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RADIOACTIVE VETERANS: A NEW LOOK AT THE NUCLEAR HISTORY OF AMERICA

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"We are all students of history, a search for the truth through extensive research and writings, but we are also in the process of becoming a part of history. You can never ask more from life. We will all be leaving behind a legacy for those who follow behind us."[1]

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* This article is dedicated to my wife Ruth, my daughter Rebecca Ashley Kabatchnick, my mother-in-law Lilian Fink, a survivor of World War II in Birmingham, England, and Robert Luskin; who have stood by my side and supported me at all times throughout my life and taught me to never quit, and that we may not at times have it all together, but together we have it all.

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> *"The truth of the matter is that you always know the right thing to do. The hard part is doing it."*[2]

I. HISTORY

A. BACKGROUND

In a personal letter dated August 2, 1939 from his home in Long Island, New York, Albert Einstein wrote to President Franklin D. Roosevelt, and stated as follows:

> Some recent work by E. Fermi and L. Szilard, which has been communicated to me in manuscript, leads me to expect that the element uranium may be turned into a new and important source of energy in the immediate future. Certain aspects of the situation which has arisen seem to call for watchfulness and, if necessary, quick action on the part of the Administration. I believe therefore that it is my duty to bring to your attention the following facts and recommendations:

Veterans of All Wars, 11 MARQ. ELDER'S ADVISOR 81 (2009); *Obstacles Faced by the Elderly Veteran in the VA Claims Adjudication Process*, 12 MARQ. ELDER'S ADVISOR 185 (2010); and *Unsung Survivors: VA Advocacy for the Spouses, Widows, and Children of Elderly Veterans*, 13 MARQ. ELDER'S ADVISOR 243 (2012).

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2. General Norman Schwarzkopf, Jr.

In the course of the last four months it has been made probable – through the work of Joliot in France as well as Fermi and Szilard in America – that it may become possible to set up a nuclear chain reaction in a large mass of uranium, by which vast amounts of power and large quantities of new radium-like elements would be generated. Now it appears almost certain that this could be achieved in the immediate future.

This new phenomenon would also lead to the construction of bombs, and it is conceivable – though much less certain – that extremely powerful bombs of a new type may thus be constructed. A single bomb of this type, carried by boat and exploded in a port, might very well destroy the whole port together with some of the surrounding territory. However, such bombs might very well prove to be too heavy for transportation by air.

The United States has only very poor ores of uranium in moderate quantities. There is some good ore in Canada and the former Czechoslovakia, while the most important source of uranium is Belgian Congo.

In view of this situation you may think it desirable to have some permanent contact maintained between the Administration and the group of physicists working on chain reactions in America. One possible way of achieving might be for you to entrust with this task a person who has your confidence and who could perhaps serve in an inofficial [sic] capacity. His task might comprise the following:

a) to approach Government Departments, keep them informed of the further development, and put forward recommendations for Government action, giving particular attention to the problem of securing a supply of uranium ore for the United States;

b) to speed up the experimental work, which is at present being carried on within the limits of the budgets of University laboratories, by providing funds, if such funds be required, through his contacts with private persons who are willing to make contributions for this cause, and perhaps also by obtaining the co-operation of industrial laboratories which have the necessary equipment.

I understand that Germany has actually stopped the sale of uranium from the Czechoslovakian mines which she has taken over. That she should have taken such early action might perhaps be understood on the

> ground that the son of the German Under-Secretary of State, von Weizsäcker, is attached to the Kaiser-Wilhelm-Institut [sic] in Berlin where some of the American work on uranium is now being repeated.[3]

Thus, with this single letter from Dr. Albert Einstein to President Franklin Roosevelt, dated just one day after the German invasion of Poland and the subsequent start of World War II, the race to build the first atomic bomb began.[4] In December 1938, a chemist in a German laboratory made a discovery, which would culminate to the creation and use of two nuclear bombs on Japanese civilian populations in August 1945 (Hiroshima and Nagasaki) both of which had no military value whatsoever at that time. Within ten months, the world would become engulfed in World War II, a "total war," whereupon Germany, led by a ruthless dictator, Adolph Hitler, would control, except for Great Britain, the entire Western and Eastern Europe portions of the European continent by 1940, and subsequently the Soviet Union in 1941-1942. The 1938 discovery by a German chemist in Nazi Germany that a uranium atom would split in two when placed next to radioactive material would begin a nuclear arms race; the initial purpose being to deny Nazi Germany and Adolph Hitler military dominance over the entire world.

This race to build the first atomic bomb, the most formidable weapon ever known to mankind, a weapon that would eventually threaten the very existence of every country in the world, would involve the world's greatest chemists and scientists.

By 1942, many major cities had been bombed. Initially, General Curtis LeMay's bombing strategy included the industrial targets in the heartland of Germany, but at a great cost

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3. Letter from Albert Einstein (with Leo Szilard), to President Franklin Roosevelt (Aug. 2, 1939) (on file at the Franklin D. Roosevelt Library and Museum), *available at* http://media.nara.gov/Public_Vaults/00762_.pdf.

4. Unless otherwise footnoted all the information in this historical section comes from two related sources: OLIVER STONE & PETER KUZNICK, THE UNTOLD HISTORY OF THE UNITED STATES 87–226 (2012) and *Oliver Stone's Untold History of the United States* (Showtime television series, 2012).

to the American bomber pilots. It was in 1943 that General LeMay and British General Arthur "Bomber" Harris started the indiscriminate use of American daylight bombing, along with British bombing at night, against German civilian centers. In the summer of 1943, the Americans and the British bombed and destroyed the city of Hamburg. Later that year, the German city of Munster was bombed and destroyed. In February 1945, the city of Dresden was completely destroyed by British and American bombings. Dresden had little military value; however, it is estimated that more than 500,000 German civilians died as a result of the bombing. By mid-April 1944 there was little military value left in bombing Germany, and it was also known to American intelligence that the Germans had stopped their atomic bomb program in favor of the V-1 flying bomb and V-2 rocket projects.

The war with Germany ended with their surrender on May 8, 1945. But the American hatred toward Japan was exhibited with great ferocity after the attack on Pearl Harbor. Further hatred toward the Japanese people was exacerbated by reports in 1944 of Japanese atrocities against American and British Prisoners of War (POWs) during the Philippine death march, and in many other instances.

In late 1944, General LeMay transferred to Japan and started a campaign of indiscriminate "terror" bombings of Japanese civilian centers, similar to the practice he had initiated in allied bombings of Germany in World War II. In March of 1945 the Allied forces were capturing more and more Japanese occupied territories, thus bringing Allied bombers that much closer to the Japanese mainland. In March 1945 General LeMay ordered 330 bombers to attack Tokyo with incendiary bombs, white phosphorous, and other flammable material. This was devastating to the city because there were large amounts of bamboo and wood throughout Tokyo. That raid killed more than 100,000 civilians, while leaving another one million homeless. The Allied Air Force firebombed at least 100 other targets in Japan, some with no military significance; these raids

killed an additional 500,000 Japanese. Yet, the Japanese would not surrender under "unconditional" terms, fearing the loss of their Emperor Hirohito.

Given the terrible costs of General LeMay's "terror" bombings of civilian targets, the atomic bomb seemed to be the logical next step in trying to force the Japanese into unconditional surrender. The atomic bomb constructed and successfully tested on July 16, 1945, was, in fact, a prototype of what was to come in the future.

Key facts led to President Truman's decision to utilize the atomic bomb. In May 1945, in taking over the island of Iwo Jima after five weeks of combat, the United States lost over 7,000 soldiers, while another 18,000 were wounded. Furthermore, at Okinawa, after 82 days of combat and what was the bloodiest battle of the Pacific War, over 12,000 Americans were killed and/or missing and 36,000 were wounded. The Japanese lost over 100,000 troops and an equivalent number of civilians while defending this island. Another key fact leading to the use of the atomic bomb was the sinking of the USS Indianapolis, which resulted in a dreadful loss of life when the ship was secretly returning to the Philippines after delivering the components of the atomic bomb to the island of Tinian.

In this regard, in the summer of 1945 it was President Truman's firm belief that, although the Japanese were essentially defeated from a military perspective, any invasion of the main islands by American forces would still result in the loss of hundreds of thousands of American lives. Furthermore, many world and American military leaders, including Churchill and Truman, believed that the Soviet Union represented an even bigger threat. The use of the atomic bomb would be an extraordinary show of strength, one that changed the face of the world.

Under the leadership of Dr. Robert Oppenheimer, the Manhattan Project, which involved many of the world's top physicists, scientists, and chemists, working together in Chicago, Illinois and Los Alamos, New Mexico, secretly completed the

construction of the atomic bomb. This successful construction and detonation of the first atomic bomb, a plutonium implosion bomb, was completed on July 16, 1945, at the Los Alamos test site in New Mexico, at a site code named Trinity.

In July 1945, the three major allied powers, the United States, Great Britain, and the Soviet Union, were to meet at Potsdam, Germany to determine the future status of post-war Europe. President Truman delayed the Potsdam Conference for two weeks, in hopes of hearing the positive outcome of the July 16 Trinity blast at Los Alamos. Upon hearing the news of the successful blast at the Trinity test site at Los Alamos, President Truman immediately notified British Prime Minister Winston Churchill and Soviet dictator Josef Stalin. Stalin was shocked and furious, for his intelligence had only informed him that the United States was in the process of constructing a nuclear bomb, not of its completion and subsequent successful test shot. This marked the start of the nuclear arms race between the United States and the Soviet Union; an arms race that gave countries the ability to develop such a formidable weapon, with a capacity to grant any country a vast capability of military dominance over the entire world, and thereby introduce the world's most devastating manmade weapon.

During the course of World War II President Harry Truman repeatedly reiterated President Roosevelt's original call for the unconditional surrender of the Imperial Japanese forces. However, on July 16, 1945, after the successful test shot at Trinity, President Truman had a new weapon that could destroy entire cities, and beyond. It was hoped by Truman that the use of such a bomb would force the Japanese into unconditional surrender.

On August 1, 1945, the Soviet Union invaded northern Manchuria and northern Japan. Then, on August 5, 1945, the Soviet Union declared war on Japan. The main fear for the Japanese was that under the terms of unconditional surrender they would lose their Emperor Hirohito, who was the equivalent of a god to the Japanese people. However, President Truman

would ultimately decide that use of the atomic bomb would end the war on American terms, and that he wanted it done as soon as possible in the face of the Soviet Union's declaration of war against the Japanese. President Truman wanted a swift end to war and a decisive end to the war with Japan.

Therefore, on the morning of August 6, 1945, at 8:15 a.m., with great secrecy, a single American B-29 bomber named the "Enola Gay" dropped a single uranium bomb, "Little Boy," which contained the equivalent of 20,000 tons of trinitrotoluene (TNT), on the city of Hiroshima, Japan. Hiroshima was selected as the first of three sites for the use of the atomic bomb because it had not previously been bombed and was not of any military significance. In an instant Hiroshima was destroyed, killing at least 70,000 people. In addition, there were an estimated 100,000 civilians who would die of wounds, burns, and radiation exposure. In many instances it would be years, and even decades, before thousands of people would die of radiation poisoning resulting from exposure to that atomic bomb.

President Truman, in his first radio address, described the first atomic bomb and its impact on the city of Hiroshima. President Truman further stated that the war started as a result of the Japanese bombing at Pearl Harbor, and that they had been repaid manifold. He stated that the atomic bomb exhibited the harnessing power of the universe.

Yet, the Japanese government still refused to surrender. Therefore on August 9, 1945, at Tinian, a B-29 was loaded with the second atomic bomb, nicknamed "Fat Man," a plutonium implosion bomb, similar to the bomb successfully tested at Los Alamos. The second target was to be the city of Kokura and the backup target was Nagasaki. As with Hiroshima, both cities were chosen because they were untouched by American bombing and had little military value. Therefore, consistent with General LeMay's long-standing belief in "terror bombings," both atomic bombings of the Japanese civilian population were deliberately targeted for shock effect. Cloud cover obscured Kokura, the primary target site, and the B-29 carrying the second

atomic bomb faced anti-aircraft fire. Therefore, the destiny of Nagasaki, the backup target site, was sealed.

Fat Man exploded over Nagasaki with the force of 22,000 tons of TNT, larger than the Hiroshima bomb, and instantly killed at least 40,000 people. Furthermore, tens of thousands of Japanese civilians were fatally wounded, while others died of radiation poisoning. Thereafter, the Japanese surrendered on August 15, 1945. Thus, the nuclear arms race between the United States and the Soviet Union gained momentum, which would forever change the fate of the world in which we live. On August 29, 1949, the Soviet Union successfully exploded their first atomic bomb, an exact duplicate of the American plutonium implosion bomb, Little Boy, tested at test site Trinity, with a force of 20,000 tons of TNT. The Americans detected the Soviet test blast when an American aircraft flying over the Western Pacific detected high levels of radiation in the atmosphere. This single atomic test blast by the Soviet Union seriously expanded the Cold War in 1949. This was best exemplified by American development and successful test of the hydrogen bomb in the Pacific on November 1, 1952. The hydrogen bomb exploded with the force of ten megatons, equivalent to ten million tons of TNT (more than 500 times more powerful than the first atomic bomb that destroyed Hiroshima).

The United States would conduct numerous atomic blasts between 1946 and 1962. Several of these atomic blasts were conducted in the Western Pacific, most especially: the Bikini and Marshall Islands, the Nevada Test Site, Camp Desert Rock, and in Alaska. Soldiers were ordered to charge towards detonated nuclear bombs to assess troop maneuverability, and battleship and airplane readiness were tested with both underwater and atmospheric nuclear detonations.[5] Thus, in the interest of national security and military strategy, the U.S. military trained

5. DEF. NUCLEAR AGENCY, DEP'T OF DEF., DNA 6014F, OPERATION UPSHOT-KNOTHOLE 66, 76–77 (1953); Frank Munger, *Atomic Vet Recalls 1946 Bomb Tests – and Dirty Aftermath*, KNOXVILLE NEWS SENTINEL, Sept. 21, 2008, http://www.knoxnews.com/news/2008/sep/21/atomic-vet-recalls/.

with nuclear bombs between 1945 and 1962. Nuclear bombs are different from traditional bombs that relied on chemical reactions like TNT[6] – as nuclear bombs generate nuclear wind gusts, excessive heat, radiation, and other environmental phenomena.[7] For this reason, the U.S. military had to learn how to use nuclear weapons in the traditional arenas of war, including land, air, and sea.[8] These missions were used to "determine the effects of nuclear detonations on military offensive and defensive systems."[9] These nuclear tests exposed thousands of veterans in a reckless fashion to lethal amounts of radiation, with the support of very few accurate or reliable radiation dosemetry badges or devices, and with reckless disregard to the dangers of lethal radiation exposure, either due to the radiation blast itself or radiation fallout thereafter.

During Operation "Crossroads" in 1946, the United States conducted both an atmospheric blast as well as an underwater test blast. These two blasts were identified as Shot "Able" and Shot "Baker." Numerous naval vessels and naval personnel participated in Operation Crossroads. The water in and around the Bikini Islands and Bikini Atoll was highly contaminated with radiation; and, the ballast utilized on the ships contained this highly contaminated water. Moreover, when sea water was sprayed on the ships, the puddles of water that gathered on the ship were contaminated with radioactive isotopes. Yet, ships were allowed to travel into Bikini Atoll just twenty hours after the nuclear blast, exposing thousands of naval personnel to excessive amounts of lethal radiation. Tragically, the radioactive

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6. *See* U.S. STRATEGIC BOMBING SURVEY, THE EFFECTS OF THE ATOMIC BOMBINGS OF HIROSHIMA & NAGASAKI 30–41 (1946), *available at* http://www.trumanlibrary.org/whistlestop/study_collections/bomb/large/documents/pdfs/65.pdf.

7. *Id.*

8. *See, e.g.*, ERNEST A. PINSON ET AL., PROJECT 2.66A, OPERATION REDWING PACIFIC PROVING GROUNDS – PRELIMINARY REPORT, EARLY CLOUD PENETRATIONS (1956), *available at* http://www.hss.energy.gov/healthsafety/ihs/marshall/collection/data/ihp1c/0898_a.pdf; DEF. NUCLEAR AGENCY, *supra* note 5, at 66, 76–77.

9. U.S. DEP'T OF ENERGY, UNITED STATES NUCLEAR TESTS JULY 1945 THROUGH SEPTEMBER 1992 viii (2000).

fallout from Shot Able and Shot Baker in the Bikini Islands during Operation Crossroads was so lethal and extensive that the innocent residents of those islands had to be evacuated permanently. The former residents of the Bikini Islands would later be compensated due to the fact that they were displaced by the radioactive exposure and fallout caused by Shot Able and Shot Baker during Operation Crossroads.

The numerous Nevada nuclear test blasts in the 1950s created their own set of problems for military personnel. The sites of the atomic test blasts were located in Nevada, which is by its very nature extremely dry, and therefore, many of the atomic test blasts were labeled "dirty blasts." The inherent risks of releasing large amounts of ionized dust particles into the atmosphere during the Nevada atomic test blasts were quite high, exposing cities, local towns, and communities to lethal amounts of radioactive fallout, thus resulting in higher rates of cancer, and other diseases linked to radiation exposure. The classic example of the effects of fallout on a civilian population was Shot "Harry." The intent of the military during Shot Harry was to avoid fallout hitting Salt Lake City and Las Vegas. Shot Harry turned out to be a dirty blast, with a vast amount of ionized dust particles shooting up into the atmosphere. That fallout headed straight toward St. George, Utah, where a wind shear brought the fallout straight over and down onto the city with tragic consequences. At the time of Shot Harry, residents of St. George, Utah remember seeing a "pink cloud" over the city. In the future, cancer clusters developed throughout the population of St. George, Utah, resulting in litigation against the U.S. Department of Justice (DOJ).

Veterans who served in the Nevada and West Pacific nuclear test blasts were treated by the military without much sophistication or science. Despite their exposure to lethal doses of radiation, little attention was paid to their future well being. For example, to test exposure to nuclear blasts, the military merely placed houses, buildings of adobe, and pigs—whose skin is similar to humans—in the vicinity of the Nevada test sites.

In addition, veterans were ordered to stand in close proximity to the test site and ordered to stare at the stem of the blast, such as in "Upshot-Knothole," Shot "Badger," and Shot "Grable" in area Five of the Nevada nuclear test-site on May 23, 1953. These and other veterans were ordered to squat or stand in shallow slit trenches and then to charge the stem of the nuclear blast. They were ordered to remain at the test site for days after the initial nuclear test blast, forcing them to eat food and remain in quarters contaminated with ionized dust particles. They oftentimes wore the same uniforms contaminated with ionized dust particles for numerous days.

At Camp Desert Rock in Nevada the U.S. military began using smaller atomic blasts to learn how to fight a nuclear war. On April 22, 1952, approximately 2,000 Army personnel conducted maneuvers beneath the mushroom cloud of the Shot "Charlie" nuclear detonation. The 31-kiloton explosion was one of the largest ever conducted in Nevada to that date. The United States government provided few basic precautions to protect military personnel from the lethal effects of the nuclear tests. These active duty military personnel were, in all respects, being handled as human guinea pigs. It was the goal of the military to deduce whether U.S. troops could fight and survive an atomic attack.[10]

In this regard, in the 1950's the Nevada National Security Site was the site for a large military camp containing thousands of young active duty military personnel, including marines, naval personnel, soldiers, and air force military personnel. They were to witness the heat and blast of the ultimate "doomsday weapon,"[11] with little thought as to the lethal radiological health risks and overall safety of these soldiers, who were exposed directly to lethal amounts of radiation.[12]

Camp Desert Rock was activated in the fall of 1951 for the

10. NAT. NUCLEAR SECURITY ADMIN., U.S. DEP'T OF ENERGY, DOE/NV – 764, CAMP DESERT ROCK (2011).

11. *Id.* at 1.

12. *Id.* at 1–2.

"Buster-Jangle" series of nuclear blasts. These blasts were conducted in Yucca Flats, Nevada. These nuclear test blasts involved an atmospheric blast. Thousands of troop observers from all parts of the United States were deployed from Camp Desert Rock to witness, at close range, the atomic detonations. Incredibly, after the atomic explosions, some of the participating troops were marched or bused even closer to "ground zero" to see the effects of these atomic explosions on military equipment before returning to Camp Desert Rock.[13]

After discharge from active duty military service, many veterans developed forms of cancer and disease for which the government had not made adequate resources and care available. And in a very real way, the fallout from these blasts continues today.

This article is dedicated to the thousands of veterans who participated in these nuclear test blasts from 1940 through 1970. These veterans participated in one of the greatest battles of all-time—the Cold War between the United States, the Soviet Union, and China. This article is the story of the inherent risks and sacrifices that veterans of the atomic test blasts made during their participation in the atomic arms race during the height of the Cold War. And now, subsequent to these atomic test blasts, modern warfare has been revolutionized and a new race, a race to keep the world's most destructive detonation from any intending nation or group, has been birthed.

B. SUMMARY

Between 1945 and 1962, several thousand service members were involved in nuclear weapons training missions[14] wherein live nuclear bombs or "shots" were detonated.[15] This class

13. *Id.*

14. EMP. EDUC. SYS., DEP'T OF VETERANS AFFAIRS, VETERANS & RADIATION 43, 141 (2001).

15. *See* U.S. DEP'T OF ENERGY, *supra* note 9 ("This document lists chronologically and alphabetically by name **all** nuclear tests and simultaneous detonations conducted by the United States from July 1945 through September 1992.").

joined other soldiers involved with the atomic bombing missions of Hiroshima and Nagasaki, Japan, the American POWs held in these cities, and soldiers who served during the Japanese occupation, as victims of radiation exposure.[16] These "Atomic Veterans," numbering over 400,000, were exposed to radiation either from the initial bomb blast, breathing the radioactive dust, ingesting contaminated food and water after the blast, or living in the radioactive environment.[17]

Epidemiological studies initiated in the late 1970s revealed that these Atomic Veterans were at an increased risk of developing a variety of cancers and chronic diseases, including leukemia.[18] However, veterans suffering from radiological diseases found it difficult to obtain medical benefits from the Veterans Administration (VA).[19] In response to public sentiment and pressure from veterans groups Congress passed the Veterans' Dioxin and Radiation Exposure Compensation Standards Act (VDRECSA),[20] acknowledging that some veterans were exposed to ionizing radiation, and that this exposure could be linked to radiological diseases. Unfortunately, few veterans have been able to receive compensation under this Act, provoking Congress to pass additional legislation to help compensate these veterans, including the Radiation-Exposed Veterans Compensation Act of 1988 (REVCA) and the Radiation

16. OFFICE OF PUB. HEALTH (10P3), U.S. DEP'T OF VETERANS AFFAIRS, ARE YOU AN ATOMIC VETERAN? (2012).

17. COMMITTEE TO REVIEW THE DOSE RECONSTRUCTION PROGRAM OF THE DEFENSE THREAT REDUCTION AGENCY, A REVIEW OF THE DOSE RECONSTRUCTION PROGRAM OF THE DEFENSE THREAT REDUCTION AGENCY 33–34 (2003), *available at* http://www.nap.edu/openbook.php?isbn=0309089026 [hereinafter REVIEW OF DTRA].

18. *See* Glyn G. Caldwell et al., *Leukemia Among Participants in Military Maneuvers at a Nuclear Bomb Test*, 244 JAMA 1575, 1577–78 (1980) [hereinafter Caldwell et al., *Leukemia*]. See also SUSAN THAUL ET AL., INST. OF MED., THE FIVE SERIES STUDY: MORTALITY OF MILITARY PARTICIPANTS IN U.S. NUCLEAR WEAPONS TESTS 9 (2000), *available at* http://www.nap.edu/catalog.php?record_id=9697, for a review of government funded entities.

19. *See* Judi Hasson, *Getting the Word Out to Atomic Veterans Exposed to Radiation*, AARP, Nov. 8, 2011, http://www.aarp.org/health/conditions-treatments/info-11-2011/atomic-veterans-special-benefits-radiation-exposure.html.

20. Veterans' Dioxin and Radiation Exposure Compensation Standards Act, Pub. L. No. 98-542, 98 Stat. 2725 (1984) (codified in part at 38 U.S.C. § 1154 (2000)).

Exposure Compensation Act of 1990 (RECA).[21] The current legislation provides Atomic Veterans, who suffer from a few specific radiological diseases, an avenue for compensation. However, obtaining medical benefits for veterans who suffer from radiological diseases not specifically outlined in the legislation continues to prove difficult.[22] This article reviews the legal and scientific challenges veterans face in establishing service-connected disability compensation for their radiological diseases, suggests a new standard, and provides a case study in which a veteran was finally awarded VA benefits for his radiological diseases after decades of litigation.

II. THE SPECIAL CHALLENGES FACED BY THE ATOMIC VETERAN

The nuclear bombs dropped in 1945 on Hiroshima and Nagasaki exhibited the most awesome display of military power in recorded history. Witnesses described a bright white-blue light and a concussive blast, followed by a ring of fire and extreme heat that incinerated thousands and devastated the cities'

21. Radiation-Exposed Veterans Compensation Act of 1988, Pub. L. No. 100-321, 102 Stat. 485 [OR] Pub. L. No. 100-322, 102 Stat. 534 (1988) (codified at 38 C.F.R. § 3.309(d) (2011) and as amended at 38 U.S.C. § 1112(c) (2006)). Radiation Exposure Compensation Act, 42 U.S.C. § 2210 note (2006) (amended 2000). The current version of RECA is officially entitled The Radiation Exposure Compensation Act Amendments of 2000, however, for colloquial ease the amended Act is still referred to as RECA.

22. *See, e.g.*, *Veterans' Health Care Improvements Act of 1998: Hearing on S. 1385 and S. 1822 Before the S. Comm. on Veterans' Affairs*, 105th Cong. (1998) (statement of Dr. Rosalie Bertell, Int'l Inst. of Concern for Pub. Health); PowerPoint: Bradley Flohr & Gail Berry, Slide Presentation, *Radiation Claims Processing* at the VETERANS' ADVISORY BOARD ON DOSE RECONSTRUCTION MEETING (Mar. 23, 2012), slides 4–5, *available at* http://www.vbdr.org/meetings/2012/Presentations/6-Flohr_VBDR_Mar12.pdf [hereinafter Flohr 2012]; PowerPoint: Bradley B. Flohr, Slide Presentation, *Update on VA Radiation Claims Compensation Program for Veterans* at the VETERANS' ADVISORY BOARD ON DOSE RECONSTRUCTION MEETING (Mar. 11, 2011), slides 6–7, *available at* http://www.vbdr.org/meetings/2011/presentations/Flohr.pdf [hereinafter Flohr 2011] (stating that 1,968 claims were granted and 3,683 were denied); PowerPoint: Bradley B. Flohr, Slide Presentation, *Update on VA Radiation Claims Compensation Program for Veterans* at the VETERANS' ADVISORY BOARD ON DOSE RECONSTRUCTION MEETING (Mar. 11, 2011), slides 6–7, *available at* http://www.vbdr.org/meetings/2010/presentations/Flohr_VBDR_Update_March_2010.pdf [hereinafter Flohr 2010] (stating that 1,648 claims were granted and 2,918 claims were denied).

infrastructure.[23] These nuclear weapons not only demonstrated the military prowess of the United States, but also symbolized the beginning of modern nuclear science and concerns regarding radiation exposure. Many survivors of the initiation blast soon succumbed to a mysterious illness, called "radiation sickness," characterized by: nausea, vomiting, headache, dizziness, fatigue, fever, and skin burns.[24] Through these observations, scientists and medical professionals became aware of the unique and immediate effects of radiation exposure.[25] However, the long-term effects of radiation were largely unknown.[26]

Once these Atomic Veterans developed radiation-related diseases they turned to the VA to provide them with medical care. However, to receive care a veteran must prove that his/her condition is service-connected.[27] Generally, this requires that there be a nexus between a disease and radiation exposure.[28] In determining this nexus the VA must consider several factors: probable radiation dose, tissues or organs affected, veterans' age, gender and family history, time-lapse between exposure and disease onset, and any non-service related activity that may have contributed to the development of the disease.[29]

Regrettably, scientists and veterans have difficulty linking radiological diseases to radiation exposure incurred during military service. This difficulty can be attributed to several factors, including: (1) the lack of knowledge and the inability to measure radiation exposure during the mission; (2) misinformation communicated to the veteran and the public

23. *See* U.S. STRATEGIC BOMBING SURVEY, *supra* note 6, at 3–4.

24. *Id.* at 16–27. *See also* PAUL S. HENSHAW & AUSTIN M. BRUES, ATOMIC BOMB CASUALTY COMM., GENERAL REPORT 3 (1947); *and* JOHN HERSEY, HIROSHIMA 87–118 (1946).

25. *See, e.g.*, Stuart C. Finch, *Acute Radiation Syndrome*, 258 JAMA 664, 664–65 (1987). *See generally* STUART FINCH ET AL., ATOMIC BOMB CAS. COMM'N, DETECTION OF LEUKEMIA & RELATED DISORDERS, HIROSHIMA & NAGASAKI: RESEARCH PLAN (1965).

26. *See* UNIV. OF WASH. ENVTL. HEALTH & SAFETY, PRINCIPLES OF RADIATION PROTECTION Bio-3 (2006).

27. 38 C.F.R. § 3.303(d) (2011).

28. 38 U.S.C. § 5107(a) (2006).

29. 38 C.F.R. § 3.311 (2011).

about radiation exposure; (3) the oath of secrecy sworn by soldiers prohibiting them from discussing their radiation exposure with their physicians; (4) the long "incubation period" with which many radiological diseases are associated; (5) the difficulty associated with retrospectively calculating radiation exposure dose; and (6) the variability of radiation exposure experienced by veterans, which complicates the scientific analysis of linking specific diseases with specific types of radiation.[30]

Unfortunately, in the absence of direct scientific data establishing a "cause-and-effect" relationship between radiation exposure and radiological disease, the VA has historically denied service-connected compensation for this class of injury.[31] Even though Congress has enacted various legislation to compel the VA and the DOJ to award radiation exposure benefits to Atomic Veterans who suffer from certain radiological diseases, including VDRECSA and REVCA, compensation remains extremely limited.[32] This is largely because, with the exception of delineated "presumptive diseases,"[33] Atomic Veterans must still prove a nexus between an in-service injury or disease and a current disability.

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30. *See* discussion *infra* Sections III, IV.

31. Prior to VDRECSA and subsequent legislation, the only option available to the veteran was a claim filed for direct service-connection, under 38 U.S.C. Sections 1110, 1154(a) and 38 C.F.R. Section 3.303. For radiogenic disease claims, the veteran had to show that the disease resulted from in-service exposure to ionizing radiation. Veterans and their survivors who attempted to establish direct service-connection were seldom successful under that regime because of the severe difficulties of proof, including the lack of ready access to scientific and medical evidence about the long-term effects of radiation exposure and the lack of reliable information about exposure levels. In addition, there was great inconsistency in the way radiogenic-disease claims were addressed by the agency's various regional offices. *See* H.R. Rep. No. 98-592, at 7 (1984) reprinted in 1984 U.S.C.C.A.N. 4449, 4453; 130 Cong. Rec. 13,147-49 (1984) (statement of Sen. Cranston).

32. Including the Veterans' Dioxin and Radiation Exposure Compensation Standards Act, Pub. L. No. 98-542, 98 Stat. 2725 (1984) (codified in part at 38 U.S.C. § 1154 (2000)); Radiation-Exposed Veterans Compensation Act of 1988, Pub. L. No. 100-321, 102 Stat. 485 [OR] Pub. L. No. 100-322, 102 Stat. 534 (1988) (codified at 38 C.F.R. § 3.309(d) (2011) and as amended at 38 U.S.C. § 1112(c) (2006)); and Radiation Exposure Compensation Act, 42 U.S.C. § 2210 note (2006) (amended 2000).

33. 38 U.S.C. § 1112(c) (2006).

This article argues that the current application of VDRECSA and REVCA creates challenges for the Atomic Veteran, often precluding the award of service connection. This is due, in part, to the way the VA evaluates the claim, arguably imposing a higher standard of review on these claims than was intended by Congress. Rather than reflecting a "likely association" between the disease and the radiation exposure, the way in which the VA evaluates these factors reflect a heightened "cause and effect" standard of review. Thus, the procedure by which radiation cases are reviewed precludes the application of the benefit-of-the-doubt standard,[34] violating expressed congressional command. Therefore, current regulations governing claims adjudication should be interpreted or amended to conform to the governing statutes and congressional intent. This would ease the burden on Atomic Veterans, subjecting their service-related compensation claims to the same standard of review that other similarly situated veterans (i.e. Vietnam Veterans) currently receive under the VDRECSA legislation.

In summary, this article argues that Atomic Veterans face an unnecessary number of challenges in establishing service-connected disability claims for their radiologic diseases; and thus, the VA should adopt a new standard under which these claims are evaluated. In Sections III and IV this article will outline the reasons why scientists and veterans have difficulty linking radiological diseases to radiation exposure incurred during military service. Next, this article will outline and evaluate the various laws that regulate veteran access to benefits. In Section VI the article presents a case study that is indicative of the difficulties inherent in a veteran appeal for benefits. Finally, this article suggests the VA use a standard similar to dioxin claims when evaluating veteran claims for benefits.

34. 38 C.F.R. § 3.102 (2012).

III. MILITARY MISSIONS: RADIATION, SECRECY & MISINFORMATION

A. RADIATION AND THE LACK OF PROTECTION

Radiobiology is the study of the effects of ionizing radiation upon living organisms.[35] The field originated and developed, along with nuclear science, during the twentieth century.[36] Nuclear bombs release radiation in the form of x-rays, gamma rays, neutron radiation, beta particles, and alpha particles (depending upon the bombs initial composition and the route of detonation).[37] Through military missions that involved the detonation of nuclear bombs, much was learned about how to better control the nuclear reactions and the types of radiation emitted from the blasts.[38] Unfortunately, during these military missions little was known about the complexity of radiation exposure. However, the potential for gamma ray radiation was known; and, gamma radiation detectors, called "dosimeter badges," were used to measure gamma radiation exposure.[39] Worn by soldiers at select locations, the badges were analyzed and used to determine radiation fields and to approximate gamma radiation doses.[40]

During these missions, precautions to protect soldiers from radiation exposure were either absent or inadequate.[41] The military adopted the "duck and cover" strategy for protecting soldiers, and encouraged veterans to utilize bunkers to avoid

35. WEBSTER'S NEW INTERNATIONAL DICTIONARY 1873 (3d ed. 2002).

36. *See generally* Henning Willers & H.-P. Beck-Bornholdt, *Origins of Radiotherapy and Radiobiology*, 38 RADIOTHERAPY & ONCOLOGY 171 (1996) (outlining the origins and growth of radiobiology).

37. *See generally* U.S. STRATEGIC BOMBING SURVEY, *supra* note 6. *See also* Harold L. Brode, *Review of Nuclear Weapons Effects,* 18 ANN. REV. NUCLEAR SCI. 153, 155 (1968).

38. U.S. DEP'T OF ENERGY, *supra* note 9, at viii.

39. REVIEW OF DTRA, *supra* note 17, at 8, 21.

40. *Id.*

41. *See, e.g.*, JONATHAN M. WEISGALL, OPERATION CROSSROADS: THE ATOMIC TESTS AT BIKINI ATOLL 230 (1994). *See* BACK FROM DUTY: OZAUKEE COUNTY'S VETERANS SHARE THEIR STORIES 14 (Laurie Arendt ed., 2002).

flash burns.[42] Other protective mechanisms included smoke curtains, shoe covers, and showering.[43] Although these methods may have provided primitive cover from some types of radiation, these methods have proven to be largely ineffective because the particles and radiation rays emitted from nuclear reactions have unique properties.[44] Alpha particles are easily absorbed by a thin piece of paper or the dead cells of the skin and pose little danger to a person fully covered.[45] Beta particles can be absorbed by clothing, but particles maintain the potential to penetrate and burn the skin.[46] However, when alpha or beta particles are inhaled or ingested the particles can damage internal organs.[47] Gamma rays, x-rays, and neutrons penetrate the skin and are absorbed by the internal organs.[48] If alpha particles, beta particles, neutrons, gamma rays, or x-rays reach living cells, the living cells absorb the radiation.[49] The radiation then acts in a variety of ways to interfere with normal cellular processes, directly killing the cell or damaging the cells' DNA, which can eventually develop into cancer.

In the absence of adequate protection, soldiers involved in these missions were exposed to ionizing radiation in a variety of ways. Veterans exposed to the initial blast were likely irradiated with x-rays, neutron and gamma rays, beta particles, and alpha particles.[50] This type of exposure has been linked to solid tumors and leukemia.[51] Veterans who inhaled radioactive dust likely had radioactive material deposited in their nose, lungs,

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42. DEF. THREAT REDUCTION AGENCY, OPERATION UPSHOT-KNOTHOLE FACT SHEET 2, 8 (2008).

43. DEF. NUCLEAR AGENCY, *supra* note 5, 171–72.

44. *Radiation Protection Basics*, U.S. ENVTL. PROT. AGENCY, http://www.epa.gov/rpdweb00/understand/protection_basics.html (last updated July 6, 2012).

45. *Radiation Exposure and Cancer*, AM. CANCER SOC'Y, http://www.cancer.org/cancer/cancercauses/othercarcinogens/medicaltreatments/radiation-exposure-and-cancer (last revised Mar. 29, 2010).

46. *Id.*

47. *Id.*

48. *Id.*

49. *Id.*

50. REVIEW OF DTRA, *supra* note 17, at 5, 21.

51. *Id.* at 60–63.

and bones.[52] This material remains in the veterans' tissues, emitting radioactive material for years, eventually causing nasal, lung, or bone cancer, and bone disease.[53] The Nevada and Marshall Island testing sites hosted several training missions where radioactivity accumulated in the sand, soil, and water; so, soldiers were exposed to large amounts of radioactivity from prior and current shots.[54] During these missions the soldiers lived in radioactive environments, drank and bathed in radioactive water,[55] and ingested radioactive food.[56] These veterans are ripe for bladder cancers in addition to the commonly associated radiation cancers.[57] Most veterans were exposed to radiation through several of these activities and, thus, are susceptible to a variety of diseases.

B. THE ROLE OF MILITARY SECRECY

Military secrecy is a unique hurdle for the Atomic Veteran. On one hand, secrecy was, and is, deemed requisite to patriotism. On the other hand, the same secrecy compromised the veteran's medical care, access to records, and prevented scientists from performing early epidemiological studies. In 1940, President Franklin Roosevelt issued an Executive Order, which protected information relating to military and naval installations.[58] Citing the Espionage Act of 1917, Roosevelt set the federal government's classification standards for secrecy, and broadly applied secrecy to all government officials.[59] After

52. *Id.* at 32, 34–35.

53. AGENCY FOR TOXIC SUBSTANCES & DISEASE REGISTRY, U.S. DEP'T HEALTH & HUMAN SERVS., TOXICOLOGICAL PROFILE FOR IONIZING RADIATION 9, 42, 57 (1999), *available at* http://www.atsdr.cdc.gov/ToxProfiles/tp149.pdf.

54. *See* Frank Munger, *Atomic Vet Recalls 1946 Bomb Tests – and Dirty Aftermath*, KNOXVILLE NEWS SENTINEL, Sept. 21, 2008, http://www.knoxnews.com/news/2008/sep/21/atomic-vet-recalls/.

55. *Id.*

56. REVIEW OF DTRA, *supra* note 17, at 21, 34.

57. *See id*. at 22. *See also, e.g.*, TERRY GREENE ET AL., CANCER AND WORKERS EXPOSED TO IONIZING RADIATION: A REVIEW OF RESEARCH LITERATURE 13–16 (2003).

58. Exec. Order No. 8,381, 5 Fed. Reg. 1,147 (Mar. 22, 1940).

59. Espionage Act, 18 U.S.C. §§ 792–99 (2006).

World War II, Congress enacted the Atomic Energy Act[60] and the Invention Secrecy Act,[61] noting the national security implication of some scientific and technological advances.[62] It is this legislation that provides the basic framework for protecting secrecy related to nuclear weapons testing. Along with the Espionage Act of 1917, this legislation subjects Atomic Veterans to penalties for disclosing information related to their mission(s).[63]

Since much of the information related to the nuclear testing missions was classified, veterans could not disclose their missions. Therefore, Atomic Veterans could not legally disclose their potential radiation exposure during military service. Physicians, largely ignorant of the scope of military nuclear missions, would not know to ask the veteran about ionizing radiation exposure and, therefore, would be less likely to consider a radiological disease as a diagnosis. Additionally,

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60. Atomic Energy Act of 1954, 42 U.S.C. § 2011 (2000).

61. Invention Secrecy Act, 35 U.S.C. § 181 (1994).

62. *Id.* (authorizing the Commissioner of Patents to keep secret those patents on inventions in which the government has an ownership interest and the widespread knowledge of which would harm national security). See generally JENNIFER ELSEA, CONG. RESEARCH SERV., RL 33502, PROTECTION OF NATIONAL SECURITY INFORMATION (2006), and GENEVIEVE J. KNEZO, CONG. RESEARCH SERV., RL 33303, "SENSITIVE BUT UNCLASSIFIED" INFORMATION & OTHER CONTROLS: POLICY & OPTIONS FOR SCIENTIFIC & TECHNICAL INFORMATION (2006), for a more detailed discussion of these and other regulatory regimes for the protection of sensitive government information.

63. 18 U.S.C. § 798(a) (2006)

> (Whoever knowingly and willfully communicates, furnishes, transmits, or otherwise makes available to an unauthorized person, or publishes, or uses in any manner prejudicial to the safety or interest of the United States or for the benefit of any foreign government to the detriment of the United States any classified information – (1) concerning the nature, preparation, or use of any code, cipher, or cryptographic system of the United States or any foreign government; or (2) concerning the design, construction, use, maintenance, or repair of any device, apparatus, or appliance used or prepared or planned for use by the United States or any foreign government for cryptographic or communication intelligence purposes; or (3) concerning the communication intelligence activities of the United States or any foreign government; or (4) obtained by the processes of communication intelligence from the communications of any foreign government, knowing the same to have been obtained by such processes – Shall be fined under this title or imprisoned not more than ten years, or both.).

because the government had informed the veterans that their radiation exposure was not harmful, the veteran would also have no reason to suspect the manifestation of a radiological disease either immediately or decades later.[64] Moreover, many veterans refused to believe illnesses and birth defects might have been caused by their service.[65] As a result, many Atomic Veterans' health and medical treatments were likely compromised by the secrecy order.

The secrecy of these nuclear missions also adversely affected the identification of radiation diseases because the secrecy order slowed and distorted the flow of information. The independent scientific community, largely unaware of these nuclear missions, was not able to study the environmental and health effects of the radiation exposure, and scientists and medical professionals could not collect data from government officials or veterans to link radiation exposure to specific diseases. A small body of governmental medical doctors, working under the Atomic Energy Commission, was the only group of scientists who had access to the radiological data.[66] Unfortunately, these doctors were not collecting Atomic Veterans' medical records to assess the long term medical risks associated with radiation exposure, but rather they were conducting "research and development in the medical aspects of atomic warfare with specific emphasis on human tolerance to and protection against radioactivity, decontamination of exposed individuals, and treatment of radiation casualties . . . ."[67] Without the scientific evidence linking

64. *See, e.g.*, Stafford L. Warren, *Conclusions: Tests Proved Irresistible Spread of Radioactivity*, LIFE, Aug. 1947, at 86, 88.

65. *Survey Pressed on Illness of Atomic Veterans*, N.Y. TIMES, June 22, 1983, http://www.nytimes.com/1983/06/22/us/survey-pressed-on-illness-of-atomic-veterans.html.

66. The Research and Development Board, Committee on Medical Sciences and Committee on Atomic Energy, Directive Joint Panel on Medical Aspects of Atomic Warfare, (Washington 25, D.C 23 Feb. 1949), *available at* http://www.gwu.edu/~nsarchiv/radiation/dir/mstreet/commeet/meet4/brief4.gfr/tab_o/br4o2a.txt.

67. THE RESEARCH & DEV. BD., DIRECTIVE: JOINT PANEL ON MEDICAL ASPECTS OF ATOMIC WARFARE 5 (1949), *available at*

radiation exposure to a particular disease, the VA could not award service-connected medical benefits or compensate the veteran for his/her suffering.[68]

In the early 1980s scientists began to publish studies linking veterans' radiation exposure with mortality and cancer,[69] which prompted congressional inquiries of the Nuclear Weapons Testing Program.[70] Subsequently, the U.S. Government began to declassify documents relating to the program.[71] Energy Secretary, Hazel O'Leary, characterized the U.S. Weapons Testing Program, stating, "[w]e were shrouded and clouded in an atmosphere of secrecy. . . . And I would take it a step further: I would call it repression."[72] These disclosures provided Congress the opportunity to hold further inquiries[73] and strengthen legislation for compensating Atomic Veterans.[74]

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http://www.gwu.edu/~nsarchiv/radiation/dir/mstreet/commeet/meet4/brief4.gfr/tab_o/br4o2a.txt (creating the Joint Panel on Medical Aspects of Atomic Warfare).

68. Under the direct service-connection regulation, 38 C.F.R. Section 3.303(d), the Veteran is required to produce competent medical evidence sufficient to establish a well–grounded claim establishing a causal link to their exposure to radiation in service. 38 C.F.R. § 3.303 (2011); 38 U.S.C. § 5107(a) (2006). Thus, the veteran would have to submit medical evidence of a nexus between an in-service injury or disease and a current disability.

69. *See, e.g.*, Caldwell et al., *Leukemia*, *supra* note 18, at 1575–78; Glyn G. Caldwell et al., *Mortality & Cancer Frequency Among Military Nuclear Test (Smoky) Participants, 1957 Through 1979,* 250 JAMA 620, 624 (1983) [hereinafter Caldwell et al., *Smoky*].

70. *See, e.g.*, STAFF OF SUBCOMM. ON OVERSIGHT & INVESTIGATIONS, 96TH CONG., THE FORGOTTEN GUINEA PIGS (Comm. Print 1980).

71. *See generally* THOMAS B. COCHRAN ET AL., NUCLEAR WEAPONS DATABOOK, VOLUME 1: U.S. NUCLEAR FORCES AND CAPABILITIES (1984). The purpose of the *Nuclear Weapons Databook* series is to shed light on the secrecy involving information about nuclear weapons. *See also* John H. Cushman, Jr., *204 Secret Nuclear Tests by U.S. are Made Public.*, N.Y. TIMES, Dec. 8, 1993, http://www.nytimes.com/1993/12/08/us/204-secret-nuclear-tests-by-us-are-made-public.html.

72. John H. Cushman, Jr., *204 Secret Nuclear Tests by U.S. are Made Public.*, N.Y. TIMES, Dec. 8, 1993, http://www.nytimes.com/1993/12/08/us/204-secret-nuclear-tests-by-us-are-made-public.html.

73. *See, e.g.*, S. REP. NO. 103-97 (1994).

74. *See, e.g.*, Veterans' Dioxin and Radiation Exposure Compensation Standards Act, Pub. L. No. 98-542, 98 Stat. 2725 (1984) (codified in part at 38 U.S.C. § 1154 (2000)); Radiation-Exposed Veterans Compensation Act of 1988, Pub. L. No. 100-321, 102 Stat. 485 [OR] Pub. L. No. 100-322, 102 Stat. 534 (1988) (codified at 38 C.F.R. § 3.309(d) (2011) and as amended at 38 U.S.C. § 1112(c) (2006)); and Radiation Exposure Compensation Act, 42 U.S.C. § 2210 note (2006) (amended 2000).

C. MISINFORMATION BY THE ATOMIC ENERGY COMMISSION

Although the acute effects of radiation exposure were revealed through the studies of Hiroshima and Nagasaki, scientists have always been concerned with the long-term or chronic effects of ionizing radiation. However, these concerns were not directly communicated to veterans or the public.[75] In fact, U.S. Government agencies assured the public that radiation was harmless[76] and set forth a campaign to "cure[] [service members] of the 'mystical' fear of radiation,"[77] so "America's atomic war-fighting capability would [not] be crippled."[78] To assure service members that radiation exposure was harmless, the Army provided brochures to service members to allay their fears.[79]

Publicly, the government assured soldiers that radiation was harmless, but an important part of the U.S. Nuclear Testing program was to understand the effects of radiation in the theater of war. Thus, various agencies tasked with this job used veterans as test subjects and discovered that exposure was quite harmful. For example, the Joint Panel on Medical Aspects of Atomic Warfare's 1949 Directive, listed below, clearly

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75. *See* Warren, *supra* note 64, at 88 (exhibiting that concerns were not communicated). *See also* HENSHAW, *supra* note 24, at 2–3 (exhibiting that even in 1947, due to previous irradiation experiences, the program had "good reason to believe that reproductive disturbances, malignancies of one form or another, shortened life span, altered genetic pattern, etc., will in time appear in greater or lesser degrees.").

76. See DEP'T OF CIVIL DEF., SURVIVAL UNDER ATOMIC ATTACK (1951), *available at* http://ia700606.us.archive.org/4/items/survivalunderato00bost/survivalunderato00bost.pdf and Nick Thorpe, *Radioactive Fallout to Iron County, UT*, WASH. NUCLEAR MUSEUM & EDUC. CTR., http://toxipedia.org/display/wanmec/Radioactive+Fallout+to+Iron+County,+UT (last updated Nov. 2, 2010), for examples of information released to the public.

77. NUCLEAR ENERGY FOR THE PROPULSION OF AIRCRAFT MEDICAL ADVISORY PANEL, ACHRE No. DOD-121494-A-2, PSYCHOLOGICAL PROBLEM OF CREW SELECTION RELATIVE TO THE SPECIAL HAZARDS OF IRRADIATION EXPOSURE (July 22, 1949).

78. ADVISORY COMM. ON HUMAN RADIATION EXPERIMENTS, FINAL REPORT OF THE ADVISORY COMMITTEE ON HUMAN RADIATION EXPERIMENTS, at Chapter 10 (1995), *available at* http://www.hss.doe.gov/healthsafety/ohre/roadmap/achre/index.html [hereinafter ACHRE].

79. *Id.*

demonstrates a willingness to use veterans as experimental subjects:

> BIOLOGICAL EFFECTS OF RADIATION
> 1. Military Goals
> 1.1 Immediate goals
> The immediate goals are to obtain new and meaningful information on the biological effects of ionizing radiation concerning:
> 1.1.1 Maximum single and repeated doses of radiation which may be tolerated by man with reasonable safety.
> 1.1.2 Hazardous doses which may cause incapacity for performance of diverse military missions with or without permanent damage or death. Determine critical dose to incapacitate within a matter of hours.
> 1.1.3 Casualty-producing doses which should lead to evacuation from contaminated areas whenever possible.
> 1.1.4.Toxicology of radioactive materials.
> 1.1.5 Effects on man of moderate doses.
> 1.1.6 The effects of radiation as modified by various concurrent factors such as burns, trauma, and infections, on environments.
> 1.1.7 Effects of radiation on the central nervous system and its function in man and mammals.
> 1.2 Future Goals
> The future goal is to understand the biologic mechanisms underlying radiation damage, so the potential radiation injury may be prevented, minimized or treated.
> 2. Deficiencies of Present Equipments and Systems in Meeting Requirements
> 2.1 Lack of accurate information concerning effects of various dose levels of external radiation on man.
> 2.2 Lack of accurate information concerning toxicology of absorbed radioactive materials.
> 2.3 There is lack of existing knowledge concerning the combined effects of radiation, thermal, and traumatic injury.
> 3. Present Research and Development Program in Support of Requirements
> 3.1 The attainment of immediate goals is technically feasible provided that effects of moderate dose levels of external radiation may be observed on human patients and volunteers.

3.2 The obtaining and disinformation of necessary information is a military necessity.

3.3 Most of the immediate goals can be achieved in five years provided there is adequate financial and scientific stimulus.

3.4 Alternative programs - none.

3.5 Some duplication is inevitable and desirable in the present state of progress. The most serious gap is failure to secure adequate quantitative data on the efforts of ionizing radiation on man.

3.6 The program shows no evidence of suffering from lack of planning personnel, facilities or money.

4. Conclusions and Recommendations

4.1 Researches in biological effects of radiation should be continued.

4.1.1 Continue the study of the deterioration of motor and sensory functions attending sublethal and lethal irradiation in mammals.

4.1.2 Decrease the emphasis on primates (monkeys).

4.1.3 Increase the emphasis on the mutual influence of radiation injury combined with thermal and with traumatic injury.

4.2 It is still necessary to initiate measurements of the effects of moderate doses of radiation in man.

4.3 Advantage should be taken of any opportunities for the study of the biological effects of radiation particularly in man.

4.4 Some duplication of effort in all phases of the program is justifiable and necessary for rapid progress. This refers both to duplication (a) within the Services, and (b) between the Services and the world of science.[80]

In 1994, by Executive Order, President Clinton created the Advisory Committee on Human Radiation Experiments to investigate and report on the use of human beings as subjects of federally funded research using ionizing radiation.[81] This report elucidated, in great detail, the lack of information about ionizing radiation and the misinformation communicated to service members and the public about the health effects of radiation

80. *See generally* THE RESEARCH & DEV. BD., *supra* note 67 (outlining its directive that includes using veterans as test subjects).

81. ACHRE, *supra* note 78, at Executive Summary.

exposure.[82] It stated:

> Data obtained on some military personnel who were exposed to radioactive fallout were collected after these men were unintentionally exposed. However, some atomic veterans believe they were used as guinea pigs to determine the effects of radiation from various distances, including those at ground zero, on human subjects. Their suspicions are supported by a 1951 document from the Joint Panel on the Medical Aspects of Atomic Warfare, Research and Development Board, Department of Defense, which identified general criteria for bomb test-related "experiments" and identified 29 "specific problems" as "legitimate basis for biomedical participation." [83]

The declassification of the Operation "Castle" Report[84] and Operation "Upshot-Knothole" Reports[85] (among other reports prepared during the testing missions) showed that the Commission meticulously recorded the troop movements, the exposure of service members to ionizing radiation, and potential concerns related to ionizing radiation exposure.[86]

IV. LINKING RADIOLOGICAL DISEASE TO MILITARY SERVICE

A. MANIFESTATION OF THE RADIOLOGICAL DISEASE, YEARS LATER

Epidemiological studies conducted over the latter half of the twentieth century revealed that the deleterious effects of nuclear radiation can take decades to manifest, resulting in a variety of

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82. STAFF OF S. COMM. ON VETERAN'S AFFAIRS, 103D CONG., IS MILITARY RESEARCH HAZARDOUS TO VETERAN'S HEALTH? LESSONS SPANNING HALF A CENTURY 7 (Comm. Print 1994).

83. *Id.* at 7 (citation omitted).

84. E. P. CRONKITE ET AL., NAVAL MED. RESEARCH INST. & U.S. NAVAL RADIOLOGICAL DEFENSE LAB., OPERATION CASTLE – FINAL REPORT PROJECT 4.1: STUDY OF RESPONSE OF HUMAN BEINGS ACCIDENTALLY EXPOSED TO SIGNIFICANT FALLOUT RADIATION (1954), *available at* https://www.osti.gov/opennet/servlets/purl/16061854-leUIeE/16061854.pdf.

85. *See generally* DEF. NUCLEAR AGENCY, *supra* note 5 (declassifying Operation Upshot-Knothole).

86. *See generally id.*; *see generally* CRONKITE ET AL., *supra* note 84; *see also* THAUL ET AL., *supra* note 18, at 129-47.

diseases.[87] Leukemia was quickly linked to radiation exposure in the 1940s and 1950s.[88] However, it was not until the early 1980s that ionizing radiation was firmly linked to solid tumors and cancer,[89] initiating a host of new scientific studies.[90] Now, recent publications link ionizing radiation exposure to many diseases, including cardiovascular, respiratory, and digestive diseases, avascular necrosis, Alzheimer's disease, and myelodysplastic syndromes.[91] As time progresses and statistical methods become more sophisticated, epidemiologists will likely continue to find new links between radiological exposure and disease.

The long-term effects of ionizing radiation are difficult to study in animals, as the animal model selected must be able to live long enough for the disease to manifest. This precludes studies in small lab animals like rats or rabbits, which have short life spans. The studies must also be done in a large number of animals, due to the low incidence of disease and the variety of tissues affected. There have been some studies using beagle dogs[92] and monkeys[93] to assess the long-term effects of

87. *See generally* UNIV. OF WASH. ENVTL. HEALTH & SAFETY, *supra* note 26, at Bio-9. See generally Evan B. Douple et al., *Long-Term Radiation-Related Health Effects in a Unique Human Population: Lessons Learned from the Atomic Bomb Survivors of Hiroshima and Nagasaki*, 5 DISASTER MED. & PUB. HEALTH PREPAREDNESS S122 (Supp. 2011), for a review of several recently published studies.

88. Paul S. Henshaw & James W. Hawkins, *Incidence of Leukemia in Physicians*, 4 J. NAT'L CANCER INST. 339 (1944).

89. *See* Caldwell et al., *Smoky*, *supra* note 69, at 621–23.

90. *See* DEF. NUCLEAR AGENCY, *supra* note 5, at 16. *See generally* COMM. ON THE BIOLOGICAL EFFECTS OF IONIZING RADIATION, NAT'L RESEARCH COUNCIL, HEALTH EFFECTS OF EXPOSURE TO LOW LEVELS OF IONIZING RADIATION: BEIR V 1-3 (1996) (reviewing the significant development in radiation exposure knowledge). *See, e.g.*, COMM. ON THE BIOLOGICAL EFFECTS OF IONIZING RADIATION, NAT'L RESEARCH COUNCIL, HEALTH EFFECTS OF EXPOSURE TO LOW LEVELS OF IONIZING RADIATION: BEIR VII vii (2006) [hereinafter BEIR VII] (summarizing findings of the health effects of low dose x-ray and gamma ray studies initiated in the 1980s and 1990s).

91. *See generally* M. P. Little, *Cancer and Non-Cancer Effects in Japanese Atomic Bomb Survivors*, 29 J. RADIOL. PROT. A43, A44 (2009); Nasrin Begum et al., *Does Ionizing Radiation Influence Alzheimer's Disease Risk?*, 53 J. RADIOL. RES., 815, 815, 818 (2012); Masako Iwanaga et al., *Risk of Myelodysplastic Syndromes in People Exposed to Ionizing Radiation: A Retrospective Cohort Study of Nagasaki Atomic Bomb Survivors*, 29 J. CLINICAL ONCOLOGY 428, 428, 431–34 (2011).

92. *See, e.g.*, J. H. Diel et al., *Influence of Dose Rate on Survival Time for 239PuO2-Induced Radiation Pneumonitis or Pulmonary Fibrosis in Dogs*, 129 RADIATION RES. 53

plutonium inhalation. In these studies, animal health has been evaluated over a few years, but the studies have been small, utilizing only a handful of animals in each study. Additionally, the types of radiation (and how the radiation gets to the tissue) complicate these studies. For example, alpha radiation does not penetrate tissue well, unlike gamma radiation, which can traverse through inches of tissue and affect tissue deep in the body, making for a difficult assessment of disease progression.[94] Also, organs have unique sensitivities to radiation, and some tissues (e.g., lung, liver, kidney, and bone) concentrate radioactive particles. This results in these organs receiving a larger dose of radioactivity, delivered over the course of a lifetime.[95]

Identifying radiological diseases in the human population is challenging for the scientific community, as the research requires longitudinal epidemiological studies. Scientists retrospectively analyze medical and death records, then they correlate these findings with the estimated radiation dose.[96] However, this data is often erroneous or incomplete. If death and medical records are found they are subject to misdiagnosis and limited by the medical knowledge at the time they were recorded.[97] Radiation

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(1992).

93. *See* NAT'L TOXICOLOGY PROGRAM, U.S. DEP'T OF HEALTH & HUMAN SERVS., REPORT ON CARCINOGENS 238 (12th ed. 2011), *available at* http://ntp.niehs.nih.gov/ntp/roc/twelfth/profiles/IonizingRadiation.pdf(listing various experimental animals).

94. EMP. EDUC. SYS., *supra* note 14, at 10.

95. REVIEW OF DTRA, *supra* note 17, at 101–07.

96. See generally Jonathan M. Samet, *Epidemiologic Studies of Ionizing Radiation and Cancer: Past Successes and Future Challenges*, 105 ENVTL. HEALTH PERSP. 883 (Supp. 4 1997), for a review of the epidemiological methods used. *See also generally* Steve Wing, *Limits of Epidemiology*, 1 MED. & GLOBAL SURVIVAL 74 (1994) (describing epidemiology as a discipline).

97. *See, e.g.*, COMM. ON IDENTIFYING THE NEEDS OF THE FORENSIC SCIS. CMTY., STRENGTHENING FORENSIC SCIENCE IN THE UNITED STATES: A PATH FORWARD 241–68 (2009). *See also* PowerPoint: John D. Boice, Jr., Slide Presentation, *Review of Atomic Veterans Epidemiology Study* at the VETERANS' ADVISORY BOARD ON DOSE RECONSTRUCTION MEETING (Mar. 23-24, 2012), slide 10, *available at* http://www.vbdr.org/meetings/2012/Presentations/1-Boice_VBDR_Mar12.pdf (reporting that of 115,328 atomic veterans surveyed, the VA has epidemiological data on only 80,186 (or 69%), the remainder are unknown causes of death).

dose estimates are often based on assumptions, with little hard data supporting the dose estimate.[98] These epidemiological studies are also subject to confounding variables like lifestyle (e.g., cigarette smoking or radiation exposure from medical x-rays), age at exposure, and gender, all of which complicate the analysis of the results.[99] For many years it was thought that a low dose of radiation did not increase a person's risk for radiological disease, but a recent government study has changed this misconception.[100] It is now accepted that there is a strong linear dose-response relationship, and even exposure to low levels of radiation is dangerous.[101] Additionally, the potential for intergenerational genetic transmission of radiological diseases has been thought to be low, but has been demonstrated in animals.[102] Thus, the full scope of the effects of radiation exposure has yet to be realized by the Atomic Veteran population and their families and descendants.

B. RETROSPECTIVELY ESTIMATING RADIATION DOSE

During the nuclear weapons testing, it was known that a variety of radiation was released into the atmosphere and that participants were exposed to neutron, gamma, x-ray radiation, alpha, and beta particles.[103] However, little hard data was collected during the nuclear tests to assess radiation exposure. Only during the initial bomb blast was a portion of this

98. REVIEW OF DTRA, *supra* note 17, at 3, 30. *See also* COMM. ON EVALUATION OF THE PRESUMPTIVE DISABILITY DECISION-MAKING PROCESS FOR VETERANS, IMPROVING THE PRESUMPTIVE DISABILITY DECISION-MAKING PROCESS FOR VETERANS 90–91, app. I-51–52 (Jonathan M. Samet & Catherine C. Bodurow eds., 2008), *available at* http://www.nap.edu/catalog/11908.html [hereinafter EVALUATION OF PRESUMPTIVE DISABILITY].

99. *See generally* Wing, *supra* note 96 (discussing problems with and limitations of epidemiological studies). *See also* NAT'L TOXICOLOGY PROGRAM, *supra* note 93, at 238. For example, the young are more susceptible than the old; females are more susceptible than males; and risks differ by organ or tissue.

100. *See* BEIR VII, *supra* note 90, at 10 (finding health risks associated with exposure to low doses of radiation).

101. *Id.* at 10, 14–15.

102. *See generally* UNIV. OF WASH. ENVTL. HEALTH & SAFETY, *supra* note 26, at Bio-21–23.

103. CRONKITE ET AL., *supra* note 84, at 15, 24.

radiation, the gamma radiation, recorded by the dosimeter badges. A small number of these badges were distributed around the battlefield to a few participants to measure where the gamma radiation was distributed and how it affected troop movements.[104] However, most participants were not issued badges, and these badges often provided incomplete data.[105]

The Department of Defense (DOD) created the Defense Threat Reduction Agency (DTRA) to assess veterans' radiation exposure.[106] The DTRA's method for reconstructing radiation dose uses existing raw data and assumptions that are input into mathematical formulas. Raw data used includes, for example, dosimeter data (gamma radiation detectors), bomb detonation data, records of troop movements, and records of environmental data including weather reports.[107] The DTRA then reports to the service member his or her external radiation dose, internal radiation dose, and upper bound estimations.[108] The methods used to estimate radiation dose have been revised many times since the first dose estimates were reported in 1978; and, there is no systematic way to review earlier dose estimates or apply changes retroactively.[109]

The ability to reconstruct the radiation dose is difficult because the lack of raw data, quite naturally, attracts the need for many assumptions. Assumptions include the radiation profile emitted from the bomb, the veterans' location relative to the radiation, the duration of the exposure, and theories about

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104. REVIEW OF DTRA, *supra* note 17, at 70.

105. Veterans' Dioxin and Radiation Exposure Compensation Standards Act, Pub. L. No. 98-542, § 2, 98 Stat. 2725, 2726 (1984)

> (These film badges often provide an incomplete measure of radiation exposure, since they were not capable of recording inhaled, ingested, or neutron doses (although the Defense Nuclear Agency currently has the capability to reconstruct individual estimates of such doses), were not issued to most of the participants in nuclear tests, often provided questionable readings because they were shielded during the detonation, and were worn for only limited periods during and after each nuclear detonation.).

106. REVIEW OF DTRA, *supra* note 17, at 1.

107. *See id.* at 69–123.

108. *Id.* at 119–21. Doses are reported in unit "rem." *Id.* at vii.

109. *Id.* at 70.

how the radioactive particles may distribute in, or on, the human body.[110] Other assumptions used include, for example, posture and position of the service member during exposure, breathing rate, and tissue susceptibility to each radiation type.[111] It is also assumed that the service members who wore dosimeter badges wore them correctly, and the badge was not shielded from radiation by clothing, dog tags, or other devices that would interfere with radiation detection.[112] Service members downwind of the explosion were assumed to have likely received higher doses of inhaled radiation than service members who were upwind.[113] Service members who were down in bunkers or trenches were assumed to have been protected from neutron and gamma radiation compared to those who stood up and watched the shot.[114] Lastly, how the solider was physically positioned (sitting, standing, running) and his breathing pattern is included in the radiation dose estimate.[115]

These assumptions make the dose calculation highly speculative and, thus, material when evaluating a reconstructed dose – for it is these dose reconstruction estimates that the VA considers when evaluating whether a veteran should receive service-connected compensation for their non-presumptive diseases.[116] In 2000, Congress requested a review of the DTRA's dose reconstruction program. In its 2003 report, the National Academy of Sciences (NAS) was highly critical of the DTRA's methodology and assumptions.[117] The NAS identified several instances where the DTRA used methods that under-estimated veterans' radiation dose.[118] Thus, the radiation dose estimates

110. *Id.* at 34, 124–230, 367.

111. *Id.* at 69–123.

112. Veterans' Dioxin and Radiation Exposure Compensation Standards Act, Pub. L. No. 98-542, § 2, 98 Stat. 2725, 2726 (1984).

113. REVIEW OF DTRA, *supra* note 17, at 83–84, 86–101.

114. *Id.* at 66–68, 73–74.

115. *Id.* at 35, 82, 87–88.

116. *Id.* at 1, 6–7.

117. *Id.* at 124–231.

118. *Id.* at 124–264. The reader is referred to the finding of the NAS committee regarding the numerous limitations related to the dose reconstruction estimate methodology used by the DTRA.

that the VA relies upon to award benefits are known to be inadequate. However, the VA continues to rely upon these calculations in evaluating service-connection for radiogenic diseases not specifically outlined in the statutes.

C. COLLECTING AND INTERPRETING THE EPIDEMIOLOGICAL DATA

Based on the existing epidemiological data, there is no doubt that radiation exposure causes cancer.[119] The few studies of Crossroads Atomic Veterans suggest some correlation between radiation exposure and leukemia.[120] However, the probability that an individual's cancer was a result of radiation exposure depends on many factors, including the type of cancer, the tissue affected, age at exposure, and other factors of the individual.[121] The NAS carefully points out that "[g]iven these uncertainties of the data on veterans, a negative or inconsistent finding cannot be taken as definitive evidence against a causal connection, in the face of the wealth of positive evidence from other epidemiological studies."[122] The Crossroad studies are based on a small number of veterans, and it is difficult to demonstrate the small number of excess cancers in small populations.[123]

Linking radiological diseases to radiation exposure during military service is additionally challenging, due to the confounding variables associated with a lack of reliable radiation dose estimates and the nature of the service-connected

119. For a comprehensive list of ionizing radiation epidemiological papers considered by the Institute of Medicine, see EVALUATION OF PRESUMPTIVE DISABILITY, *supra* note 98, at app. I-61–63.

120. Caldwell et al., *Leukemia, supra* note 18, at 1578; Caldwell et al., *Smoky, supra* note 69, at 624; COMM. ON THE CROSSROADS NUCLEAR TEST, INST. OF MED., MORTALITY OF VETERAN PARTICIPANTS IN THE CROSSROADS NUCLEAR TEST 8 (1996); THAUL ET AL., *supra* note 18, at 77–78. For a general summary of all studies see EVALUATION OF PRESUMPTIVE DISABILITY, *supra* note 98, at app. I-59–61.

121. *See* BEIR VII, *supra* note 90, at 14–15; NAT'L TOXICOLOGY PROGRAM, *supra* note 93, at 238. *See also generally* Wing, *supra* note 96 (describing possible confounding factors in determining whether cancer was caused by radiation alone).

122. EVALUATION OF PRESUMPTIVE DISABILITY, *supra* note 98, at app. I-52.

123. *Id.* at app. I-59.

radiation exposure.[124] This is because each of the nuclear bomb missions had different detonation routes and strengths, resulting in distinct decay schemes and radiation emission profiles.[125] In other words, detonation of the Shot "Badger" exposed service members to a different radiation profile and strength than the detonation of the Shot Baker. Veterans were exposed to a variety of radiation (alpha and beta particles, gamma, neutron and x-ray), doses, and exposure routes. These factors complicate the analysis of epidemiological studies of service members. Additionally, not all cancers in a radiation-exposed individual are a result of their military service.

Of the 1,646 claims related to radiation exposure processed by the VA in the 1970s and early 1980s, only 30 were granted;[126] 945 (or 57%) of the denied claims were for solid tumors or cancers.[127] The claims were denied based on the lack of epidemiological data linking radiation exposure with specific diseases. Because of the numerous uncertainties associated with estimating individual exposure and calculating the probability that their cancer or chronic disease is service-related, Congress recognized the need for legislation to aid veteran compensation.[128]

V. RECEIVING COMPENSATION

A. ATOMIC VETERANS' COMPENSATION: LAWS & REGULATIONS

Veterans can show entitlement to benefits on a direct basis if the evidence establishes that the disease was incurred in service.[129] Direct service-connection can be established by

124. REVIEW OF DTRA, *supra* note 17, at 8, 227, 258. *See also* EVALUATION OF PRESUMPTIVE DISABILITY, *supra* note 98, at app. I-52.

125. *See, e.g.*, U.S. Dept. of Health & Human Serv., *Nuclear Detonation: Weapons, Improvised Nuclear Devices*, RADIATION EMERGENCY MED. MGMT., http://www.remm.nlm.gov/nuclearexplosion.htm (last updated Dec. 21, 2012).

126. 130 CONG. REC. 13,147–49 (1984) (statement of Sen. Cranston).

127. *Id.*

128. 130 CONG. REC. 29,551 (1984) (statement of Rep. Montgomery).

129. 38 C.F.R. § 3.303(d) (2011).

"show[ing] that the disease or malady was incurred during or aggravated by service," a task which "includes the difficult burden of tracing causation to a condition or event during service."[130] However, in the absence of solid epidemiological data, this was a preclusive hurdle for most Atomic Veteran claims. In response, Congress passed three additional statutes that addressed compensation for veterans who experienced radiation exposure during service and have manifest "radiological diseases." These laws include: VDRECSA,[131] REVCA,[132] and RECA.[133]

VDRECSA and REVCA claims are reviewed by the VA. In contrast, RECA claims are reviewed by the DOJ and award a lump sum payment to veterans "who contracted certain cancers and other serious diseases following their exposure to radiation released during the atmospheric nuclear weapons tests."[134] Also, the DOJ does not require claimants to establish causation.[135] It is also important to note that compensation from a RECA DOJ claim can adversely affect the potential compensation from VDRECSA and REVCA Veterans Administration claims, so careful planning is required.

Originally, veterans who were exposed to ionizing radiation had to file for compensation under the strict terms of VDRECSA.[136] VDRECSA awards compensation only if a veteran's disease is "likely" or "as likely as not" the result of

130. Combee v. Brown, 34 F.3d 1039, 1043 (Fed. Cir. 1994).

131. Veterans' Dioxin and Radiation Exposure Compensation Standards Act, Pub. L. No. 98-542, 98 Stat. 2725 (1984) (codified in part at 38 U.S.C. § 1154 (2000)).

132. Radiation-Exposed Veterans Compensation Act of 1988, Pub. L. No. 100-321, 102 Stat. 485 [OR] Pub. L. No. 100-322, 102 Stat. 534 (1988) (codified at 38 C.F.R. § 3.309(d) (2011) and as amended at 38 U.S.C. § 1112(c) (2006)).

133. Radiation Exposure Compensation Act, 42 U.S.C. § 2210 note (2006) (amended 2000).

134. *See Radiation Exposure Compensation Act*, DEPT. OF JUSTICE, http://www.justice.gov/civil/common/reca.html (last updated Jan. 14, 2013).

135. *Id.*

136. Veterans' Dioxin and Radiation Exposure Compensation Standards Act, Pub. L. No. 98-542, 98 Stat. 2725 (1984) (codified in part at 38 U.S.C. § 1154 (2000)). This statute does not contain presumptions but directs the VA to adopt regulations that would assist veterans who have been exposed to radiation.

exposure to radiation while in service.[137] This law requires that a dose reconstruction and evaluation be conducted on behalf of the veteran. Few veterans have been able to receive compensation under these criteria, as it is difficult to establish service-connection between the disease, the reconstructed radiation dose, and the existing epidemiological data.[138]

In 1988, Congress passed the REVCA, which established a presumption of service-connection for thirteen specific cancers.[139] Under the presumptive service-connection scenario, the veteran has to establish service during one of the specified atomic missions and have one of the radiological diseases listed in the statute.[140] A dose reconstruction is not required or considered for a presumptive service disease. Instead, the statute creates a rebuttable presumption that the disease is service-connected.[141] This shifts the burden of proof to the VA, as they must prove that the disease is not service-connected in order to deny benefits. In 1992, two new cancers were added to the presumptive list in the statute,[142] and now the legislation recognizes over 21 radiological cancers.[143]

The legislation has removed one encumbrance faced by veterans seeking compensation, and few presumptive service-

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137. 38 C.F.R. § 3.311 (2011).

138. *See* Matthew L. Wald, *Veterans Nuclear Exposure Underestimated, Panel Says*, N.Y. TIMES, May 9, 2003, at A20 (stating that of 4,000 claims submitted under the non-presumptive statute, only 50 have been awarded).

139. Radiation-Exposed Veterans Compensation Act of 1988, Pub. L. No. 100-321, § 2, 102 Stat. 485, 485 (1988).

140. 38 C.F.R. § 3.309(d) (2011).

141. *Id.*

142. SARAH A. LISTER ET. AL., CONG. RESEARCH SERV., RL 33927, SELECTED FEDERAL COMPENSATION PROGRAMS FOR PHYSICAL INJURY OR DEATH 26–27 (2008).

143. *Id.*

> (The 21 cancers presumed to be service-connected for veterans who participated in radiation-risk activities are: leukemia (all forms except chronic lymphocytic leukemia); cancer of the thyroid, breast, pharynx, esophagus, stomach, small intestine, pancreas, bile ducts, gall bladder, salivary gland, urinary tract (renal pelvis, urethra, urinary bladder, and urethra), brain, bone, lung, colon, and ovary; bronchiolo-alveolar carcinoma; multiple myeloma; lymphomas (other than Hodgkin's disease); and primary liver cancer (except if cirrhosis or hepatitis B is indicated).).

See also 38 U.S.C. § 1112(c)(2) (2006).

connection claims have been rebutted.[144] Despite the presumptive diseases that have been established, many veterans still have difficulty establishing service-connection. These veterans are unable to furnish the required evidence of their exposure at a specified location and time, in part, because such information may be classified as secret or their service records are unavailable.[145]

Radiation-exposed veterans who do not suffer from one of the statutorily-defined presumptive diseases must resort to the non-presumptive requirements outlined by the VDRECSA or the direct service-connection regulations under 38 C.F.R. Section 3.303(d). VDRECSA identifies a group of "radiogenic diseases"[146] and criteria by which the Under Secretary for Benefits will consider service-connection. By identifying particular diseases as radiogenic, the regulation relieves the veteran of the need to show that the in-service exposure to ionizing radiation was a precipitating factor for the disease. When a veteran manifests one of these "radiogenic diseases" within any applicable time period, the VA is required to assess the size and nature of the radiation dose that the veteran may have received.[147] A

144. EVALUATION OF PRESUMPTIVE DISABILITY, *supra* note 98, at 54, 72.

145. Melinda F. Podgor, *The Inability of World War II Atomic Veterans to Obtain Disability Benefits: Time is Running Out on Our Chance to Fix the System*, 13 ELDER L. J. 519, 533–34 (2005). For example, on July 12, 1973, a fire at the National Personnel Records Center (NPRC) destroyed approximately 16-18 million Official Military Personnel Files, including 80% of army veterans' from WWII. *The 1973 Fire, National Personnel Records Center*, NAT'L ARCHIVES, www.archives.gov/st-louis/military-personnel/fire-1973.html (last visited Jan. 14, 2013).

146. 38 C.F.R. § 3.311(b)(2) (2011)

> (For purposes of this section the term "radiogenic disease" means a disease that may be induced by ionizing radiation and shall include the following: (i) All forms of leukemia except chronic lymphatic (lymphocytic) leukemia; (ii) Thyroid cancer; (iii) Breast cancer; (iv) Lung cancer; (v) Bone cancer; (vi) Liver cancer; (vii) Skin cancer; (viii) Esophageal cancer; (ix) Stomach cancer; (x) Colon cancer; (xi) Pancreatic cancer; (xii) Kidney cancer; (xiii) Urinary bladder cancer; (xiv) Salivary gland cancer; (xv) Multiple myeloma; (xvi) Posterior subcapsular cataracts; (xvii) Non-malignant thyroid nodular disease; (xviii) Ovarian cancer; (xix) Parathyroid adenoma; (xx) Tumors of the brain and central nervous system; (xxi) Cancer of the rectum; (xxii) Lymphomas other than Hodgkin's disease; (xxiii) Prostate cancer; and (xxiv) Any other cancer.).

147. *See* Davis v. Brown, 10 Vet. App. 209, 213 (1997); Hardin v. West, 11 Vet.

radiation dose estimate from the DOD and other information is then forwarded to the Under Secretary for Benefits for review.[148] The Under Secretary for Benefits considers various factors and may request an opinion from the Under Secretary for Health or an outside consultant before ultimately determining whether "it is at least as likely as not, or that there is no reasonable possibility, the veteran's disease resulted from radiation exposure in service."[149] By requiring the involvement of the Under Secretary for Benefits, the regulation attempts to harmonize decision-making and give the veteran the benefit of the most current scientific and medical studies of radiogenic diseases.

Under 38 C.F.R. Section 3.311(e) the VA is required to consider the upper bound calculation in assessing radiation claims. Under these regulations, there is a rebuttable presumption of service-connection of other "radiogenic diseases" if the VA Under Secretary for Benefits determines that they are related to ionizing radiation exposure during service. According to 38 C.F.R. Section 3.311(e), the factors to be considered in determining whether a veteran's disease resulted from exposure to ionizing radiation in service include:

> (1) The probable dose, in terms of dose type, rate and duration as a factor in inducing the disease, taking into account any known limitations in the dosimetry devices employed in its measurement or the methodologies employed in its estimation;
> (2) The relative sensitivity of the involved tissue to induction, by ionizing radiation, of the specific pathology;
> (3) The veteran's gender and pertinent family history;
> (4) The veteran's age at time of exposure;
> (5) The time-lapse between exposure and onset of the disease; and
> (6) The extent to which exposure to radiation, or other carcinogens, outside of service may have contributed to

App. 74, 79 (1998); Ramey v. Brown, 9 Vet. App. 40, 43 (1996).

148. 38 C.F.R. § 3.311(c) (2011).

149. 38 C.F.R. § 3.311(c)(2) (2011).

development of the disease.[150]

If a claim is filed based on a disease that is not listed above, the "VA shall nevertheless consider the claim under the provisions of this section provided that the claimant has cited or submitted competent scientific or medical evidence that the claimed condition is a radiogenic disease."[151] For instance, one disease that the VA has determined not to be a radiogenic disease is polycythemia vera.[152] The VA, however, is legally required to consider a service-connection claim for polycythemia vera based on radiation exposure as long as the claimant submits competent medical or scientific evidence to support the claim.[153]

B. THE VA INTERPRETS THE LAW TO EVALUATE CLAIMS

For claims that fall within the statutory presumptive legislation of REVCA, compensation should be fairly straightforward. However, veterans have nonetheless struggled to receive compensation. During fiscal year 2011-2012, the Veterans Advisory Board on Dose Reconstruction reported that of 7,715 REVCA and VDRECSA claims accepted for adjudication, only 2,210 were granted.[154] This is an increase in compensated claims compared with the fiscal years 2009-2010 and 2010-2011.[155] Unfortunately, the rate of success for

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150. 38 C.F.R. § 3.311(e) (2011).

151. 38 C.F.R. § 3.311(b)(4) (2011). The statute goes on to explain that:

> "Sound scientific evidence" means observations, findings, or conclusions which are statistically and epidemiologically valid, are statistically significant, are capable of replication, and withstand peer review, and "sound medical evidence" means observations, findings or conclusions which are consistent with current medical knowledge and are so reasonable and logical as to serve as the basis of management of a medical condition.

Id. at § 3.111(c)(3).

152. *Id.* at § 3.311(b)(3).

153. *Id.*

154. Flohr 2012, *supra* note 22, slide 4.

155. Flohr 2011, *supra* note 22, slide 4; *and* Flohr 2010, *supra* note 22, slide 6 (In 2011, 1,968 claims were granted and 3,683 denied; and, in 2010, 1,648 claims were granted and 2,918 claims denied).

VDRECSA non-presumptive disease claims cannot be estimated because the VA does not keep these records.[156] However, VDRECSA non-service presumptive disease claims are thought to be rarely awarded;[157] and, in 2011 claim rejections included many skin, prostate, and rectal cancers.[158] It is important to note that the veteran has the initial burden of proof, and that a person who submits a claim for benefits under a law administered by the Secretary shall have the burden of submitting evidence sufficient to justify a belief, by a fair and impartial individual, that the claim is well grounded.[159] This is a fairly low standard; and, most claims are considered to meet this standard and determined to be well grounded. Nevertheless, claims are denied when the Under Secretary of Benefits evaluates the evidence. One need only to visit the Board of Veterans Appeals website and search the terms "radiation exposure and related decisions" to ascertain the volume of radiological disease claims that the VA and BVA have denied.[160]

VDRECSA non-presumptive disease claim rejection is based primarily on the way in which the VA considers the six factors outlined in 38 C.F.R. Section 3.311. Unfortunately, these factors provide a plethora of ways in which the VA can deny service-

156. REVIEW OF DTRA, *supra* note 17, at 252.

157. *Id.* at 252—53.

158. PowerPoint: John Lathrop, Slide Presentation, *Review of Atomic Veterans Demographic Study*, at the VETERANS' ADVISORY BOARD ON DOSE RECONSTRUCTION MEETING (Mar. 23, 2012), slide 10, *available at* http://www.vbdr.org/meetings/2012/Presentations/2-Lathrop_VBDR_Mar12.pdf.

159. 38 U.S.C. § 5107 (2006). *See* Rucker v. Brown, 10 Vet. App. 67, 70–71 (1997) (The Court has interpreted this burden as the necessity of submitting a claim that is "a plausible claim, one which is meritorious on its own or capable of substantiation. Such a claim need not be conclusive, but only possible to satisfy the initial burden of § [5107(a)]." *Murphy v. Derwinski*, 1 Vet. App. 78, 81 (1990). Where the determinative issue involves either medical etiology or a medical diagnosis, competent medical evidence is required to fulfill the well-grounded-claim requirement; where the determinative issue is factual in nature, lay testimony may suffice by itself. *See Grottveit*, 5 Vet. App. at 93; *Espiritu v. Derwinski*, 2 Vet. App. 492, 494–95 (1992).).

160. *See* U.S. Dep't of Veterans Affairs, *Board of Veterans' Appeals Decisions Search,* U.S. DEP'T VETERANS AFFAIRS, http://www.index.va.gov/search/va/bva.html (search "radiation exposure and related decisions") (last updated Jan. 17, 2013).

connection to a disease. Often, the VA will reject a claim by citing that the DTRA dose reconstruction estimate does not support service-connection, even when many of these dose estimates were calculated based on theory.[161] The DTRA contends, and the VA obviously supports the proposition, that most Atomic Veterans only received a small amount of radiation – an amount lower than that required to cause radiological diseases.[162] If the service member was a smoker, the VA will often deny the claim based on the fact that the veteran smoked, asserting that smoking may be as likely to contribute to the radiological disease as service-related radiation exposure.[163]

In many cases, where a veteran suffers from more than one type of cancer and/or radiological disease, the claim is denied without considering the increased probability of radiological causation.[164] In other words, the VA does not consider that the manifestation of more than one cancer or radiological disease suggests radiological causation for both diseases. This is in contrast to the way in which other agencies evaluate radiological disease claims, [165] as articulated by the Department of Health

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161. EVALUATION OF PRESUMPTIVE DISABILITY, *supra* note 98, at 332 (finding that the "VA (1) has no formal published rules governing this process, (2) does not thoroughly disclose and discuss what "other" medical and scientific information it considered, and (3) publishes abbreviated and insufficiently informative explanations of why a presumption was or was not granted.").

162. REVIEW OF DTRA, *supra* note 17, at 3—4.

163. The Transportation Equity Act for the 21st Century (TEA-21) (1998) characterized tobacco use by service members as "willful misconduct" so as to allow the VA to deny service-related connection of smoking-related illnesses. The reader is referred, generally, to the following references that outline the interesting history and issues related to this legislation: DENNIS W. SNOOK, CONG. RESEARCH SERV., 98-373 EPW, VETERANS AND SMOKING-RELATED ILLNESSES: CONGRESS ENACTS LIMITS TO COMPENSATION (1998); Claims Based on the Effects of Tobacco Products, 66 Fed. Reg. 18,195 (Apr. 6, 2001) (to be codified at 38 C.F.R. pt. 3); Naphtali Offen et al., *"Willful Misconduct": How the U.S. Government Prevented Tobacco-Disabled Veterans From Obtaining Disability Pensions*, 100 AM. J. PUB. HEALTH 1166 (2010).

164. *See, e.g.*, Ramey v. Gober, 120 F.3d 1239 (Fed. Cir. 1997); Farris v. Principi, 4 Vet. App 6 (1993); Rucker v. Brown, 10 Vet. App. 67 (1997).

165. *See, e.g.*, Energy Employees Occupational Illness Compensation Program Act, 42 U.S.C. §§ 7384q(b), 7384s (Supp. 4 2006) (establishing a compensation program to provide a lump sum payment of $150,000 and medical benefits as compensation to covered employees suffering from designated illnesses (i.e. cancer resulting from radiation exposure, chronic beryllium disease, or silicosis) incurred as a result of their exposures while in the performance of duty for the Department

and Human Services:

> Employees diagnosed with two or more primary cancers also raise a special issue for determining probability of causation. Even under the assumption that the biological mechanisms by which each cancer is caused are unrelated, uncertainty estimates about the level of radiation delivered to each cancer site will be related. While fully understanding this situation requires statistical training, the consequence has simple but important implications. Under this rule, instead of determining the probability that each cancer was caused by radiation independently, DOL [the Department of Labor] will perform an additional statistical procedure following the use of IREP [Interactive RadioEpidemiological Program] to determine the probability that at least one of the cancers was caused by the radiation. This approach is important to the claimant because it would determine a higher probability of causation than would be determined for either cancer individually.[166]

The way in which the claims are assessed is evidence that the VA does not apply the benefit-of-the-doubt standard of proof under 38 C.F.R. Section 3.301. The VA is required to consider all the evidence, and assess whether it is "at least as likely as not" that the veteran's disease is connected to the radiation exposure.[167] The claim can only be denied if a preponderance of the evidence is against the claimant. These examples are but a few of the common ways in which the VA uses the factors in 38 C.F.R. Section 3.311 to circumvent the application of the benefit-of-the-doubt standard under 38 C.F.R. Section 3.301 to deny compensation for radiation claims.

The number and nature of denied claims is truly astounding, considering the legislative intent and framework governing presumptive as well as non-presumptive claims

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of Energy (''DOE'') and certain of its vendors, contractors, and subcontractors).

166. Guidelines for Determining the Probability of Causation Under the Energy Employees Occupational Illness Compensation Program Act of 2000, 67 Fed. Reg. 22,296, 22,298 (May 2, 2002) (to be codified at 42 C.F.R. pt. 81).

167. 38 C.F.R. § 3.311 (2011); VETERANS FOR AM., THE AMERICAN VETERANS AND SERVICEMEMBERS SURVIVAL GUIDE 79 (2007), *available at* http://www.nvlsp.org/images/products/survivalguide.pdf.

adjudication. In passing REVCA presumptive disease legislation there was little scientific evidence to support the legislation – only the statistical data of excess cancer mortalities related to leukemia among atmospheric weapons test participants was used.[168] "[T]he House Veterans' Affairs Committee concluded that there was a lack of definitive exposure data, and decided to concentrate on the likelihood of association between cancers and radiation exposures."[169] The VA was concerned that the REVCA presumptive legislation would require the VA to compensate for an estimated 32,010 cancers, only a handful of which being potentially caused by the radiation exposure.[170] However, by passing the presumptive disease legislation, Congressional intent clearly supported broad compensation. In signing the bill (H.R. 1811), President Ronald Reagan stated:

> Enactment of this legislation does not represent a judgment that service-related radiation exposure of veterans covered by the Act in fact caused any disease, nor does it represent endorsement of a principle of permitting veterans to receive benefits funded through veterans programs which bear no relationship to their former military service.
> Instead, the Act gives due recognition for the unusual service rendered by Americans who participated in military activities involving exposure to radiation generated by the detonation of atomic explosives. The Nation is grateful for their special service, and enactment of H.R. 1811 makes clear the Nation's continuing concern for their welfare.[171]

The VDRECSA non-presumptive disease legislation has also been interpreted to support broader compensation for dioxin diseases suffered by Vietnam Veterans. In *Nehmer v. U.S. Veterans' Administration*, 712 F. Supp. 1404 (N.D. Cal. 1989), the

168. *See generally* G.V. (SONNY) MONTGOMERY, ATOMIC VETERANS COMPENSATION ACT OF 1987, H.R. REP. NO. 100-235, at 8 (1987).

169. PRESIDENTIAL COMM'N ON CATASTROPHIC NUCLEAR ACCIDENTS, 101ST CONG., (Comm. Print 1990) app. E (emphasis added).

170. H.R. REP. NO. 100-235, at 8, 10–11.

171. Presidential Statement on Signing the Radiation-Exposed Veterans Compensation Act of 1988, 24 WEEKLY COMP. PRES. DOC. 641, 642 (May 20, 1988).

U.S. Federal Courts found that Congress intended the legislation to compensate veterans for diseases likely associated with dioxin exposure.[172] The court found ample evidence that the "cause and effect test is also inconsistent with prior VA and congressional practice: both the VA and Congress have used a 'statistical association' standard to grant service-connection status for other types of diseases."[173] In subsequent legislation[174] enacted to further ease the burden of proof for Vietnam Veterans, Congress characterized the *Nehmer* court holding:

> The court held that VA had erred in two key ways in carrying out the requirement in P.L. 98-542. First, by utilizing too high a standard for determining if there is a linkage between exposure to Agent Orange and a subsequent manifestation of a disease and, second, by failing to give the benefit of the doubt to veterans in prescribing the standards in the regulations for VA to use in deciding whether to provide service connection for any specific disease.[175]

The *Nehmer* decision is an important ruling for Atomic Veterans, as many of the congressional statements addressing dioxin-exposed veterans cited by the court would also apply to Atomic Veterans.[176] Unfortunately, VDRECSA has not been challenged in the same way by Atomic Veterans.[177] Atomic

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172. Nehmer v. U.S. Veterans' Admin., 712 F. Supp. 1404, 1420 (N.D. Cal. 1989).

173. *Id.* at 1418.

174. Agent Orange Act of 1991, Pub. L. No. 102-4, 105 Stat. 11 (1991) (codified in part at 38 U.S.C. § 1116 (2000)).

175. SIDATH VIRANGA PANANGALA ET AL., CONG. RESEARCH SERV., R 41405, VETERANS AFFAIRS: PRESUMPTIVE SERVICE CONNECTION AND DISABILITY COMPENSATION 14 (2010) (quoting STAFF OF S. COMM. ON VETERANS AFFAIRS, 101ST CONG., VETERANS' AGENT ORANGE EXPOSURE AND VIETNAM SERVICE BENEFITS ACT OF 1989 35 (Comm. Print 1989)).

176. 130 CONG. REC. 13,154–73 (1984); 130 CONG. REC. 29,551 (1984) (statement of Rep. Montgomery).

177. *See* Brown v. Sec'y of Veterans Affairs, No. 95-7067, 1997 WL 488930, at *3 n.1 (Cal. Fed. 1997). This was a case brought by a group of atomic veterans that challenged the burden of proof used in radiation cases. The plaintiffs argued that the regulations issued by the Department of Veterans Affairs in determining eligibility for radiation exposure shall be held unlawful, and the actions, findings, and conclusions shall be set aside as they were "arbitrary, capricious . . . and contrary to constitutional right." 5 U.S.C. § 706(2) (2006). The case was dismissed as untimely without addressing the merits of the case.

Veterans' claims have likely been evaluated contrary to Congressional intent since the regulations were promulgated, denying thousands of Atomic Veterans benefits for their service-connected radiological diseases.

The standard by which the VA evaluates scientific and medical evidence for radiological disease controls the success or failure of a veteran's claim. A statistical or "likely association" has been described as "the observed coincidence in variations between exposure to the toxic substance and the adverse health effects is unlikely to be a chance occurrence or happenstance."[178] This is in contrast to the cause-and-effect relationship, which "describes a much stronger relationship between exposure to a particular toxic substance and the development of a particular disease."[179] It is clear that Congress intends for the VA to apply the lower, likely association, standard to radiological claims, although the standard has not been challenged and reviewed by the federal courts.

The way in which the VA Under Secretary for Benefits denies radiogenic disease claims demonstrates that a heightened standard of proof, that of cause-and-effect, is likely being applied to evaluate radiological claims. In other words, by applying the six factors outlined in 38 C.F.R. Section 3.311, and assessing these factors, the VA is effectually applying a cause-and-effect standard to determine whether a radiogenic disease is related to ionizing radiation exposure. This is evident, for example, by the denial of claims for prostate cancer[180] (diseases that are associated with radiation exposure)[181] where the claim asserts a relatively low radiation dose estimate.[182] The clear implication is that the VA places more value in the suspect dose

178. Nehmer v. U.S. Veterans' Admin., 712 F. Supp. 1404, 1416 (N.D. Cal. 1989).

179. *Id.*

180. Flohr 2012, *supra* note 22, slide 13.

181. EVALUATION OF PRESUMPTIVE DISABILITY, *supra* note 98, at app. I-89; *see also* Elaine Ron et al., *Skin Tumor Risk Among Atomic-Bomb Survivors in Japan*, 9 CANCER CAUSES & CONTROL 393, 398—99 (1998) (finding that skin cancer is associated with, and can be caused by, ionizing radiation as well).

182. EVALUATION OF PRESUMPTIVE DISABILITY, *supra* note 98, at 90.

estimate and minimizing epidemiological data showing association between radiation exposure and these diseases. Thus, the VA requires stronger epidemiological evidence than is required by VDRECSA to award claims for radiation exposure. Thus, Atomic Veterans' claims are subject to a higher standard of proof than dioxin-exposed Vietnam Veterans evaluated under the same statutory framework of VDRECSA.[183]

VI. CASE STUDY: ONE ATOMIC VETERAN'S 24-YEAR FIGHT FOR COMPENSATION

The scientific challenges outlined herein are best illustrated by a recent case before the Board of Veterans Appeals (BVA).[184]

A. FACTS OF THE CASE

A veteran was awarded service-connected disability benefits for diseases attributed to radiation exposure, including avascular necrosis of the femoral head, breathing problems, and an increased rating for skin cancer, among other claims. The

183. In response to the holding in *Nehmer* Congress passed the Agent Orange Act of 1991, establishing a new process for the evaluation of dioxin cases that relies upon the NAS to help review the scientific evidence and establish presumptions based on the standard of "statistical association" instead of "cause and effect." Agent Orange Act of 1991, Pub. L. No. 102-4, 105 Stat. 11 (1991) (codified in part at 38 U.S.C. § 1116 (2000)).

184. Citation No. 0911154 (eDecision Mar. 25, 2009), http://www.va.gov/vetapp09/files2/0911154.txt (Bd. of Veterans Appeals). Professor Craig Kabatchnick was long-time counsel for the widow and her husband at the time of the hearing before the Board of Veterans Appeals and the subsequent decision granting relief. Professor Kabatchnick qualified one of his students in the North Carolina Central University School of Law Veterans Law Program, specifically Michelle Fitzsimmons, as an expert. Given her vast background in nuclear medicine and physics, especially in view of the fact that Dr. Fitzsimmons earned her Ph.D. in Inorganic Chemistry from Wake Forest University where her doctoral research focused on the synthesis and characterization of metal complexes for use in nuclear medicine, she served as an excellent expert. Correspondingly, some facts and procedural details may not be found in the citation above. Unless otherwise footnoted, all facts in this section may be found in the above cited case or are personal knowledge of the authors. The authors are currently working to garner accrued benefits for the widow of the veteran in this case. Should the reader like more information on her case see Craig M. Kabatchnick & Jonathan B. Kelly, *Unsung Survivors: VA Advocacy for the Spouses, Widows, and Children of Elderly Veterans*, 13 MARQ. ELDER'S ADVISOR 243, 251–56 (2012).

claims, initiated in 1980, were accompanied by a radiation dose reconstruction estimate prepared by the DTRA, and five professional medical opinions. The medical opinions supported the conclusion that the diseases were attributable to radiation exposure. The VA Under Secretary for Benefits denied the claims. However, on appeal in 2009, the BVA ruled in favor of the veteran for avascular necrosis and skin cancer. Avascular necrosis is a radiation exposure-related disease not listed as a presumptive disease in REVCA, VDRECSA, or 38 C.F.R. Section 3.311.

The veteran was a member of the Marine Corps "C" Company, 1st Battalion, 8th Marines, whose mission was aborted due to excessive radiation exposure during Operation Upshot-Knothole, Shot Badger. The Claimant was 4,500 yards from Shot Badger and, after detonation, his battalion was ordered to charge towards ground zero. The battalion advanced about 500 yards before the winds shifted, and the marines were unexpectedly subjected to excessive radiation exposure. After the mission was aborted, the marines remained on-site for an additional five and-a-half hours and then returned to Camp Desert Rock (near the test site).

Seven years after being exposed to radiation, when the veteran was 27 years old, he began to have hip and skeletal pain, eventually becoming bed ridden at the age of 44. The veteran was eventually diagnosed with bilateral avascular necrosis of the femoral head, requiring bilateral hip replacement. His other skeletal diseases included arthralgia of the cervical and dorsal spine, and bursitis of the left shoulder. In 1978, the veteran began suffering from nosebleeds, nasal and facial dermatitis, basal cell carcinoma and malignant melanoma, and recurrent lesions of his ears, cheeks, and arms. After leaving the Marine Corps, the veteran submitted evidence to the VA of progressively deteriorating health effects due to a variety of radiogenic diseases, which included fifteen skeletal surgeries and seven additional surgeries.

The veteran submitted scientific publications and five

medical opinions linking avascular necrosis (bone death) to radiation exposure. The radiation, inhaled through the veteran's lungs, likely lodged in his bones. Inhaled plutonium preferentially distributes in the femoral head and lung tissue, irradiates over a period of years, and eventually destroys the tissue.[185] The scientific literature showed that avascular necrosis has been seen in the femoral head with the administration of just a small amount of radiation.[186] Additionally, tissue necrosis can develop when the radionuclide inhaled is either plutonium or strontium oxide.[187] Unfortunately, there is no suitable data available correlating the dose of inhaled radioactive plutonium and strontium oxide dose necessary to cause avascular necrosis.

Idiopathic avascular necrosis is extremely rare in healthy individuals, and most cases are associated with alcoholism or hypercortisonism[188] (neither of which the veteran suffered). A sizable number of avascular necrosis cases are a result of trauma, including trauma from radiation exposure.[189] Bilateral avascular necrosis is generally seen with disease processes, including radiation exposure.[190] "The radiation tolerance of the femoral head is substantially lower than the radiation tolerance of long

185. James F. McInroy, *A True Measure of Exposure: The Human Tissue Analysis Program at Los Alamos,* 23 LOS ALAMOS SCI. 235, 243–44 (1995).

186. UW MSK Resident Projects, *Radiation Changes to Bone*, UNIV. OF WASH. MUSCULOSKELETAL RADIOLOGY (last updated Aug. 4, 2005), http://uwmsk.org/residentprojects/radiationchanges.html (stating that avascular necrosis of the femoral head and fractures of the femoral neck have been seen with as little as 16 Gy of external radiation).

187. AGENCY FOR TOXIC SUBSTANCES & DISEASE REGISTRY, *supra* note 53, at 103, 122–23.

188. *See* Thomas Parker Vail & Diane Beal Covington, *The Incidence of Osteonecrosis*, *in* AM. ORTHOPAEDIC ASS'N, OSTEONECROSIS – ETIOLOGY, DIAGNOSIS, AND TREATMENT 43, 44 (James R. Urbaniak & John Paul Jones, Jr. eds., 1997); Yoshio Hirota et al., *Idiopathic Osteonecrosis of the Femoral Head: Nationwide Epidemiologic Studies in Japan*, *in* AM. ORTHOPAEDIC ASS'N, OSTEONECROSIS – ETIOLOGY, DIAGNOSIS, AND TREATMENT 51, 53, 57 (James R. Urbaniak & John Paul Jones, Jr. eds., 1997).

189. Michael R. Aiello, *Imaging in Avascular Necrosis of the Femoral Head*, MEDSCAPE REFERENCE, http://emedicine.medscape.com/article/386808-overview (last updated May 25, 2011).

190. Peter G. Harper et al., *Avascular Necrosis of Bone Caused by Combination Chemotherapy Without Corticosteroids,* 288 BRITISH MED. J. 267, 267 (1984).

bones."[191] The femoral head requires a relatively smaller amount of radiation to result in avascular necrosis.[192]

Regarding the respiratory problems, the veteran submitted scientific publications indicating that both human and animal studies of inhaled plutonium indicate irreparable damage to the respiratory tract and nasal passage.[193] These studies also indicated that inhaled plutonium distributed in the lung tissue, and depending on the particle size and characteristics, remains in the lungs and continues to irradiate for years.[194] Generally speaking, "[t]he lungs are particularly sensitive to irradiation."[195] Although the veteran smoked cigarettes, the damage caused by the radiation exposure to the lungs from Shot Badger could be significantly larger than the damage from the cigarettes. However, as cited previously by NAS, the error associated with the internal dose calculations of plutonium refute internal dose calculations.[196] The veteran did not submit medical opinions with the diagnosis of a specific radiological disease of the lung and breathing passages.

Additionally, the veteran was requesting a disability rate increase for skin cancer, to which he was already receiving service-connected compensation. The requested increase was based on the progression of the skin diseases and resulting disfigurement.

B. VA EVALUATION

The veteran had diseases that were not listed as

191. Mark A. Engleman et al., *Radiation-Induced Skeletal Injury*, *in* RADIATION TOXICITY: A PRACTICAL GUIDE 155, 160 (William Small Jr. & Gayle E. Woloschak eds., 2006).

192. UW MSK Resident Projects, *supra* note 186.

193. *See* AGENCY FOR TOXIC SUBSTANCES & DISEASE REGISTRY, U.S. DEP'T HEALTH & HUMAN SERVS., TOXICOLOGICAL PROFILE FOR PLUTONIUM 13–14 (2010) (discussing the publications that supported the veteran's assertion).

194. *See id.* at 10, 13–14; *see also* McInroy, *supra* note 185, at 244.

195. Jeffrey Bradley & Benjamin Movsas, *Radiation Pneumonitis and Esophagitis in Thoracic Irradiation*, *in* RADIATION TOXICITY: A PRACTICAL GUIDE 43, 45 (William Small Jr. & Gayle E. Woloschak eds., 2006).

196. REVIEW OF DTRA, *supra* note 17, at 148, 178, 182, 190, 204.

presumptive diseases under REVCA. Thus, the claim was assessed under VDRECSA, and 38 C.F.R. Sections 3.311 and 3.303(d). The veteran's claim included evidence of service-connection through the submission of service records and a radiation dose reconstruction estimate. The scientific and medical evidence submitted to associate the radiological disease with radiation exposure included physician statements and scientific publications. The VA denied the veteran's claims, as discussed below.

The veteran's service records established that the claim was to be evaluated as a radiological claim. The dose reconstruction estimate was initially performed in 1978 by the Defense Nuclear Agency and was revised downward by the DTRA in 2005. The dose estimate included: (1) total external dose, (2) dose estimate for skin exposure limited to the face and ears, and (3) an internal dose estimate. The "total external dose estimate" and the "dose estimate for the skin" used available dosimeter data, reflecting gamma, beta, and neutron radiation emitted from Shot Badger. The internal dose estimate was based on theoretical calculations for inhaled and ingested radioactive particles. However, the radiation dose estimates were relatively low.

As for the avascular necrosis, the VA reasoned that the veteran's radiation dose estimate was too low to be service-connected. The VA based its arguments on the radiation associated with avascular necrosis resulting from fractional radiotherapy and radionuclide irradiation. These procedures expose the whole body to radiation.[197] A large dose is required to achieve irradiation of the bone and the unintended avascular necrosis because of an uncontrolled environment.[198] These procedures are unlike the inhaled dose of bone-seeking radioactive plutonium and radioactive strontium to which the

197. *Understanding Radiation: Health Effects*, U.S. EPA, http://www.epa.gov/radiation/understand/health_effects.html (last updated Aug. 7, 2012).

198. *See, e.g.*, H. J. G. Bloom, Section of Pathology with Section of Radiology, *Discussion on the Changes Produced in Tissue by Irradiation,* 52 PROCEEDINGS ROYAL SOC'Y. MED. 495, 497–98 (1959).

veteran was exposed.[199]

By citing the importance of the veteran's radiation dose estimate, the VA emphasized the importance of the dose estimate in their evaluation. However, the VA did not evaluate the weaknesses associated with the calculations. NAS and the Committee to Review the Dose Reconstruction Program of the DTRA concluded that there were several incorrect assumptions made in the calculation of internal doses.[200] Most importantly, the errors in the calculation were so substantial that they rendered the veteran's dose reconstruction estimate meaningless.[201]

C. BVA EVALUATION

When the VA denies a claim, the veteran has the option of appealing the decision to the BVA. If the BVA denies the claim, the claimant can appeal, sequentially, to the Court of Appeals for Veterans Claims (CAVC), United States Court of Appeals Federal Circuit, and United States Supreme Court. The courts require the claimant to articulate his/her argument under specific legal causes of actions that describe violations of the law. Common issues on appeal against the VA include: clear and unmistakable error, failure to apply the benefit-of-the-doubt standard, and failure to provide a "reason or basis" for the decision(s).

In this case, the veteran argued the following to the BVA: (1) the VA committed clear and unmistakable error in denying the claim, because the correct facts were not before the VA. The VA used the wrong data to evaluate the radiologic effects of avascular necrosis and the skin diseases. The VA did not consider the inaccuracy of the inhalation dose estimate, and did

199. *See id.*; Lisa Bodei et al., *EANM Procedure Guideline for Treatment of Refractory Metastatic Bone Pain*, 35 EUR. J. NUCL. MED. MOL. IMAGING 1934, 1935 (2008) (explaining that bone pain can be treated with radiotherapy and this radiotherapy effect).

200. REVIEW OF DTRA, *supra* note 17, at 168, 169, 182.

201. The assumptions used to calculate the dose reconstruction estimate render the dose estimate subject to 400% error.

not evaluate the radiation dose estimate for the lung or nasal passages; (2) the VA committed clear and unmistakable error in denying the claim, as the VA misapplied the law. The VA did not correctly apply 38 C.F.R. Section 3.311, as the statutory factors were not wholly considered in determining service connection. Specifically, the limitation in the inhaled radiation dose estimate methodologies and measurements were not adequately considered, the relative sensitivity of the involved tissue to induction, by ionizing radiation, of the specific pathology, the time-lapse between exposure and onset of the disease and the extent to which exposure to radiation, or other carcinogens, outside of service may have contributed to development of the disease; (3) the VA committed clear and unmistakable error, as the VA failed to properly apply the Burden of Proof standard, under 38 C.F.R. 3.301; (4) the VA failed to apply the benefit of the doubt standard, as codified in 38 U.S.C. Section 5107(b) and 38 C.F.R. Section 3.102; and (5) the VA failed to explain their reasons or basis for the arrival at their decision for avascular necrosis and claimants breathing problems.

Based on the evidence presented the BVA awarded service-connection for avascular necrosis of the bilateral hips, as well as increased compensation for residuals of basal cell carcinoma of the face, head, and right forearm.[202] Unfortunately, service-connected compensation for the respiratory problems was denied, as the BVA found that the medical opinion did not articulate a particular radiological disease.[203] This case is unique, as it is demonstrative of radiation claims that were adjudicated

202. These awards were based on the following statutes:
38 U.S.C. §§ 1110, 1112, 5107 (2002); 38 C.F.R. §§ 3.102, 3.303, 3.309 (2011) (all statutes establishing a basis for service-connection for avascular necrosis of the bilateral hips); *and* 38 U.S.C. §§ 1155, 5107(b) (2002); 38 C.F.R. §§ 4.1, 4.3, 4.118 (2002) (all statutes establishing a basis for increased compensation for residuals of basal cell carcinoma of the face, head, and right forearm). Ratings are under the 7800 and 7803 diagnostic code series in the Schedule for Rating Disabilities. 38 C.F.R. § 4.118 (2011).

203. 38 U.S.C. §§ 1110, 1112, 1113, 5107 (2002); 38 C.F.R. §§ 3.102, 3.303, 3.307, 3.309, 3.311 (2011) (delineating the necessity of a particular radiological disease).

under both 38 C.F.R. Section 3.303(d)[204] and VDRECSA regulations.

Notably, in adjudicating the claims, the BVA found, as a matter of law, that avascular necrosis was not a listed presumptive condition under 38 C.F.R. Sections 3.309 or 3.311, but the veteran was able to show entitlement to benefits on a direct basis under 38 C.F.R. Section 3.303(d).[205] The Board found that:

> [A]lthough the evidence of record reflects a fairly low dose of radiation, relative to the levels discussed in the studies relied upon by the appellant, the evidence does support a finding that it is scientifically sound to relate the development of avascular necrosis of the femoral head/hip to radiation exposure, as a general principle. Moreover, numerous private doctors have opined, after reviewing the Veteran's medical history and his exposure to radiation, and conducting examinations, that in his particular case it is likely that radiation played a role in causing the currently diagnosed bilateral hip disability.[206]

This case is an important case for the Atomic Veteran community and it demonstrates the scientific and legal challenges associated with non-presumptive, complex radiation claims. As exemplified in this case, for a radiological disease claim to be properly evaluated, the claim should include physician statements and solid scientific literature that associates the disease with radiation exposure. Since radiation exposure is linked with a variety of chronic diseases, the VA may not immediately identify the disease as a radiological disease. For this reason, even with the proper evidence, these claims are often denied, requiring further appeal for justice.

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204. Direct service-connection.

205. The veteran employed the strategies outlined in *Combee*. Combee v. Brown, 34 F.3d 1039, 1043–44 (Fed. Cir. 1994).

206. Citation No. 0911154 (eDecision Mar. 25, 2009), http://www.va.gov/vetapp09/files2/0911154.txt (Bd. of Veterans Appeals).

VII. ARGUMENTS FOR A NEW STANDARD

The VA should evaluate radiologic disease claims similar to the way in which dioxin disease claims are currently evaluated, because of the similarities in establishing service-connection. These veterans are similarly situated, as both sets of veterans face the challenges outlined in Sections III and IV, including: (1) The lack of knowledge and the inability to measure exposure during the mission; (2) misinformation communicated to the veteran and the public about the health risks; (3) the oath of secrecy soldiers swore, prohibiting them from discussing their exposure; (4) the long "incubation period" with which these diseases are associated; (5) the difficulty associated with assessing exposure dose; and (6) the variability of exposure experienced by the veteran, which complicates the scientific analysis of linking specific disease with exposure. In 1991, Congress acknowledged these challenges for Vietnam Veterans and passed the Agent Orange Act.[207] This legislation requires the VA to work with NAS to review and summarize available scientific evidence regarding an association between disease and exposure to herbicides used in Vietnam.

NAS, through an Institute of Medicine (IOM) committee, examines and characterizes the strength of the scientific and medical evidence relating to dioxin exposure into the following four categories: "(1) sufficient evidence of an association, (2) limited/suggestive evidence of an association, (3) inadequate/insufficient evidence to determine whether an association exists, and (4) limited/suggestive evidence of *no* association."[208] IOM was additionally contracted to explore possible links between service in the Gulf War I and a host of medical conditions experienced by veterans known collectively

207. Agent Orange Act of 1991, Pub. L. No. 102-4, 105 Stat. 11 (1991) (codified in part at 38 U.S.C. § 1116 (2000)).

208. EVALUATION OF PRESUMPTIVE DISABILITY, *supra* note 98, at 64 (quoting COMM. TO REVIEW THE HEALTH EFFECTS IN VIETNAM VETERANS OF EXPOSURE TO HERBICIDES, VETERANS AND AGENT ORANGE: HEALTH EFFECTS OF HERBICIDES USED IN VIETNAM 6–7 (1994)).

as "Gulf War Syndrome." The IOM committees conducted the Gulf War I studies using a similar categorization process that included: "(1) sufficient evidence of a causal relationship, (2) sufficient evidence of an association, (3) limited/suggestive evidence of an association, (4) inadequate/insufficient evidence to determine whether an association does or does not exist, and (5) limited/suggestive evidence of no association."[209] If the VA adopted this type of approach to evaluate non-presumptive disease radiation claims, the evaluation process would better conform to congressional intent, current statutes, and applicable regulations.[210]

VIII. CONCLUSION

Atomic Veterans face an unnecessary number of challenges in establishing service-connected disability claims for their radiological diseases. The current legislation, as implemented by the VA, does not provide an appropriate mechanism for the proper adjudication of radiation claims. Because these claims involve the evaluation of complex scientific evidence, the VA should adopt a new standard under which these claims are evaluated, similar to the way in which dioxin claims are evaluated. Implementation of this standard would realize congressional intent and provide Atomic Veterans with the same standard of proof applied to dioxin claims.

209. *Id.* at 65 (quoting 1 COMM. ON HEALTH EFFECTS ASSOCIATED WITH EXPOSURES DURING THE GULF WAR, GULF WAR AND HEALTH: DEPLETED URANIUM, SARIN, PYRIDOSTIGMINE BROMIDE, VACCINES 4–5 (Carolyn E. Fulco et al. eds., 2000)).

210. Specifically, VDRECSA and 38 C.F.R. § 3.102 (2006).