

The Da Nang Harbor Report



THE CONTAMINATION OF DA NANG HARBOR: Blue Water Navy and Direct Exposure to Herbicides in Vietnam

Co-Authors:

John Paul Rossie, MA, MS, MBA

Wallace M. Ward, QE

Blue Water Navy Vietnam Veterans Association;

PO Box 1035

Littleton, CO 80160-1035

www.BlueWaterNavy.org

THE CONTAMINATION OF DA NANG HARBOR: Direct Exposure to Herbicides in Vietnam

John Paul Rossie and Wallace M. Ward
Blue Water Navy Vietnam Veterans Association

Executive Summary

Presumption of exposure to herbicides in Vietnam provides almost all veterans of the Vietnam War with Health Care and Compensation from the Department of Veterans Affairs (DVA). This provides life-long medical benefits and lost income compensation to those who suffer disabilities from the complications related to herbicide exposure. The largest group not receiving these benefits is personnel of the Navy, Coast Guard and Marine Corps who served offshore Vietnam during the period 1962 through 1975. Despite its charter to keep a constant vigil to protect all Vietnam veterans from newly discovered medical problems associated with herbicides, the DVA refuses to provide offshore personnel with their just benefits.

One of the chief modes of contamination by herbicides was inhalation of vapors before and after the herbicide was sprayed across the countryside of Vietnam. Under the right conditions, vapors were known to kill vegetation at extreme distances from the point of herbicide release.

Ports, bays and harbors became collection points for the residuals of herbicide that washed from the inland country via rivers and streams to the sea. Da Nang Harbor had additional herbicide input to its water, given that a major air base for the herbicide spraying project was less than a mile from the harbor's edge. Vast amounts of diluted and undiluted herbicides, along with their contaminants, entered the harbor waters at Da Nang. This provided a continuous replenishment of vaporizing herbicide, including Agent Orange and its byproduct dioxin, one of the most toxic substances known.

When ships from offshore entered Da Nang Harbor, they were surrounded by a floating mass of dioxin-laden herbicide clinging to oil, particulates, and debris on the water's surface. The crews of these ships were exposed to the toxic atmosphere that was more likely than not contaminated with dioxin molecules arising from surface waters around their ships.

DVA appears to adhere to a biased treatment of offshore personnel, taking any opportunity to deny those benefits related to exposure to herbicides and their contaminants. In open public comments, senior DVA staff has stated there is no scientific or medical evidence, thus no justifiable reason, for withholding those benefits. In Update: 2008, the Institute of Medicine (IOM) reviewed existing medical and scientific information on the issue of separating offshore personnel from their herbicide-based benefits and reported in strong and direct terms that offshore personnel should be included in presumptive exposure to herbicides as is applied to personnel who served on land in Vietnam. In a blatant irrational move, the DVA chose to ignore the IOM recommendation. They chose to lock out offshore personnel from receiving those benefits for at least two years by ordering an unneeded and redundant study of the relationship between herbicides and offshore personnel.

This paper presents data that clearly shows the logical and robust medical and scientific data that begs acknowledgment by the DVA of the inevitable exposure of offshore personnel to the illnesses related to exposure to herbicides and their contaminants when they were situated in Da Nang Harbor. **resumption**

One of the signature wounds of the Vietnam War is the dioxin-induced panoply of Agent Orange health issues. This was addressed by Congress in the Agent Orange Act of 1991. Knowing exactly who had been exposed to herbicides during that War was virtually impossible due to an inability to match up troop movements relative to live spray missions and later troop movement through those sprayed areas.

To ensure that everyone in the Vietnam Theater of Operations was included in the possibility of having been exposed to any of the herbicides and their contaminants, the Agent Orange Act of 1991 employed a concept called "presumption of exposure." This mechanism allowed all personnel in the Theater of Operations to

assume they had been exposed to an herbicide at some time or other, while serving in the Army, Navy, Coast Guard, Air Force or Marines, as long as there was proof of an individual actually having been in the Theater of Operations noted in some official documentation, and as long as there was no documentation to the contrary.

The Theater of Operations typically refers to "the combat zone". The proof for having been in the War Zone was originally specified as an individual's receipt of the Vietnam Service Medal (VSM) or, for earlier participation in the War, the Armed Forces Expeditionary Medal. The employment of blanket "presumption" left a possibility that a few false disability claims may slip through; however, as a trade-off, all legitimate claims would be recognized. The only valid claims would be from individuals who had provable chronic disabilities from diseases designated by The Department of Veterans Affairs (DVA) as related to herbicides and their contaminants.

A review of definitions for some key words that underlie this report is warranted. EXPOSURE defines the state in which an individual has come into an environment where contact with a toxin is possible. In order to be exposed to a toxin, an individual would need to be in an area that surpassed a measurement considered as a safe level for their health. Actual contact may or may not take place during exposure. CONTAMINATION refers to the state in which an individual has actually come into contact with a toxin. Their bodies have absorbed some measure of the toxin and it has been transported to the inner workings of that living organism. Actual poisoning is contamination that takes place when a bio-system shows signs of the toxin working its negative affects.

Not everyone who is exposed to a toxin becomes contaminated. Not everyone who has been contaminated will show signs of ill health caused by the toxin. There is a vast range in every organism's capability to fight off or otherwise suppress and not be affected following contamination. Some individuals can remain relatively healthy when contaminated by a certain toxins, while others exposed to the same amount, or less, may sicken and even die within a relatively short period of time, given that their bodies processed the toxin contamination differently. (52)

Toxin poisonings present in far more ailments than the list acknowledged by DVA. In fact, an obvious first stage of dioxin poisoning can be acute immuno-suppression; however, the possible results of that condition are not all on the DVA's list. (38) Following the breakdown of the body's ability to fight off diseases because of a highly diminished ability to produce protective antibodies, the organism is left defenseless against the formation of cancers, diabetes and other illnesses and diseases, all the result of having a compromised immune system. Toxins weaken or destroy a body's immune system. Additionally, some toxins, like dioxin, can lie dormant in a body's fat cells and not do any major damage for decades after contamination when they then emerges with persistent and serious diseases that typically do not respond to conventional treatments. (37) (48) (63)

Many who have been contaminated suffer a wide range of generally shared but not particularly life-threatening symptoms such as: Irritable Bowel Syndrome (IBS); lactose intolerance; general joint and muscle pain; fibromyalgia; chronic fatigue; polymyalgia rheumatica; rheumatism, rheumatoid arthritis; deterioration of the teeth; loss of hair on the legs to the knee; sleep apnea; and a severely suppressed immune system which makes it difficult to fight off infections that the general population tends to weather with only minor complaints. Many of these symptoms have been researched and documented, as well as peer reviewed, but little of that work has been done in America, and fewer have been acknowledged by the DVA as symptoms of herbicide contamination. (40) (41) (42) (48) (51)

The DVA was given the task, by the Agent Orange Act of 1991, of constantly monitoring the scientific and medical information that could connect diseases of Vietnam veterans with their service in Southeast Asia. Some people have erroneously read the directives of the Agent Orange Act as giving the IOM a 'sole source provider' role of this information. They further assume the Secretary and his various departments can sit back without pursuing any medical evidence themselves. I suggest they re-read the Act carefully, because that is far from true. (53)

You will hear the term Ranch Hand used throughout this paper. The Ranch Hand Project consisted of the planes and pilots that were directly involved in spraying several types of herbicides across the vast ecosystems of Southeast Asia.

Sections within this paper quote liberally from military and industry sources and within some of those quotes are edits we have made to otherwise direct quotations. These sources are Primary Data containing some of our own observations. We have attempted to acknowledge all areas quoted directly from primary sources to avoid unintended plagiarism.

A variety of herbicides were used in Vietnam. They include Agents Orange, Blue, Green, Pink, Purple and White, named for the colored identification band around their containers. The most widely used of these agents was Agent Orange, a 1:1 mixture of the n-butyl esters of 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T). An unintended but deadly byproduct of the manufacturing process for 2,4,5-T is 2,3,7,8-tetrachlorodibenzo-para-dioxin (TCDD), commonly referred to as dioxin. It is one of many types of dioxin. Dioxins are one of the most toxic poisons and carcinogens ever created. (1) The amount of TCDD that resulted when manufacturing 2,4,5-T could be somewhat regulated by a slower manufacturing process with more regulated heat control. However, given that this translated into more time and expense during production, more 'rapid' production ensued and the dioxin content of Agent Orange used in Vietnam was extremely high. "Agent Orange/ dioxin" has become a catch phrase for many of the ensuing medical problems that came out of the Vietnam War, some still unexplained. The other herbicides and chemicals may well be responsible for certain of the symptoms, and therefore some of the resulting deaths and disabilities veterans have faced. (43) The 2,4,5-T and 2,4-D were poisons in and of themselves. The addition of TCDD simply made things much worse. For this analysis, we will assume that Agent Orange (AO) and dioxin were the culprits of the problems we discuss.

Given that herbicides were used in Vietnam to destroy vegetation, including crops and to defoliate triple canopy jungle cover, the military used herbicides at strengths up to 27 times greater than the manufacturer's recommendation for domestic applications. (1)

Vaporization

With very high dioxin content in the herbicide solution, the vapors given off by open Agent Orange containers, as well as vapors from its presence in the environment after spraying, was in itself eventually, literally, deadly. In instances where Agent Orange could be smelled, harmful vapor was present and exposure by inhalation was occurring. Even with the final mixture of 50-50 Agent Orange and diesel fuel, fumes from that mixture were still lethal. Reports were filed regarding vapor that killed plants and trees a significant distance away from the source. This fact was highly important for anyone who found themselves in a situation where they were surrounded by vaporizing AO but had no respiratory protection or no immediate escape. A perfect example of this was a sailor on the deck of a ship anchored in Da Nang Harbor. Floating on the surface all around his ship were the fresh, constantly replenished and active dioxin molecules clinging to floating oil or debris and releasing deadly fumes all the while. (9) Undoubtedly, dioxin from the Ranch Hand site at the northern sector of the Da Nang air base, where AO was stored and loaded onto the spray planes, was transported by runoff from spills and wash-down areas into drainage pathways that terminated in Da Nang Harbor. (13)(45)

The terrific aural strength of the raw herbicide in the 55-gallon drums was, more likely than not, overwhelming. There are well documented instances where the mere vapors of the chemical, a process referred to as volatilization, were enough to kill plant life, including trees, without having to actually apply the Agent Orange to these plants or trees. Many soldiers and sailors who were near previously sprayed areas reported they could identify by smell the residuals of an AO spray mission, including its presence in water. There were many on board ships that could smell the same residuals in the ship's potable water. A report dated 25 Oct 1968 concluded that many "empty" barrels in a single location identified vapor as the "highly probable" cause of damage and death to trees and crops. The US Military often expressed a need for the South Vietnam Army to more closely control distribution of "empty" drums. (10) A Trip Report from August, 1969 states "volatilization of the residual herbicide has undoubtedly caused considerable damage to shade trees, fruit trees and other desirable vegetation" in the Dan Nang area. (29)

Is the likelihood of exposure by vapors being given too much emphasis? No, absolutely not. Regardless of how strongly the Air Force and other involved entities try to downplay this aspect, documentation tells another story. In 1979, the Air Force was requested to prepare for the DoD a report identifying the most likely criteria by which

military personnel could have been exposed to dioxin. Three modes were given, and two of them involved the inhalation of vapors. These three modes were reported as:

1. *Percutaneous absorption and inhalation of vapors/aerosols by direct exposure to sprays.*
2. *Percutaneous absorption and inhalation of vapors by exposure to treated areas following spray application, and*
3. *Ingestion of foods contaminated with the material.* (62)

In a report of 31 Oct 1968 by Col. Moran, Chief Chemical Operation Division, MACV, he reiterates the power of plant damage from vapors arising from what were believed to be empty barrels. "Although supposedly empty, these drums could contain small amounts of herbicide which, when vaporized, would be sufficient to cause damage to the highly susceptible vegetables plants. These drums were noted in the hamlets being used for trash containers and water barrels." (9)

"Volatilization from soil surfaces during warm, summer months may be a major mechanism by which TCDD is removed from soil." This also accounts for a high percentage of ambient atmospheric saturation by TCDD on hot, humid days. This describes the majority of days along the coast of Vietnam throughout the year. If these vapors were able to do that to plants, they were surely a danger to other 'breathing' organisms. The quantity of Agent Orange flown out of Da Nang produced a staggering number of 'allegedly' empty barrels. These barrels were definitely not "empty." (14)

A Memorandum dated 31 Oct 1968 identifies problems with empty barrels releasing vapors that were "unquestionably a cause" of dead vegetation. It was officially concluded that in areas where the damage was not attributable to leaks from the airplanes or other direct contact with the herbicide, fumes were the direct cause of extensive damage to plant life. (31)

As stated by one Canadian researcher, "All herbicides can drift as spray droplets, but some herbicides are sufficiently volatile to cause plant injury from drift of vapor (fumes). ... Vapor drift occurred when a volatile herbicide changes from solid or liquid into a gaseous state..... Herbicide vapor may drift farther and over a longer period of time than spray droplets. spray droplets can move over two miles under certain environmental conditions..." (32)

This conclusion is of major importance. This is essentially 'death at a distance'. Without the actual, physical act of applying an herbicide to an area, plant life within a specific location was affected, and even killed, through volatilization, arising from another area possibly two miles away. This is documented in military records. This expands the direct exposure of Agent Orange to areas where no spraying actually took place. It strongly indicates that the harbor at Da Nang was a toxic basin dangerous to all organisms (plant, animal and human) that 'breathed'.

What are EPA's drinking water regulations for dioxin?

In 1974, Congress passed the Safe Drinking Water Act. This law requires EPA to determine the level of contaminants in drinking water at which no adverse health effects are likely to occur. These non-enforceable health guidelines, based solely on potential health risks and cumulative exposure over a lifetime with an adequate margin of safety, are called maximum contaminant level goals (MCLG). Contaminants are any physical, chemical, biological or radiological substances that somehow find their way into the water system.

From an EPA web site, we learn the MCLG for dioxin is zero. EPA has set this level of protection based on the best available science to prevent potential health problems. EPA has set an enforceable regulation for dioxin, called a maximum contaminant level (MCL), at 0.00000003 mg/L or 30 ppq (30 parts per quadrillion or 30×10^{15}). MCLs are set as close to the health goals as possible, considering cost, benefits and the ability of public water systems to detect and remove contaminants using suitable treatment technologies.

The Phase V Rule, the regulation for dioxin became effective in 1994. The Safe Drinking Water Act requires EPA to periodically review the national primary drinking water regulation for each contaminant and revise the regulation, if appropriate. EPA recently reviewed dioxin as part of the Six Year Review and determined that the zero MCLG and 0.00000003 mg/L or 30 ppq MCL for dioxin are still protective of human health. (2)

Given this MCLG announced by the EPA, it is highly unlikely that anyone who served in the Da Nang area, with

boots on ground or temporarily in port from offshore duty, was not exposed to herbicides and their contaminants. It is just as unlikely to assume that reports of over 3,000 gallons of Agent Orange dumped from spray planes directly into the water of the South China Sea would not be considered as 'applying Agent Orange to the water'. Given that the oil mixture would float, this would contribute contamination to offshore sea water. This report of only 3,000 gallons being dumped by spray planes into the ocean water surrounding Vietnam is intuitively far too low an amount in this authors' mind and probably exhibits the sloppiness of military paperwork and record keeping. We won't venture a guess as to what that real number is, but over the period of 10 years, it is probably many times that amount. Any ship passing through such an area would scoop this slowly dispersing mixture into their intake water and would be hard pressed to come anywhere near the EPA's designated safe level. (20)

Additionally, there are notarized documents from sailors who literally saw Ranch Hand aircraft spraying directly onto the water of Da Nang harbor as the planes moved from spraying vegetation on the north side of the harbor to Monkey Mountain on the south side of the harbor without shutting down their spray system. In the swamps and mangrove thickets of the Special Rung Sat Zone, just to the north of Vung Tau Harbor, the water was deep enough for patrol boats, mine sweepers and even Destroyers. This area never dried up and was contiguous with the waters of Vung Tau Harbor. These examples should put an end to the erroneous rumors that all herbicide was sprayed on land, and none was ever sprayed on the water. (35)

Knowing what we do about the location and amount of Agent Orange spread around Da Nang city and harbor, it is hard to imagine that the safe EPA level existed anywhere in that area at any time between 1962 and 1975. It is more likely true than not personnel in those areas were exposed to many times in excess of the minimum safe level for dioxin in drinking water. Presumptive exposure may apply to other areas of Vietnam. However, the certainty of direct exposure surely applies to the entire Da Nang area, both the city and harbor.

Here we may have the proverbial "smoking gun" in the question of whether offshore personnel were exposed to dioxin during their tour of duty in Southeast Asia. They did if they ever entered into Da Nang Harbor. There is no mathematical trickery that can save these personnel. They were all exposed to a degree of guaranteed contamination, which is what the VA considers to be "Direct Exposure."

Agent Orange Research Projects

U.S. Studies

Following a study conducted in 1989 and published in 1990 by the Center for Disease Control (CDC), it was concluded that Vietnam veterans had a higher incidence of cancer and other fatal or disabling maladies than the general public. The "Selective Cancers Study" of 1990 concluded that the offshore water-based military personnel of the Vietnam War had a higher incidence of non-Hodgkins Lymphoma than those who served during the Vietnam War on the land. (54) After these findings, the United States appears to have severely restricted further research on this subject. Other than a major boondoggle study conducted by the Air Force, which has been proven to be an elaborate and fraudulent hoax, there were very few other significant studies into this issue by U.S. Government-funded agencies. (46)

One theory has it that as far back as 1970, it was evident that the United States Government wanted to limit information regarding the dangers of their recent rampage using Chemical Warfare agents, and abruptly limited any acknowledgment that dioxin in particular spread beyond the physical boundaries of Vietnam, especially by water. It is presumed that any acknowledgement of this would put the United States at significant global liability for damage to fish and other sea products which would destroy the livelihood of tens of thousands of workers from several nearby Asian countries that depended heavily on the sea for food source and commercial livelihood. In other words, the U.S Government decided that it was better to remain silent than to warn the world of a major environmental catastrophe that threatened the health and life of the Asian people and all the markets to which Asian fisheries sent their products. As we've learned more over the intervening years, the impact of herbicide use in the 1960s and 70s has affected the global population of man, animals and plant life. It is possible that there has never been a more serious threat to global health than the collective silence surrounding this issue of Agent Orange. Destruction and death by silence is the legacy of Vietnam and is the primary sin that has damned the leaders of American into the present day and into our present wars. (55)

The U.S. government adamantly claims that the herbicides used in Southeast Asia were not weapons of Chemical Warfare. The U.S. government has a long way to go in facing and admitting the truth about many aspects of the Vietnam War, even 40 years after the events. It is a sad state of affairs when our government refuses to acknowledge its misjudgment in just how potent the herbicides used in Vietnam actually were. It doesn't help their case at all when one finds that a "Chemical Warfare Officer" was a member of the MACV staff in Saigon in the 1960s. (64)

Australian Studies

The Australians were U.S. allies during the Vietnam War, committing land, sea and air troops and equipment. They too noticed an inexplicably higher level of cancers and other illnesses in members of their Armed Forces who fought along side us in Vietnam. They also showed a higher rate of certain cancers prevalent in their offshore personnel who served in the same water, at the same time, on identically manufactured naval vessels, using the same material and military tactics as did our Naval Forces.(54) In contrast to our hiding our heads in the sand, the Australians pursued medical and scientific research to understand why this discrepancy between offshore and shore based personnel existed. The US Government cowered in silence, attempting to protect both itself and the US Chemical Industry. The Australian Government has now published several mortality studies and laboratory reports which resulted in the award of full health care and compensation benefits to their Royal Australian Navy (RAN) Vietnam veterans. In other words, the Australians consider their offshore military personnel to have at least an equal degree of exposure to Agent Orange as their ground troops, out to 100 nautical miles from the coastline of Vietnam. The formal name of a key Australian medical and scientific report is "Examination of the Potential Exposure of RAN Personnel to Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans via Drinking Water a Report to: The Department of Veteran Affairs, Australia" and is sometimes referred to as the NRCET or RAN report, released in 2002. This study found that the high temperature heat flash used during the distillation process of sea water for use in the ship's propulsion system, and only secondarily in the creation of potable water, greatly increased the toxicity of any dioxin in the processed water by at least a factor of four. (3)

The desalination and distillation process used on all Royal Australian Navy vessels was identical to the systems used on American Navy and Coast Guard vessels of that time. The United States Department of Veterans Affairs has erroneously and publically discounted the Australian studies as meaningless because "they had not being peer reviewed."(4) These reports are now recognized as fully published and peer reviewed work by the Institute of Medicine (IOM) and already had been by other scientific and medical authorities around the globe. The DVA opined otherwise, with no substantial evidence, in their Federal Register call for comments for proposed changes to the M21-1 Manual in 2007. Once again, the DVA was wrong. This Australian study was reviewed by an IOM specialist in 2009 and found to be scientifically sound.

In writing the Seventh Biennial Update, "Veterans and Agent Orange: Update 2008," the IOM Committee which reviewed the health effects of Vietnam Veterans exposed to herbicides, and which involved a review of much of the research done on offshore personnel by the Australians, published several direct statements correcting and admonishing the DVA for its many erroneous beliefs about the widespread effects of dioxin upon those who served in the offshore waters during the Vietnam War. They showed that the true nature of the errors of the DVA were not medical or scientific; they were purely political and economically driven. (47)

Addressing a significant change put in place by the Department of Veterans Affairs, the IOM concluded that a number of pronouncements the DVA made regarding offshore and on land veterans of the Vietnam War were medically, scientifically and logically unfounded and incorrect. Additionally, the IOM made several specific statements in their assessments that very clearly told the DVA that exclusion of offshore personnel from the presumption of exposure to herbicide was scientifically and medically wrong. The evidence that the IOM committee reviewed showed that limiting presumption of exposure to those who set foot on Vietnamese soil was baseless and that offshore personnel should not be excluded from health care and compensation benefits enjoyed by personnel with boots-on-ground. (47) In response to this, the DVA ordered the IOM to conduct an 18-month study regarding the relationship between Agent Orange and the offshore personnel of the Vietnam War. Not only did this spiteful act put another nail in the coffins of many Vietnam veterans who have and will die during that hiatus, it may well have driven a wedge into DVA that harbingers its own demise. The DVA's seemingly groundless actions of wholly ignoring the recommendations of the IOM in some instances and

accepting the IOM recommendations in other instances should be a matter for judicial review by the highest court in our land.

Undying Attitudes of the DVA

The preceding history of courtroom battles (roughly between 2006 and 2008) with hearings and appeals in the US Court of Appeals for Veterans Claims (*Haas v. Nicholson*) and in the Court of Appeals for the Federal Circuit reflect the outright animosity DVA holds for offshore personnel. The 2008 IOM publication states there is little reason to believe that exposure of US military personnel to the herbicides sprayed in Vietnam was limited only to those who actually set foot in the Republic of Vietnam. Having reviewed the Australian report (NRCET, 2002) on the fate of TCDD when seawater is distilled to produce drinking water, the committee was convinced that this treatment of seawater would provide a feasible route for exposure of personnel in the offshore waters, which might have been supplemented by spray drift from herbicide spray missions and a plethora of other modes of toxin transport to areas offshore where our naval vessels served. (47) Ocean currents and subsurface currents could easily have carried dioxin-laden particles hundreds of miles, while a mere 50 miles or less is all the movement necessary to reach and be a continuous source of contamination for nearly every ship in the Pacific Fleet that served in Vietnam at one time or other, including the aircraft carriers. Proof of the existence of dioxin in the South China Sea can be found in the fish and plant life living there, including coral formations. Coral was found at the southern end of Vietnam, off the coast of Vung Tau, which contained dioxin. This study concludes that a degradation in the coral reefs appear to have a direct relationship to dioxins used during the Vietnam War. (36)

Within a second Russian research article are diagrams of the ocean currents in the Gulf of Tonkin and South China Sea. The currents take all the run-off water and other sources of dioxin floating or suspended in the water directly to the area of Yankee Station. The pattern of this flow of ocean currents provides proof that the contaminated waters from the shores and bays of Vietnam went directly out to the location of all the aircraft carriers of the US Seventh Fleet on Yankee Station. (33) Regardless of hard medical and scientific facts, the DVA has chosen to continue denying offshore personnel any service-connection for the diseases and disabilities they suffer, which just so happen to be identical to the diseases and disabilities suffered by those who served with boots-on-ground in Vietnam and are attributed to the effects of herbicides and their contaminants. These personnel were in the same geographical area and both groups suffer identical medical problems. To refuse to admit an identical cause for these two groups of veterans' ailments is ludicrous.

Loss of Benefits

What does the loss of benefits by not receiving "service-connection" for disabilities mean for a veteran? The DVA Health Care System, through a nationwide network of VA Hospitals, exists solely to provide services to veterans, despite the lack of services veterans have routinely experienced since the 1960s. If a veteran has a service-connected disability or injury, the DVA grants that veteran access to free medical care for life for that 'condition'. A service-connected injury is often synonymous with a war injury. "Service-connected" means the injury was incurred in, or exacerbated by, the veteran's time during active military duty. Without being service-connected, a veteran is not eligible for treatment within the VA Health Care System, with very few exceptions. There is a hierarchy of disability percentage ratings that can be assigned to a veteran's injuries. Those play into the assignment of that veteran's priority of care. Generally, the more severe the condition incurred in military service, the higher the service-connected percentage rating is given and the individual is then generally assigned to a higher priority of care.

For the case at hand, disability due to herbicides and their contaminants, a veteran can have multiple major illnesses and several secondary illnesses directly caused by (or presumed to be caused by) the toxin. Veterans with boots-on-ground in Vietnam are automatically service-connected for all DVA-listed illnesses, primary and secondary, with some given higher ratings than others, based on severity of disability. And for the remainder of that veteran's life, he will receive free medical care for all primary and secondary disabilities due to toxic poisoning and all other service-connected injuries he may have. (34)

Since the diseases caused by herbicides and their contaminants are serious in nature, medical care is extremely costly. Having the DVA Health Care System provide those services gratis, based on earned benefits

due to service in the military, offers the veteran relief from having to make a choice between paying for medical care and feeding their family. Additionally, a service-connected rating for a chronic disability can also result in a monthly payment of compensation to help offset wage loss. Many of the service-connected diseases are debilitating, so the veteran disabled by service-connected injuries will eventually not be able to work due to health conditions. At that point he loses a wage income. Monthly compensation is provided to relieve some of that financial loss.

Both service-connected health care and service-connected compensation are available to all veterans who had boots-on-ground in Vietnam and who suffer some chronic disability due to exposure to herbicides. Offshore military personnel with the exact same disabilities, also presumably caused by herbicides and their contaminants, are denied both types of DVA benefits because they are denied the status of "service-connection" through presumption of exposure. Not being medically treated for the cancers and other serious conditions condemns those offshore veterans to a life of suffering and early death, usually deep in poverty. A large number of offshore veterans are forced to face that fact and fate, along with their families, with little or no income or other monetary payment to help make up for the loss of their earning power. However, they, in fact, earned those medical and compensation benefits which are being withheld through their military service to this country. Vietnam veterans are dying approximately 13 years earlier than their non-military contemporaries, an average difference of 65 years (based on BWNVVA analysis) vs. 78 years (based on CDC statistics, 2007). Offshore personnel with disabilities from herbicides and their contaminants seem to die a little faster and in greater poverty than their brothers in arms who may only have been separated by 100 yards when the toxic contamination occurred to both of them. There are additional benefits the survivors of service-connected veterans receive that are likewise stripped from the veteran who served offshore. To have this matter of life and death and quality of life offhandedly plucked away from this group of veterans by a groundless decision is shameful, inhumane, and cruel, and amounts to nothing short of the Department of Veterans Affairs knowingly condemning a veteran to death. They are purposely denigrating the death of offshore veterans which should be a shame felt by every American citizen and a crime that should result in a punishment of some responsible party. Unfortunately, one of the things the DVA is exceedingly short on is someone that can be held responsible for its acts of intentional harm or negligence.

Tragedy and Lies

Of all of the great tragedies of war throughout history, modern warfare has introduced heinous weapons of Chemical, Biological and Nuclear (CBN) agents whose effects can take years to manifest, but ultimately leave the contaminated civilians and veterans with long-term problems not totally understood at the time and which may manifest in slow, progressive deterioration of body systems and functions. These veterans face the additional challenge of having to prove to their would-be care givers, the Department of Veterans Affairs and the American public, that what they are experiencing at each stage of their deteriorating condition is directly caused by their exposure to the Chemical, Biological or Nuclear (CBN) agents that have contaminated them so many years earlier. Instead of shouldering the responsibility of caring for these veterans, the Department of Veterans Affairs uses any and every means of avoiding this responsibility because they are funded by a government that can not seem to comprehend the fact that the cost of war is never over until the last veteran dies. And this says nothing about the immeasurably long time an entire regional geography can be ruined, or the immense effects of CBN agents could have on the entire planet's ecosystem.

This tragedy is based on great moral gaps in the chain of thought leading up to the use of CBN agents. And here again, it appears that awareness of the real cost of war is somehow magically swept under the rug. The only other explanation can be: our military and political leaders have absolutely no regard for human life and will fight a war literally at any cost or consequence to the enemy or our own troops, for their own personal gain of money and power. Such a concept is despicable but seems the most probable.

Chemical, Biological and Nuclear weapons do not just appear like new items on a dessert menu. They require well thought-out and extremely precise planning and production, which intrinsically implies a committed intention of using those weapons some day, in some dire situation, in some dark future. They are still being stock piled "just in case." Unfortunately, our servicemen and women will end up being the expendable cannon fodder that is needlessly wasted while our leaders and button pushers sit safely in underground bunkers. It is one thing to pledge one's life for their country by facing bombs and bullets. It is entirely different to assume that pledge was

also an agreement to be exposed, by their own leaders, to CBN weapons that will result in untreated, long-ignored and debilitating disabilities.

Consider the planning that preceded our war in Vietnam, when the production of Chemical Warfare agents to kill vegetation was brought to the battlefield. Odds are high that the upper echelon of military, industry and government knew exactly the kind of risk to human life they were taking by saturating the countryside of South Vietnam with tons of dioxin and other deadly chemicals. They had been actively experimenting with dioxin since the early 1950s. (59) (60) They certainly projected human casualty to the enemy. They very probably projected some "acceptable" level of 'friendly fire' casualty on our own side, called 'collateral damage.' But who could possibly have projected the vast and massive casualties this Chemical Warfare agent has wrought on at least three generations of both enemy and friendly combatants as well as innocent civilians? The use of these Chemical Agents in Vietnam is clearly one of the greatest man-made disasters to have ever been brought down upon the human race. TCDD has been shown to mutate the genetic code and guarantee a continuation of further suffering down through the generations.(48)

Agent Orange, which contained TCDD, was dispersed on the Vietnamese country side by a group of individuals piloting C-123 fixed-wing aircraft which we have already identified as project Ranch Hand. Varied numbers of such aircraft were in use by the Ranch Hand Project during its operational phase, ranging from 3 to 30. Additionally, hundreds of helicopters and smaller airplanes were in use at some time or other between 1962 and 1972. This project also included some use of hand carried spray apparatus as well as spray systems aboard river patrol boats. As we now know, the results were globally disastrous. (56)

The water cycle of our planet Earth is guaranteed to spread the herbicides and the worst of their contaminants by the runoff of rain water from the smaller inland streams and rivers into the waters of the ports and harbors which then wash out into the Gulf of Tonkin and the South China Sea. And the US Navy and Coast Guard were right there in the runoff path, doing their jobs fighting a war. An overwhelming volume of nearly 21 million gallons of Agent Orange sprayed on land guaranteed a notable amount of dioxin particles washed to sea during the years 1962 thru 1972 and beyond, and for many years, perhaps decades, afterwards.

sage and Abuses

Agent Orange barrels used on the military bases and distributed to local citizens were often used to store gasoline. When the residue herbicide left inside the drums mixed with the gasoline and that in turn was ignited in an internal combustion engine, the dioxin was reheated. We know from the Australian study that heating dioxin increased its toxicity. The dioxin content which combined like an aerosol mist in the exhaust fumes of smoky two-cycle engines ranging from motor bikes to backup power generators was another contributor of poison in Da Nang's air, added to the pure vapors. If the fumes from a few barrels could actually kill trees at a distance, what hope did human life have when it sat directly above the fumes? What was the chance of escaping contamination for sailors on ships either at anchor in or moving through the middle of the harbor?

Early DoD reports show that the officers in charge did not fully understand how dangerous TCDD was. In their initial training and through their service, ground troops were told that it was harmless. There was little or no marking on the barrels themselves, per instruction of the Pentagon and no literature accompanied the stripped barrels. (44) There was widespread lack of understanding, instruction and knowledge, at all levels of authority, of the toxicity of many components used in our Chemical Warfare campaign in Vietnam.

Documents located in the Texas Tech Virtual Vietnam Archive show how problems were just beginning to be discovered as late as 1968-69 and there were no clear-cut plan to alleviate the dangers. Army Chemical Officers brought the problem of defoliated trees in the city of Da Nang and vegetable farm plot damage around the airport to higher level authorities in late October 1968. The sources for the contamination were investigated with the following order of suspicion:

Leaking valves on C-123 spray aircraft. Leaking valves had been a problem with spray aircraft since the very beginning of the Ranch Hand program when it was discovered that Agent Purple ate through rubber valve seals. Those seals were later replaced with less pliable plastic. The problem was not solved, however, because crystalline deposits formed from the chemical mixture would form at the spray apertures and continue to interfere with the valves properly closing. This problem was very difficult to resolve from a

design and maintenance perspective. A problem with the rear spray boom leaking after pressure had been cut from the spray tank caused a gravity feed of approximately 3 gallons in the boom that would leak out. There is evidence that this occurred after jettisoning any residual AO in the on-board tanks and the 3 gallons from the tail boom fell mainly in the harbor waters upon the aircraft's approach for landing in Da Nang. This occurred on multiple flights per day, day after day, for nearly 10 years. Barrel residue was the second item to be considered. Barrels were pumped into the on-board tanks of the spray aircraft. Since the small barrel openings and pumping techniques used on the barrels did not allow them to be fully emptied, between 2 and 3 gallons of residue Agent Orange remained in each barrel when they were discarded. The barrels were the property of the South Vietnamese Army and they in turn supplied them to local residents. Significant quantities of undiluted Agent Orange were not controlled because of this. The barrels left standing even prior to their usage for storing gasoline and the resultant damage caused by fumes from combustion engines contaminated both the civilian population and United States military in areas of Da Nang. (8) (9) (11)

Additional considerations, per the Hatfield Report, included:

The area between the former storage area and the three Sen Lakes at the north end of the runway had been used as a waste dump for decades, and it is therefore possible that Sen Lakes received direct dumping of herbicide and/or empty herbicide barrels during the 1960s. Drainage from the Sen Lakes flowed north into the sewer system. The Phu Loc River is found to the north and east of the Airport, and is regarded as one of the main recipient of drainage from the Da Nang Airport. Low dioxin levels were found in the Phu Loc River by Hatfield / Office 33 (2007). Drainage in the central and southern area of the airport flowed south to the Han River, in a separate watershed. Drainage patterns from the Da Nang airport into the city of Da Nang were determined based on field investigations by Hatfield Consultants and BEM Systems Inc, and also from a 1968 airport drainage map of Da Nang obtained by Hatfield from the US Archives in Washington, DC (Hatfield/Office 33 2007).

This is important because it shows drainage from the northern part of airport traveled from the drainage ditches to Sen Lakes to the Da Nang City storm sewer system into Phu Loc River. The Phu Loc River empties directly into the harbor just east of the naval harbor area. AO flow from the central and southern areas of the airport went southward to the Han River that opens to both the sea south of Da Nang and to the harbor near the boat docks.

During the Vietnam War, Da Nang was a very underdeveloped city with primitive public works. The city had open sewer drainage to the river. Any residue from barrels obtained from the airport most likely traveled the short distance to the river by being rolled down to the river and rinsed. The path from the tarmac to the river was well worn and as the barrels rolled, the remaining undiluted Agent Orange sloshed out along the trail. Once at the river, what remaining chemical that could be rinsed took place before the barrels began their transformation into water containers, fuel containers, floatation devices, bar-b-que cookers and any number of additional ingenious means the local population used to put these 55-gallon drums into their daily lives. Vapors from barrels and other sources would have been blown toward the harbor area by predominate North Easterly winds. That was out in the direction where the US Navy ships anchored. (65)

Herbicide was rinsed off the runway (often after every flight) in the Ranch Hand area, located at the north end of the airport, and traveled toward the harbor. Agent Orange was so strong that it routinely dissolved the rubber canvas clad fire hose used in the pumping operation, causing large spills of the toxin. The airport had a wash down area for C-123 spray aircraft at this end of the runway which was used to clean the aircraft and equipment after spray missions. It was also a priority to keep the herbicide away from the airplane tires.

Dosage

Let's examine two different dosages and types of contamination that need to be considered and investigated further. On the one hand, there were some personnel physically walking around on the Vietnamese soil. Soldiers would often go out into the bush (a cliché indicating terrain ranging from triple canopy jungle to flat rice paddies to rolling fields of elephant grass), and encounter Agent Orange by rubbing against previously sprayed foliage or occasionally being directly sprayed during a live Ranch Hand spray mission. According to Ranch Hand operation documentation, this direct spray encounter was the rare case. According to first hand reports

from the troops on the ground, it happened much more often. This type of exposure can be described as large quantity exposure on an occasional basis with contamination through skin absorption and some inhalation. In some cases, herbicide may have been in the run-off water drunk by those troops in the field.

In contrast, there were other veterans who were exposed to very small doses through constant oral ingestion (drinking or eating) over long, episodic periods of time, perhaps measured in multiple periods of 30 to 45 day cycles. That type of contamination applies to those on offshore vessels which sucked in the dioxin-laden run-off water that came from the inland hills via streams to rivers to the ocean into a ship's desalination system which operated continuously while the ship's steam plant was on line. This included times when a ship was close in to shore or during a presence in or close to a harbor when the ship continued to run off its own power and when the steam plant was kept on line in a ready, stand-by condition. The water taken in from the outside would also top off the potable water system used for cooking, showering, and drinking.

Toxin exposure by these two types of dosage could probably produce differences in the type, duration, and presentation of contamination effects. Dosage type might be what accounts for the differences in offshore increases in NHL and some other cancers over those diseases experienced by the men with boots-on-ground. Experiments have shown that small dose exposure is sometimes more potent than large dose exposure. However, in all cases, contamination was inevitable.(51)

Run-Off

A main source of movement for contaminated sea water was when dioxin was clinging to organic or inert particles that washed down from higher land into the streams and rivers and into the harbors and bays that eventually fed into the South China Sea. This describes an extensive source of dioxin that had a natural movement from the sprayed land to waterways leading to the "deep sea" water where the offshore Navy and Coast Guard fleet (the Blue Water Navy) operated. In most cases, drainage into a harbor or bay slowed down the final step of reaching the ocean, temporarily concentrating dioxin run off in the catch-basins of the harbors. However, this could never completely stop the steady migration of inland water of the harbor to the open sea. The dioxin particles were temporarily trapped in areas where the runoff water pooled in a single location in very high concentration, such as in Da Nang Harbor. In the case of Da Nang, other circumstances acted to bring even higher concentrations of dioxin to the harbor area, based on the location of the Ranch Hand flight project at the Da Nang air strip.

A study of the movement of runoff water carrying AO along with silt and larger particles shows that much of this runoff pattern hugged the coast line in a band over 2 miles wide (49) and, because of the flow of sea currents, moved north from the South China Sea up into the Gulf of Tonkin directly into the area of Yankee Station.(33) Based on an examination of these water flows, one could not pick a better place for a toxin gathering spot within the Gulf of Tonkin as the area designated as Yankee Station. This was true of all outward flowing water as far south as the Mekong Delta up the coastline to the larger rivers including the Cua Viet just south of the DMZ. Some photos of these flows can be seen at <http://bluewaternavy.org/harbors.htm> (49)

Da Nang is considered by many, some 40 years after the War, as one of the most polluted spots on Planet Earth. Levels of dioxin in and around the areas of Da Nang city and Da Nang harbor 40 years ago, both in the air and on the surface, were more likely than not, so high that individuals who passed through that area would have experienced direct exposure to dioxin by simply breathing normally. Veterans who were in that area should not have to invoke the concept of "presumptive exposure" to dioxin. Documents from the years between 1962 and 1972 indicate that the presence of an individual in Da Nang city and Da Nang Harbor, for no matter what duration of time, experienced direct exposure to dioxin from a number of sources in a number of forms which were inevitable sources of certain contamination.

This begs the question: Are presumptive exposures based on a foreknowledge of specific or even suspected areas that were sprayed? No, absolutely not. In fact, quite the opposite is true. That is why the "presumptive exposure" rule was put into place. Under presumptive exposure, land based individuals are not required to have been in any specific location, at any particular time; and no data on any measurement of herbicide which might have existed in any area is ever asked for or considered. Just being anywhere on land within the country's boundary is grounds for an assignment of presumptive exposure, leading to all DVA health and compensation

benefits should that veteran suffer any of the diseases on the Agent Orange List.(57) In the case of Da Nang Harbor, we have identified a location where high toxic concentration absolutely existed. Individuals in that location were well past any 'presumptive' criteria; they were directly contaminated because the presence of herbicide is known.

In the case of sea-going personnel present in ports, bays and harbors, and in all offshore locations, they were, up to this point in time, assumed to have NOT been in a specific area of herbicide exposure because they could not provide proof, causing them to be ineligible for a presumptive exposure rating. But neither could the VA provide proof that herbicide was absent and exposure did not take place. But the benefit of the doubt was not given to the veteran. Now we can show proof of exposure with certainty, beyond any probability, leading Blue Water sailors far beyond the vague implications needed to apply the rules of presumption. In the case of Da Nang Harbor, we come to the table with proof of direct exposure. Very, very few of the boots-on-ground personnel can stand so confidently to prove their case for exposure to herbicide. In fact, they're not even asked to prove their case.

To leave those with harbor visits bound to the standard definition of presumptive exposure is a clear contradiction to the requirements of presumptive exposure currently on record and is an embarrassingly naive misstatement of the physics of Nature and the water cycle that occurs on this planet. There is no reasonable argument to contradict the fact that herbicides were present at high levels in bays, ports and harbors, and in particular, in Da Nang Harbor. The evidence is irrefutable that the water within the harbor contained an even higher, far more likely than not, level of dioxin such that to escape without contamination would be nearly impossible.

Inevitably, this will be wrongly challenged by the concept of metrics. We will run into the situation where a measurement or quantity of herbicide is required to be present in ports, bays and harbors, as well as in offshore waters, before the VA concedes direct exposure, much less approves presumptive exposure. Land based assessment of presumptive exposure is spared this tedious rigor of metrics to determine an admittedly unknown and unknowable measurement. It can't be done. On the other hand, estimated measurements can be given regarding probable amounts of herbicide in many areas of harbors as well as offshore water. The most obvious of these, and possibly the most easily measured (even by assumption), are the ports, bays and harbors where water runoff bearing contaminated particles continuously gathered.

Ports, bays and harbors are not included in the definition of "inland water" and are not included as legitimate areas for presumption of exposure. By requiring the Blue Water Navy to present these data, the DVA is showing the absolute worst kind of prejudice by establishing an irrational double standard based on very bad science. Luckily, this evidence provides strong proof that, more likely than not, presence of herbicide in ports, bays and harbors directly contaminated the offshore veterans of the Vietnam War who visited the harbors, making the arguments for presumption of exposure moot. To deny that is to stand before the world, buck naked, bragging about one's clothing. The DVA has done similar things before, but few so blatantly and obviously wrong.

It seems the rationale of the DVA rests on the incorrect assumption that Agent Orange was not sprayed over any port, bay or harbor, nor over open seas or water of any kind and had no migration routes from land to water. The exception to this is an acknowledgment that herbicide spraying took place over inland water. But one could successfully argue that it is highly unlikely that herbicides and their contaminants were ever present in certain land areas of Vietnam, such as valleys and low growing grassland where concealment of enemy forces or presence of crops were not an issue, making spraying for the elimination of foliage or destruction of crops totally unnecessary. There are large tracts of land within Vietnam that were never sprayed. And although there may be no record that a Ranch Hand mission was ever conducted within a 20 mile radius of that area, any personnel who were present in that location are nevertheless covered by the rule of presumptive exposure as are those who spend minutes of Tan Son Nhut's tarmac.

If, on the other hand, one is able to show by documented military records that herbicide was absolutely present in ports, bays and harbors, and there is ample documentation to show that Ranch Hand spray planes passed over water on a regular basis leaking or spraying herbicide, any personnel who were present in that area or later moved through that water should logically be acknowledged as having been exposed. This examination of

officially documented evidence shows that Da Nang Harbor received one of the heaviest saturations of herbicide in all of Vietnam. This came from sources including: direct dumping, run-off water from inland hills, rinse-off from the Ranch Hand site, and rinsing of expended AO barrels. Individuals who visited those ports, bays and harbors had direct exposure to herbicides. And obviously the boots-on-ground personnel stationed in those areas would be considered to have had direct exposure, too.

Given the established protocol for considering all areas within Vietnam to have been potentially sprayed, and for all land-based personnel to have potentially come in contact with the herbicide at any location, there seems to be no rationale that could rule out the ports, bays and harbors of Vietnam as areas where toxins were present and where personnel would not qualify for at least presumptive exposure. Presence in many harbors, such as Da Nang Harbor, would more likely than not show direct exposure at orders of magnitude higher than many who spent their whole time in service with boots on ground in Vietnam.

In a letter from the DVA's Director of Compensation and Pension to the Executive Director of the Blue Water Navy Vietnam Veterans Association dated February 10, 2009, Bradley G. Mayes states: Your letter indicates that you favor the idea of drawing an arbitrary line down the coast of Vietnam and assuming that any vessel crossing this line from offshore waters into coastal ports and harbors will be considered within the inland waterways of Vietnam. We are unable to accept your recommendation. It is contrary to established VA policy and Federal Court precedent and is not consistent with the facts of herbicide use in Vietnam. Inland waterways are those located within the country itself and, as such, were those subjected to the same aerial herbicide spraying as the land areas that enclosed them or formed their banks. Inland waterways include rivers, estuaries, canals and delta areas inside the country, but do not include open deep-water coastal ports and harbors where there is no evidence of herbicide use. Naval vessels temporarily anchored in the coastal ports of Da Nang, Cam Ranh Bay, Vung Tau, or any other location along the open coastline of Vietnam, are not considered by VA to be within the Country itself or on its inland waterways, for purposes of presumptive claim adjudication. (35)

I can assume from this statement that Mr. Mayes failed to take into account the fact that, unlike the land that enclosed the inland waterway, the water, along with anything added to it, moved downstream and was never in the same place twice. It headed out to sea carrying all the herbicide with it. Additionally, this paper presents ample evidence that Agent Orange actually did end up in the coastal waters as well as in the ports, bays and harbors through direct spraying, load dumping and water run off. VA policy may have dictated their internal myopic definitions regarding bays, ports and harbors, but there has never been a Federal Court decision that made this ruling or set any precedent regarding where Agent Orange was or wasn't. But for much of the data presented here, the rule of presumption need not apply since what we are describing are cases of direct exposure.

Further Examination

The Department of Veterans Affairs remains adamant that contamination by herbicides could only have occurred upon the land mass of Vietnam because of the method of application, which was primarily by fixed wing spray planes. Handling problems were not considered and mechanical problems with aircraft spray systems which constantly leaked were not considered. Although known from early on in the Ranch Hand Program, these problems were never fully addressed nor satisfactorily and completely repaired, as the cited documentation shows. Contrary to what the DVA would want you to believe, there is ample documentation and first hand reports of spraying upon the water's surface, vast amounts of run-off entering sea-bound rivers, and the dumping of thousands of gallons of Agent Orange by jettisoned herbicide payloads into the South China Sea.(20) There may have been massive sinking of Agent Orange barrels just outside Da Nang Harbor, although documentation on that is sketchy.

As standard procedure, excess herbicide payload was jettisoned just before landing. In Da Nang, this would have meant that any excess was dumped into the harbor or into the ocean waters just seaward of the harbor. The landing approach to Da Nang airport had a flight path directly over the area of the harbor water for approximately 10 miles, the length of the harbor. We've heard statements that the herbicide sprayed from fixed wing aircraft was absolutely precise and since the herbicide was mixed with oil, it "fell straight to the ground because it was heavier than air." This absurdity was stated at the IOM hearing on May 3, 2010 by retired Navy

Commander Thomas Hamrick, testifying on behalf of the VA in opposition to offshore personnel receiving their earned benefits. It is but one of many asinine and illogical statements from the DVA and its proponents. A 1981 report from MACV Incidence Reports addresses some of the loads of herbicides that were dumped due to flight problems with the fixed wing spray planes. This list is far from complete and does not give clear details for most of the lost payloads. Those that it does list as dumped into the South China Sea probably represent a small fraction of what actually did end up there. Even at that, the reports account for over 8,000 gallons dumped directly into the South China Sea. (20) Since we know from current EPA reports that one part in ten trillion is all that is needed to cause severe health problems, it indicates that large areas of sea water were at least temporarily contaminated at extremely high levels by these specific accidents.

The Agent Orange sprayed from the Ranch Hand aircraft was mixed with various petrochemicals, typically diesel oil. When droplets landed on water, they stayed afloat as long as the oil stayed buoyant, which could be measured in weeks. Once released from the floating oil, dioxin molecules then could either attach to surrounding surface bio-matter, which also occurs as a floating layer (scum) on most water surfaces or begin a very slow process of sinking to the bottom, but suspended for long periods of time at depths within the range of the water intake ports along the hull of Navy and Coast Guard ships. In well travelled shipping lanes, or in situations such as Yankee Station where the ships repeated a pattern that doubled back on itself, it was very easy to actually see the floating oil and fuel on vast areas of the ocean. (58)

Floating toxins are dangerous to ships that have water intakes for this simple reason. Particles floating on the surface were turned over as the bow moved forward, cutting the surface, and were curled beneath the surface to the depth range easily accessible to the water intakes. If the contaminated particles were not scooped up by the first ship, they were left suspended at a depth that could be scooped in by following ships. Previously settled particles were susceptible to churning by the motion of a ship's propulsion screws or, in shallower areas, by the movement of poles and oars that propelled the smaller sampans and fishing boats within the harbor, pulling particles toward the surface and bringing them into play once again as they floated to the surface before slowly settling past depths accessible by the ship's water intakes. Anchors and anchor chains went to the bottom and continuously disturbed the bottom sediment, bringing the contaminated molecules back to or near the surface to begin again their very slow decent to the bottom. When dropping anchor, additional chain measuring five or six times the depth to the seabed was typically dropped atop the anchor. This caused significant disruption of the sediment when both dropping and weighing anchor, displacing bottom sediment as the chain dragged across the bottom and large chunks of sea bed were lifted to the surface as the anchor releases its bite.

Da Nang Airport

Da Nang airport sits at approximately 28 feet above sea level, which is the surface of the adjacent harbor water. Distance from the north end of the runway to the harbor's edge is less than 1 mile. Runoff of liquid from the airport tarmac would not be confined at that location and would travel downhill. Even if captured in the lakes or holding ponds, the herbicide originating on the airport tarmac, if it didn't indirectly drain in to the harbor water, had a strong chance of entering the harbor water system through a high water table and underground seepage. Evidence of a system of drainage ditches passing the air strip and leading directly to the Sen Lakes was recently uncovered by Hatfield Consultants in their analysis of current levels of dioxin contamination at Da Nang. This system existed during the 1960s and 1970s and provided access of spilled herbicide directly to the harbor water. (13)

The C-123s fitted out with spray systems would come to the north end of the runway, the end nearest the harbor, where the barrels were stored, to be loaded with both herbicide and diesel fuel. The size of the onboard holding tanks on the C-123s of the Ranch Hand Project was 1,000 gallons. The spray planes would be filled with approximately half herbicide and half diesel fuel. Hundreds of drums of Agent Orange were stored in sheds or in the open at the same end of the runway. During the process of filling the spray plane tanks, herbicide splashed and spilled onto the north runway. The tarmac was hosed off after loading Ranch Hand flights nearly every day, and the planes, tarmac and spray equipment were washed clean of residual herbicide at the end of each flight and even more thoroughly at the end of each day. That would have been six to eight or more times a day, depending on the year of operation dictating the number of planes at Da Nang. Spilled and rinsing of spray equipment were hosed off the tarmac and pushed into a slow journey to Da Nang Harbor. What didn't go straight into the harbor or the lake seeped into the water table and entered the ground water system.

Evidence for this can be found in recent documentation by Hatfield Consultants. That documentation shows that the lakes positioned north of the runway are currently still contaminated and fishing and harvesting of lotus blossoms in the Sen lakes is absolutely prohibited. This is the situation 40 years after the initial contamination took place. The level of contamination that existed in the environment 40 years ago must have been horrendous to have persisted at that level to this day (7).

Some simple calculations can be accomplished to discover the typical daily amount of herbicide that was transferred to the spray planes and how many barrels that would require. Da Nang stored approximately 120,000 barrels of Agent Orange. This supply was constantly replenished by trucks bringing in new barrels of Agent Orange as well as other chemicals and herbicides. All this was loaded onto the spray planes at various times during the operational life of the Ranch Hand Project and any follow-on activities run under South Vietnamese control after 1972. The number of sorties flown by the spray planes can be examined; however the records are not precise. The original Ranch Hand operation transferred to Da Nang at some point during 1964 and all available planes would have been at that location for some period of time during 1964. Planes would return sporadically during the intervening years. In 1965, only two spray planes were assigned to Da Nang on a permanent basis; subsequently, a third aircraft was added for a period of at least one year.

Spray flights were scheduled for early morning hours to take advantage of the temperature inversions at that time of day. Three flights per aircraft were carried out to complete a day's mission from Da Nang. The spray tanks on the aircraft held 1,000 gallons of which one half was Agent Orange and one half was fuel oil to help make the chemical cling to leaves. This means that 500 gallons of Agent Orange was used per flight. Five hundred gallons would equal the contents of approximately 10 barrels. The precision of these numbers may not have been accurate every day, but we'll use this formula to simplify the math.

Three flights per day would use 30 barrels per day for each plane, so two planes would use 60 barrels daily while three planes would use 90 barrels daily. Residue left in each allegedly 'empty barrel' has been estimated at 2 to 3 gallons per barrel, representing a trace amount of herbicide left in the barrel (~4%) because of the pumping technique used to transfer the liquid from the barrels. These 'empty barrels' were then given to, sold to, or taken by the local population, which will become an important issue. At two to three gallons per barrel, this would amount to 21,600 to 32,400 gallons of undiluted Agent Orange handed over to the local population every six months. The expended, but not quite empty, barrels were often washed out in the Sen Lakes or the Han River or directly in the harbor. However, not all barrels were rinsed. As in all harbors, algae and other life thrived along the shoreline. That plant life and other organic scum would provide Agent Orange the perfect vehicle to cling to so that it stayed at or near the surface as the water in the harbor moved slowly out to sea. Even if only half the barrels were washed out, this still equates to significant quantities of vapor and ultimately to considerable contaminated sediment that traveled across the harbor to areas where U.S. Navy ships were at anchor.

Investigating Leakage

Airplanes taking off and landing at Da Nang air field would transit over approximately 10 miles of harbor water (see map below). During that time over the water, the spray system would be constantly leaking the liquid herbicide from the tail boom. If the typical speed over the water was 120 mph upon landing approach, the trip over harbor water would take about 5 minutes. The tail boom held approximately three gallons of herbicide that dropped into the harbor 4 to 6 times a day. Over a period of only 5 years and that would mean over 400 gallons a week went directly into Da Nang Harbor during the landing approaches of aircraft.

From various reports, we have the following documented information: (31) (61)

18 Oct 1968

Mr. E.M. Stickney, CORDS Agricultural Advisor, Col. John Moran, Chief Chemical Operation Division, MACV, reported damage to local vegetable plants had been caused by leaks from Ranch Hand aircraft. That would be on the departure flight path from Da Nang air base.

25 Oct 1968

Barry Flam, USAID, Major Hidalgo, COC-7, Ltc Larsen, Detachment Commander: Damage to some crops were 20 km (12.5 miles) away from the air base. Admitted damage was from aircraft that leaked Agent Orange, both on take off and landing. His maintenance personnel made "strenuous effort" to stop leakage by continuously replacing faulty nozzle valves - but leakage still occurred. They went to a vegetable plot south of air base. All plants were dead and damage to jak and palm trees was evident and complete. This area was not likely to be from faulty valve leakage. [and was therefore due to vapors.] (31)

26 OCT 1968

Stickney, Flam and Major Hidalgo went to areas away from flight pattern. There were areas to the east, actually under the flight path, but showed no damage. However, there were many empty drums allowing vaporization.

31 October 1968 - Report by Col. Moran acknowledges damage due to spillage by Ranch hand aircraft on take off and landing occurs near Da Nang airport and kills vegetables. Since no spraying occurs within 20 km of airport, damage must be done by leaking herbicide from aircraft. [NOTE: Apparently not at all times. Spraying in 1966 to 1967 on hillsides on north and south (Monkey Mountain) of the harbor was observed and sworn to by crew of Hospital Ship SANCTUARY, anchored in Da Nang Harbor.] Ltc. Larsen admits to leakage from faulty valves prior to each mission.

Harbor

Da Nang was a special location for the U.S. Navy. The harbor area usually had a full complement of war ships at anchor as well as many tied to piers.(27) Shipboard ventilation systems remained open to outside air and could easily allow wind-blown particles and vapors into the system which spread throughout the ship via ventilation distribution. (66) There was simply no escaping the airborne toxins and vapors that rose from the harbor water. One can picture vast areas of the harbor with Agent Orange floating on the surface due to the massive amounts that herbicide we now know was rinsed, washed and dropped into the harbor daily, and all of it was letting off lethal vapors. No special breathing apparatus was issued for those who stepped out onto the deck of an anchored ship into the open air, and everyone who did so came was immediately exposed to the fumes and vapors which floated up from the water surface surrounding the ship, with the additional sprays and splashes that constantly take place in maritime harbors such as Da Nang. The ships at anchor were literally surrounded by a floating mass of herbicide continuously letting off dangerous vapors. In this situation, we know the location of the Agent Orange, we know the time of exposure, we know in general terms the amount and strength of the Agent Orange, and we know the mode of exposure. These are the criteria for proving direct exposure. It may well be that offshore personal that visited Da Hang Harbor have more rightful claim for contamination than a vast majority of "boots on ground" personnel, who base their claim of contamination on the mere presumption of Agent Orange exposure.

The technology did not exist for filtering out contaminants such as herbicides suspended in the water, and this capability was not even a specification of the feed water system until the 1980s. So Vietnam Era ships (which were themselves mostly WWII era ships) had no way to remove, much less recognize, dioxin from onboard water. Additionally, as proven by Australian studies, the high heat-flash type distillation actually enhanced the toxicity of dioxin by about 400%. Per the Navy water treatment manuals of the time, chlorine was added to the potable water to keep bacteria growth down and no more attention was given to the potable water.

From *U.S. Naval Forces Vietnam Monthly Historical Summary* we learn "...Water supply in the Da Nang area became a problem during May (1966). Although supply was able to keep up with demand, it was anticipated that demands would continue to increase as the supply of water steadily decreased during the dry summer months. A water conservation program was initiated to help eliminate the problem. A new 1,900,000 gallon storage dam on Monkey Mountain was completed and an effort was begun to store as much water as possible in this site". (67)

Port services continued to assist visiting fleet ships by coordinating water, fuel and mail supply services. The rate of flow of water from the Monkey Mountain Site decreased from 6,000 gallons/hour to 3,000 gallons/hour. Efforts were then initiated to build a dam on the beach and pump water to the YW. This was hoped to bring the combined flow back to approximately 6,000 gallons/hour. The addition of a second YW improved the water situation in Da Nang. [Note: A YW is an unpowered barge.]

The port of Da Nang was visited 100 times by U.S. Seventh Fleet ships during June, 1967. The ships were provided with over one million gallons of diesel fuel and almost two million gallons of potable water, in addition to mail, freight, courier, transient billeting and disbursing services.

This cited material from *U.S. Naval Forces Vietnam Monthly Historical Summary* should be enough to establish that fresh water was supplied from Monkey Mountain to Da Nang and from Da Nang to the ships of the Seventh Fleet serving off shore. The fact that this water was stored in dams open to the atmosphere and in very close proximity to the most highly contaminated area in Vietnam gives cause for deep thought. What were we actually providing to these ships?

There is absolutely no reason to believe that dioxin particles were not carried by run-off water in mass quantities and distributed out to the entire area of the Vietnam Theater of Operations, up to and beyond 100 nautical miles from shore. There is hard science that shows the dispersion of run-off particles were distributed to nearly all areas where U.S. and Australian ships operated for "gun line" duty within one mile off the coast. Sediment flow charts and sea current maps show that the direction of these flows carried the toxin directly into the area of Yankee Station. Any method of filtering out dioxin was totally missing from these ships because the technology to do that didn't exist. The drinking water on these ships was contaminated with dioxin. The Royal Australian Navy has been compensating its offshore personnel for all dioxin-related diseases, with an eligibility qualification zone of 100 nautical miles from the coast of Vietnam.

Mark Brown's Presentation

The offshore personnel of the US Military were originally covered and compensated by the Agent Orange Act of 1991. In 2002, the DVA stopped paying medical benefits and compensation to personnel who served offshore Vietnam without following proper legal procedure, but more importantly, without having a valid medical or scientific reason for doing so. In 2004, Mark Brown, Ph.D., then Director of DVA's Environmental Agents Services, very clearly stated the Department's thoughts behind the elimination of a specific class of Vietnam veterans (those who served offshore) from presumptive coverage for herbicide exposure. There are several reasons why Mark Brown's presentation is so vitally important to grasp. It was the first clearly stated 'justification' of DVA policy relating to the removal of offshore personnel from attaining service connection for disabilities of dioxin-based diseases, and it was clearly stated that the decision to eliminate offshore personnel from the presumption of exposure, as provided to them by the Agent Orange Act of 1991, was totally whimsical on the part of DVA. To this day, there has been no stronger statement to explain or justify the change that removed offshore personnel from service-connection for Agent Orange disabilities.

Mark Brown made his presentation to the fourth program on Science for Judges, held at Brooklyn Law School on November 4, 2004. Many of Brown's statements are worth examining, because this was short of three years after the VA stopped providing the benefits of medical services and compensation payment to deserving War veterans who served offshore Vietnam; and also because the presentation was given the blessing of the Department's Office of the General Council prior to the presentation. In this presentation, Dr. Brown states some very key attitudes and assumptions that still prevail within the management ranks of DVA in their treatment of offshore personnel.

The following is taken directly from Brown's presentation from pages as indicated:

Page 597 Key elements for DIRECT EXPOSURE

- "1. Evidence of a Scientific Association. Veterans must show credible scientific or medical evidence that the exposure involved is accepted as being associated with their specific illness or injury;*
- 2. Evidence of Military Exposure. Veterans must show evidence that the relevant environmental or occupational exposure occurred during their active military duty;*
- 3. Evidence of Temporal Plausibility. Veterans must show that their illnesses or injuries were initiated or were exacerbated during active military duty; and*
- 4. Evidence of Exposure Magnitude. Veterans must show evidence of an unusually large or prolonged exposure to support the conclusion that the exposure was at least as likely as not to have been the specific cause of their illnesses or injuries, in comparison to all other potential causes of those illnesses experienced before and after military service.*

[This is a general policy statement that applies to everyone except those with boots-on-ground, who are afforded a presumption of exposure by their mere presence on the land mass of Vietnam. Brown's statement referring to "an unusually large or prolonged exposure" reflects the misunderstanding that dioxin can, at microscopic levels, be just as devastating, or more so, as large quantities in short duration, depending on a particular body's reaction and possibly where the dioxin initially finds an internal bond within any particular body. This also shows a shifting in the burden of proof where a lack of contradicting documentation could otherwise give the veteran the benefit of the doubt to win their claim. The VA has absolutely no documentation indicating that offshore personnel were not exposed to herbicides. Held against the presumption of exposure automatically given to anyone at any place with boot-on-ground, these are clearly a double standard prejudiced against offshore personnel. The veteran is expected to come to the table with considerable evidence while the VA admits it has absolutely no medical or scientific evidence to have excluded the offshore veteran from the benefit in the first place.]

Page 604 Paragraph 3

"There is no obvious scientific or public health basis for excluding these non-Vietnam War veterans from the presumptive service connection offered to Vietnam veterans."

"Non-Vietnam veterans exposed to herbicides and dioxins do not receive the benefit of presumptive service connections; however, many non-Vietnam veterans have been exposed to these agents, including U.S. troops serving during the Vietnam War but *only* in nearby countries, including Cambodia, Laos, and Thailand, or off-shore aboard ships. To partially address this apparent inequity, the VA has established the general policy that when a non-Vietnam veteran is diagnosed with one of the presumptively service-connected Agent Orange illnesses *and* the veteran can provide evidence of exposure to Agent Orange, then he can be granted service connection through a sort of modified direct service connection route." (6)

Here is the most damning set of statements in Brown's description of the new DVA policy: an openly admitted, totally irrational and unfounded basis for the exclusion of offshore personnel. And this also includes the official pronouncement that the term Vietnam War veteran did not apply to veterans, regardless of their job or location, whose boots never touched the land mass of South Vietnam. In this description, a blue water navy veteran, or

anyone in the Vietnam Theater of War, without having had boots-on-ground, is branded a "non-Vietnam War veteran." This includes John McCain, Jim Stockdale, Orson Swindle and all other POWs who were shot out of the sky and who landed north of the DMZ, only to spend years as prisoners of the North Vietnamese. When released, these POWs were flown directly to Clarke Air Force Base in the Philippines and never had the opportunity to walk on the landmass of South Vietnam. They are not Vietnam War veterans.

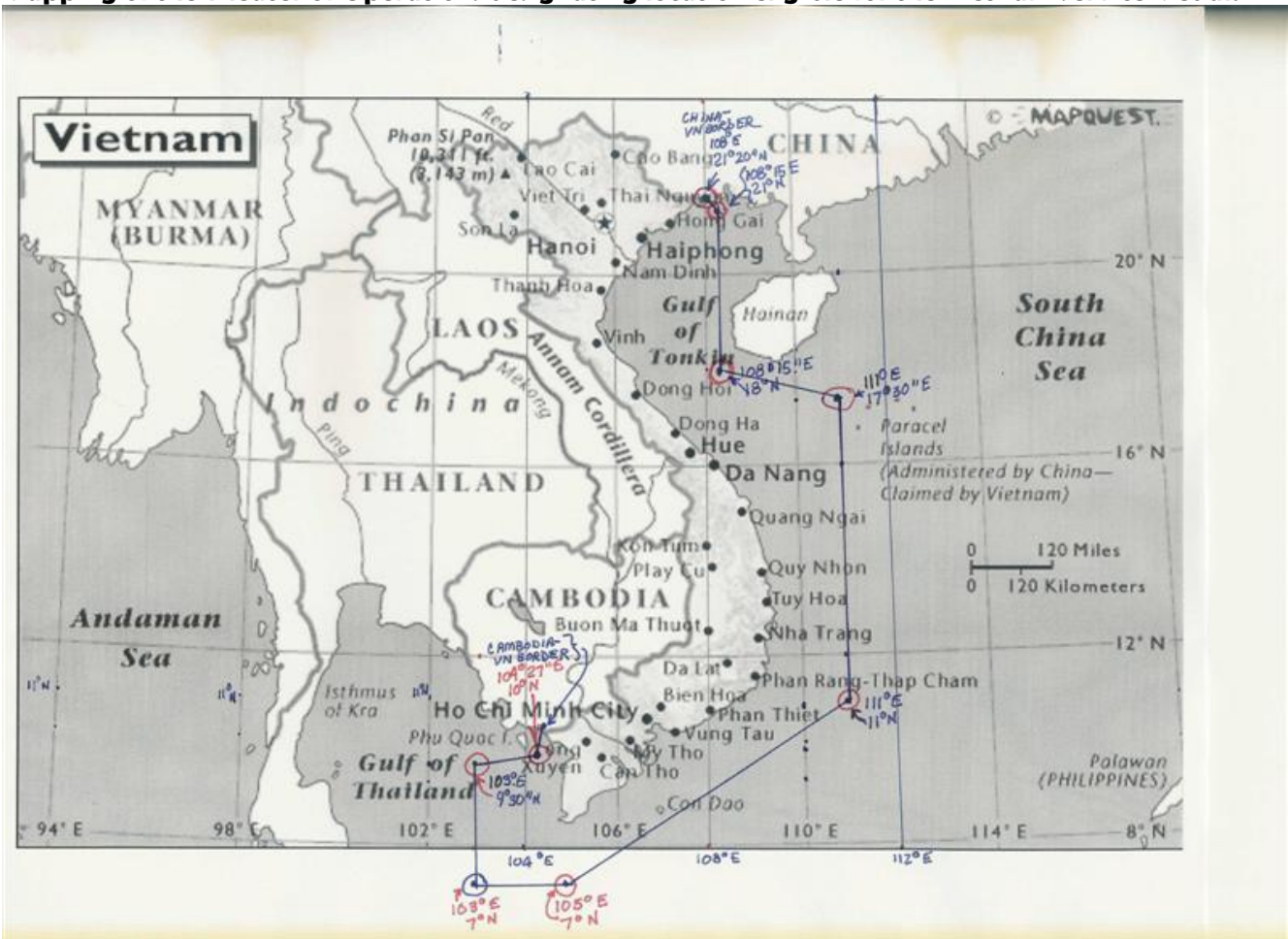
Brown concludes by describing a procedure that would allow someone to apply for 'direct exposure,' which was actually a well-established procedure available to all service personnel under the Agent Orange Act of 1991. This represented nothing new, yet he posed it as a way to mitigate the problems they had caused the offshore personnel, as if the VA were giving the offshore personnel some special rules to help offset the blatant prejudice leveled against them. Unfortunately, this was not the case because these rules were in effect since the Agent Orange Act of 1991, 13 years before Brown uttered those words to the judges.

Most sailors of the Blue Water Navy resent being called non-Vietnam War veteran because they were awarded medals by the DoD and by their own service branch with honors and citations for their wartime service. Many ship's companies earned the Combat Action Ribbon (CAR), some on multiple occasions, for direct combat with the enemy. The CAR is the equivalent of the Combat Infantry Badge (CIB), which is an award given for 'combat service' in any theater of war. Many offshore naval personnel died as a result of hostile attacks which severely damaged their vessels. The fact they fought and provided combat support and did so with honor, lost aircraft and pilots and had ships damaged by enemy small arms and heavy artillery fire, seem to make them war veterans under definitions of every military conflict in history. They are viewed that way by ordinary Americans, but not by the Department of Veteran Affairs and apparently not by the Department of the Navy. No one in the high command has yet stepped forward from the DoD or the Department of the Navy to inform the DVA that they are not at liberty to downgrade the meaning of Navy combat service medals and their citations or to re-write the history of the combat role of the Navy, Coast Guard and Fleet Marines who laid their lives on the line for the American public during the Vietnam War.

Conclusion

Offshore Navy, Coast Guard and Fleet Marine personnel have ample scientific and medical evidence to show that dioxin was, much more likely than not, a component of their drinking water while operating in harbors, close to shore, or 60 to 80 miles away from shore while on duty at Yankee Station. The evidence is irrefutable that Da Nang Harbor was contaminated with Agent Orange and that there was no escape from direct exposure in that location. Not only does the VA have no evidence that can contradict the proof brought to the table by this report, they are on record as blatantly admitting that they have no medical or scientific evidence to exclude offshore personnel from receipt of presumptive exposure to herbicide, while even admitting that some of these men were in fact contaminated by dioxin.

Mapping of the Theater of Operations designating location eligible for the Vietnam Service Medal.



The outer blue line marks the distance and area defined as the location defined as the Vietnam War war zone and which dictates the area which defines the eligibility for receiving the Vietnam Service Medal (VSM).

SOURCES

These are primary sources for facts cited throughout this paper. In many but not all instances, a footnote is offered at specific locations to identify the source. The basis of facts given but not footnoted can find their genesis in these following documents. Nearly all of them can be found on the Blue Water Navy Vietnam Veterans Association web site, or as indicated otherwise.

- (1) Historical Overview From The Veteran's Perspective, DIOX2002-16; Paul Sutton
Available at <http://bluewaternavy.org/harbors.htm>

- (2) Basic Information about Dioxin (2,3,7,8-TCDD) in Drinking Water; EPA
<http://www.epa.gov/safewater/contaminants/basicinformation/dioxin-2-3-7-8-tcdd.html>

- (3) Examination of the Potential Exposure of RAN Personnel to Polychlorinated Dibenzodioxins and Polychlorinated Dibenzofurans via Drinking Water A Report to: The Department of Veteran Affairs, Australia; National Research Centre for Environmental Toxicology; Brisbane, Australia
Available at http://www.bluewaternavy.org/aussie/aussie_final_report_water.pdf

- (4) Federal Register; Call for comments on changes to the definition of "in Vietnam."
Available at <http://edocket.access.gpo.gov/2008/pdf/E8-8091.pdf>

- (5) Veterans and Agent Orange: Update 2008, Committee to review the Health Effects in Vietnam Veterans of Exposure to Herbicides (Seventh Biennial Update), Institute of Medicine ISBN: 0-309-13885-X, 706 pages, 6x9, (2009)

- (6) The Role Of Science In Department Of Veterans Affairs Disability Compensation Policies For Environmental And Occupational Illnesses And Injuries, Mark Brown, Ph.D. Presentation for the fourth program on Science for Judges, held at Brooklyn Law School on November 4, 2004. Available at <http://bluewaternavy.org/harbors.htm>

- (7) "Agent Orange Dioxin Contamination in the Environment and Human Population in the Vicinity of Da Nang Airbase, Viet Nam," Hatfield Consultants, Ltd. T.G. Boivin, K.S. Le, L.W. Dwernychuk, M.H. Tran, G.S. Bruce, N.H. Minh, N.T. Tran, K.S. Trinh, T.D. Phung, D. Moats, J.A. Allen, L. Borton, and M. Davies,
Available at <http://www.hatfieldgroup.com/services/contaminantagentorange/agentorangereports.aspx>

- (8) Texas Tech Virtual Vietnam Library Item ID Number 00207
Typescript: Report of Trip to Republic of Vietnam, 15 August – 2 September 1969
Robert A. Darrow
Available at <http://bluewaternavy.org/harbors.htm>

(9) Texas Tech Virtual Vietnam Library Item ID Number 00210 Memorandum: Herbicide Damage to Vegetable Plots Vicinity Da Nang Air Base, from John Moran to 7th Air Force, TACC, ATT: Lt. Robert McCollester, October 31, 1968 Available at <http://bluewaternavy.org/harbors.htm>

(10) Texas Tech Virtual Vietnam Library Item ID Number 00212 Memorandum: Report of Investigation into Possible Herbicide Damage at Vietnamese Naval Compound at Da Nang, from Cpt. Ray W. Bills to III Maf Chemical Officer (Cpt. Lott), 26 September 1969

(11) Texas Tech Virtual Vietnam Library Item Numbers 13120205001, 131201055001b, 3120106001b, 168300011124 U. S. Naval Forces, Vietnam: Monthly Historical Summary and Supplement, May 1968 (214 pages) [May 1968] and supplement pages from 1966 and 1967.

(12) Spray Maps Interactive: http://www.chicagotribune.com/health/agentorange/chi-091204-agentorange-map_0_1959438.htmlpage

This interactive map is based on the Herbicide Exposure Assessment-Vietnam database developed by Jeanne Stellman, professor emeritus at Columbia University's school of public health, and Columbia epidemiology professor Steven Stellman. They cleaned data from a 1974 National Academy of Sciences database and supplemented the records with documents from the National Archives. The database is considered the most comprehensive available on spraying missions. The effort was funded by a contract from the National Academy of Sciences to build an exposure model that could be used to assess the defoliants' health impact on U.S. veterans who served in Vietnam. The model has been evaluated twice by the Institute of Medicine, which recommended that the U.S. Department of Veterans Affairs use it to evaluate the chemicals' health impact. The VA has been testing the exposure model since 2003.

(13) Personal email: Dr. Wayne. Dwernychuk, former lead scientist with Hatfield Consultants, August, 2010

(14) Spectrum Laboratory Fact Sheet

<http://www.speclab.com/compound/c1746016.htm>

15) NATURE, VOL 422, 17 APRIL 2003, The extent and patterns of usage of Agent Orange and other herbicides in Vietnam.

Available at <http://www.bluewaternavy.org/stellman%20pattern%20of%20usage.pdf>

(16) Texas Tech Vietnam Virtual Archive Item ID Number 05308, United States Environmental Protection Agency Before the Administrator, In re: The Dow Chemical Company, et al., FIFRA docket Nos. 415, et al., Respondents Prehearing Brief on the Risks Associated with the Registered Uses of 2,4,5,-T and Silvex.

Available at <http://www.bluewaternavy.org/dispersion/epadow05308.pdf>

(17) Comprehensive Assessment of Dioxin Contamination in Da Nang Airport, Viet Nam: Environmental Levels, Human Exposure and Options for Mitigating Impacts, Final Report, Hatfield Consultants, November 2009

Available at <http://www.hatfieldgroup.com/services/contaminantagentorange/agentorangereports.aspx>

(18) Spray Drift of Pesticides Arising from Aerial Application in Cotton

Nicholas Woods,* Ian P. Craig, Gary Dorr, and Brian Young

Journal of Environmental Quality, VOL. 30, MAY–JUNE 2001

(19) Item 0301

Author Blumenfeld, S. N.

Office of the Science Advisor, Military Assistance Comm A Theoretical Analysis of Downwind Drift of Herbicide Sprayed From an Aircraft, April 4, 1968

Available at <http://bluewaternavy.org/harbors.htm>(20) Item 00189

(20) Department of the Army, Office of the Adjutant General, Alexandria, VA

MACV Fixed-Wing Aircraft Herbicide Incidents. 15 October 1981

Available at <http://bluewaternavy.org/harbors.htm>

(21) Item 004811

Darrow, Robert A. Draft - Use of Herbicides on Southeast Asia , December, 1967

Available at <http://bluewaternavy.org/harbors.htm>

(22) Bench-Scale Testing Of Photolysis, Chemical Oxidation And Biodegradation Of PCB Contaminated Soils And Photolysis Of TCDD Contaminated Soils, By IT Corporation,

Knoxville, Tennessee 37923, Cooperative Agreement No. CR816817-020-0

(23) Ranch Hand Da Nang, Document created: 18 June 04, Air University Review, January-February 1970,

Lieutenant Colonel Arthur F. McConnell, Jr. Available at <http://bluewaternavy.org/harbors.htm>

(24) What Is Dioxin?, Navy Environmental Health Center Environmental Programs

620 John Paul Jones Circle, Suite 1100 Portsmouth, VA 23708, January 2003

(25) A Reconnaissance Study of Herbicides and Their Metabolites in Surface Water of the Midwestern United States Using Immunoassay and Gas Chromatography/Mass Spectrometry

Environmental Science Technology,. 1992, 26, 2440-2447

(26) Risk Analysis of Shipboard Drinking Water Chemical Contaminants, 18 August 2000

Lieutenant Michael D. Cassady, Medical Service Corps, United States Navy

(27) Da Nang Harbor Photo, Circa 1968

Maps of Da Nang Harbor

Available at <http://bluewaternavy.org/harbors.htm>

(28) Item ID Number, 00086, Department of the Army, Headquarters, Washington, D.C.

Friday, December 01, 2000, Page 86 of 91

(29) Item 00207

Darrow, Robert A., Typescript: Report of Trip to Republic of Vietnam, 15 August - 2 September 1969

Available at <http://bluewaternavy.org/harbors.htm>

(30) Ventilation Systems, US Navy Ships,

<http://www.safetycenter.navy.mil/acquisition/ventilation/default.htm>

(31) Item 00210

Moran, John, Memorandum, Herbicide Damage to Vegetable Plots Vicinity Da Nang Air Base, October 31, 1968.

Available at <http://www.bluewaternavy.org/harbors/00210AO%20DAMAGE%20DA%20NANG.pdf>

(32) Spray Drift From Aerial Application Of Pesticides, Kelly Porter Franklin, January 25, 2007

(33) Reef-Building Corals and Reefs of Vietnam: 2. The Gulf of Tonkin, Yu. Ya. Latypov, Russian Journal of Marine Biology, Vol. 29, Suppl.I, 2003, pp. S34S45.

(34) List of diseases sanctioned by the Department of Veteran Affairs as being caused by exposure due to Agent Orange. <http://www.publichealth.va.gov/exposures/agentorange/diseases.asp>

(35) Letter dated February 10, 2009, from Bradley G. Mayes, DVA to John Rossie, BWNVVA

<http://bluewaternavy.org/bradleymayesletter.htm>

(36) Present-Day State of Coral Reefs of Nha Trang Bay.

Available at <<http://bluewaternavy.org/harbors.htm>>

(37) Agent Orange Exposure Increases Veterans' Risk Of Aggressive Recurrence Of Prostate Cancer

Available at <<http://bluewaternavy.org/harbors.htm>>

(38) <<http://www.ourstolenfuture.org/newscience/immune/2002/2002-0930baccarellietal.htm>>, et. al.

(39) Dioxin Fact Sheet, < <http://www.idph.state.il.us/envhealth/factsheets/dioxin.htm>>

(40) EPA Dioxin Fact Sheet - Available at <<http://bluewaternavy.org/harbors.htm>>

(41) Summary of Study Results linking Diabetes with PCBs and Dioxin

Available at <<http://bluewaternavy.org/harbors.htm>>

(42) Research of Dr. John Boscarino

Available at <<http://bluewaternavy.org/harbors.htm>>

- (43) Production of Herbicides
Available at <<http://bluewaternavy.org/harbors.htm>>
- (44) Winter v Diamond Shamrock-1.pdf
Available at <<http://bluewaternavy.org/harbors.htm>>
- (45) Vapor Intrusion - see <http://agentorangelegacy.blogspot.com/>
- (46) Studies and Research showing offshore personnel with high rates of cancers - Summaries
Please see that heading available at <<http://bluewaternavy.org/harbors.htm>>
- (47) IOM Update 2008 declaring presumption only to boots-on ground "inappropriate"
Available at <<http://bluewaternavy.org/harbors.htm>>
- (48) Genetic Damage from Agent Orange Exposure
Available at <<http://bluewaternavy.org/harbors.htm>>
- (49) Satellite photo of Mekong Delta silt flowing up the coastline to the north
Available at <<http://bluewaternavy.org/harbors.htm>>
- (50) Ranch Hand Studies Are Deeply Flawed
Available at <<http://bluewaternavy.org/harbors.htm>>
- (51) EPA Reanalysis of TCDD
Available at <<http://bluewaternavy.org/harbors.htm>>
- (52) Heterogeneity of Toxicant Response: Sources of Human Variability
Available at <<http://bluewaternavy.org/harbors.htm>>
- (53) Agent Orange Act of 1991
Available at <http://bluewaternavy.org/PL_102.doc>
- (54) Studies and Research showing offshore personnel with high rates of cancers
Available at <<http://bluewaternavy.org/harbors.htm>>
- (55) Running Scared: A Conspiracy Theory
Available at <<http://bluewaternavy.org/harbors.htm>>
- (56) Waging War on South East Asia's Landscape
Available at <<http://bluewaternavy.org/harbors.htm>>
- (57) Diseases Associated with Agent Orange Exposure
See <<http://www.publichealth.va.gov/exposures/agentorange/diseases.asp>>
- (58) Authors' personal experience
- (59) Delayed Toxic Effects of Chemical Warfare Agents
Available at <<http://bluewaternavy.org/harbors.htm>>
- (60) Vietnam Association for Victims of Agent Orange/Dioxin v. Dow Chemical Co.
Available at <<http://bluewaternavy.org/harbors.htm>>
- (61) 211-Dioxin Damage around Da Nang
Available at <<http://bluewaternavy.org/harbors.htm>>

(62) Report on most likely methods for exposure to dioxin
Available at < <http://bluewaternavy.org/harbors.htm>>

(63) Agent Orange and Diabetes
Available at < <http://bluewaternavy.org/harbors.htm>>

(64) Storage of Agent Orange
Available at < <http://bluewaternavy.org/harbors.htm>>

(65) Photo showing deep water anchorage at Da Nang
Available at < <http://bluewaternavy.org/harbors.htm>>

(66) Shipboard Ventilation Systems
Available at < <http://bluewaternavy.org/harbors.htm>>

(67) Vietnam Monthly Historical Summary
Available at < <http://bluewaternavy.org/harbors.htm>>