unknown consequences of using weedkillers— "The full maturing of whatever seeds of malignancy have been sown by these chemicals is yet to come."²² Carson was referring to common domestic weedkillers, but two of the chemicals she specifically mentioned, 2,4-D and 2,4,5-T, were primary ingredients in the military herbicides used in Vietnam.²³

By 1966, The American scientific community was becoming equally concerned over the extensive use of herbicides, particularly in Vietnam. Numerous articles and letters appeared in publications such as Scientific Research, Scientific American, Environment, and the Bulletin of the Atomic Scientists. Both the American Association for the Advancement of Science (AAAS) and the Society for Social Responsibility in Science sent investigatory teams to Vietnam. The subsequent reports of these teams were critical of the impact of herbicidal use in Southeast Asia, and the AAAS Herbicide Assessment Commission recommended further in-depth, long-range study.²³

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When a following study by the National Institute of Environmental Health Sciences supported the Cancer Institute's findings, the use of Orange was suspended indefinitely. ^{Wh/1a} The remaining herbicides used in Southeast Asia did not contain 2,4,5-T. ~~however~~, the unfavorable press associated with the 2,4,5-T issue, coupled with the generally unfavorable political view of the war in general, caused the Defense Department to withdraw the entire aerial spray operation within the year.²⁷

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None of these efforts will provide an immediate answer to the questions which have been raised; indeed, it is likely that science will not be able to answer all of the questions. ~~Regardless of the~~ eventual findings, some will dismiss them as biased, irrelevant, or inconclusive.

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(S)?

and can be expected
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→ o Korea

→ o - Ford as a weapon

→ o - air power in any form as technological bullying

○ → o ~~Y~~ program momentum -

→ o - the constant of propaganda - unverifiable

1 → DEFOLIATION IN VIETNAM: THE CONTROVERSIAL WEAPON¹

One of the most debated tactics used in the recent Vietnam conflict was the use of chemicals to defoliate trees and destroy crops. Although the herbicide weapons system lasted less than a decade, 1962 to 1971, it aroused intense controversy, both within United States government circles and in the community around the world. Initially the debate raged over the questions of environmental impact and long-term ecological effects of repeated chemical use. Later, the issues of genetic modification and physical injury to human beings became the focal point of those opposing chemical weaponry. More recently, the controversy has been reborn following claims of some American veterans of Vietnam service that contact with certain herbicides has resulted in various physical disabilities. The subject is further confused by current accusations that the Soviet Union has used intentionally toxic chemicals in Laos, ^{Kampuchea,} and Afghanistan. Not since the use of atomic weapons in Japan during World War II has a weapon of war aroused so much public interest.

2 → Chemical weapons are not new to warfare. The Spartans created poisonous, choking chemical fumes by burning wood saturated with pitch and sulphur during the Peloponnesian Wars, and the Syrian Callinicus helped save the Eastern Roman Empire during the eighth century A.D. with an inflammable chemical known as "Greek fire," a predecessor of the 1942 invention of napalm. The best known chemical weapons, of course, are the poison gases of World War I.

3 →

Nor is the idea of using chemical defoliants as a combat weapon a new concept. During World War II, United States' forces in the Pacific theater used phosphorus munitions to expose Japanese cave and tunnel entrances by burning away

4 natural and artificial vegetable cover. Army chemical experts at Camp Detrick, Maryland, also experimented with the use of plant growth-regulating compounds, although none were used in combat due to official concern that the United States might be accused of conducting chemical warfare in violation of President Roosevelt's pledge that we would not be the first to do so. In the chemical equivalent of "swords into plowshares," one of the Camp Detrick developments, the highly effective 2,4-dichlorophenoxyacetic acid (2,4-D), found wide application in the postwar agricultural market as a weed control agent.

5 Not until the 1960s did the World War II experimentation lead to a viable military weapon. In 1961, the government of South Vietnam was engaged in an increasingly difficult civil war with insurgent forces known as the Viet Cong, a pejorative term coined by the government to refer to communist-backed forces in particular and to all anti-government opposition in general. The heavily forested terrain of Vietnam afforded the Viet Cong excellent concealment, allowing rapid movement of men and supplies with virtual impunity. Because the Viet Cong depended upon the forests to hide their base camps, infiltration routes, and ambush sites, the Diem government asked for American assistance in developing a chemical program to clear lines-of-communications and expose enemy strongholds. Forerunner of this proposal was the limited defoliation and food control program used by the British in their 1948-1957 campaign against terrorists in Malaya.

6 Following a brief trial program under the Joint US/Vietnamese Combat Development and Test Center in mid-1961, President Kennedy authorized a limited number of specially modified Air Force C-123

9 → transports to go to Southeast Asia for operational evaluation, under the code-name RANCH HAND. The defoliant chemicals they would use were highly concentrated mixtures of common herbicides already in extensive use in American agriculture and forestry, ^{including} 2,4-0. The aircraft and crews, however, were restricted to defoliation missions only; Vietnamese planes and pilots would fly the crop destruction sorties.

10 → For the next two years, RANCH HAND suffered a "stop and go" existence as one committee after another evaluated the program to see if it was effective. Finally, in mid-1964, RANCH HAND was changed from a temporary duty organization to a permanent unit within the Pacific Air Forces (PACAF) structure, indicating acceptance of the spray concept. Almost immediately afterwards, the spray detachment was assigned ^{primary} ~~initial~~ responsibility for the formerly all-Vietnamese crop destruction mission, and additional aircraft and crews were programmed into the unit. ←

11 → In the first three years, From 1962 through 1964, the United States herbicide effort in Vietnam had increased at a slow, but steady rate—60 sorties in 1962, 107 in 1963, 273 in 1964. In 1965, however, sorties soared to 696 and in 1966 to 2759.

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From a modest sixty sorties dispensing less than fifty-thousand gallons of herbicides in 1962, RANCH HAND flights grew at an annual rate of nearly 300 percent for the next five years. Herbicide operations finally peaked in 1967 with over 6800 sorties dispensing almost five million gallons of chemical. During this period, the spray unit grew from a minimum of two aircraft to an over-sized nineteen-plane squadron, the 12th Air Commando Squadron. Because the UC-123s flew at treetop level and minimum airspeed, they were particularly vulnerable to enemy groundfire. One measure of the effectiveness of the herbicide program was the enemy's efforts to stop the spray planes. By the end of 1967, spray planes had been hit by enemy fire over 2700 times, and the unit had lost six aircraft. Seventeen RANCH HANDS were killed and a high percentage of crew members were wounded at least once—RANCH HAND became known as the most shot at Air Force unit in Vietnam.

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