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A Japanese Place in Utah History:

Dugway Proving Ground's Japanese Village

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Photo 1: Dugway Proving Ground, Testing the M-69 incendiary bomb on a model enemy building.

Noyes, W.A. Jr. *Chemistry: A History of the Chemistry Components of the National Defense Research Committee, 1940-1946.*

P. IV.

The M69/M69X bomb was designed to lodge in the most flammable part of the building—the ceiling beams.

- U.S. Army Dugway Proving Ground, *Historical Fact Sheet*, p. 1

Initially, it often seemed a home was unaffected, until the windows began to shine from within and then glowed 'like a paper lantern' from a ball of fire that sprouted tentacles that danced out from beneath the eaves to envelope the house until it crumbled inward upon itself.

- Richard B. Frank, describing an M-69 in the Tokyo air raid of March 9-10, 1945
Downfall pp. 7-9

And, when I saw Japanese Village [at Dugway Proving Ground, Utah], it was burning. It went. It was gone. [It] was built in such a, you know, material, nothing like German Village, it was burnt. It burnt to the ground. All you find out there was a few pieces of wire, or something like that. Maybe some nails. That's all that's left of Japanese Village.

- Ethnographic Interviewee [name withheld], employee at Dugway Proving Ground, *Interview #4 Transcript*, p. 5

1. INTRODUCTION

Dugway Proving Ground is a U.S. Army post roughly 90 miles southwest of Salt Lake City, Utah, in Tooele County. It is self-contained and has "all of the attributes of any small town in America" according to its official *Newcomer and Visitor Guide*, and is located between the Salt Lake Desert and Dugway Valley in Tooele County. The gas station-less road from Salt Lake City to Dugway Proving Ground (a site larger than the state of Rhode Island) is unfenced open range filled with wildlife, cattle, blind curves, and vision-impeding hillsides.[1] Isolated more than twenty miles beyond the gate of Dugway Proving Ground lies the site of German-Japanese Village, the site of WW-II testing of incendiary weaponry. Even today special clearance is required to get to the testing site.[2]

One member of the chemical corps that served at Dugway during the time of German and Japanese Village, in an ethnographic interview, called the ride to German-Japanese Village "the most boring road in the world" and told of people frequently falling asleep on evening trips.[3] This testing site, amid an interconnecting labyrinth of seemingly nameless and featureless roadways, is difficult to locate even with online maps. It's no small wonder that even employees interviewed about their memories of German and Japanese Village rarely seemed to have had reason to go that far out onto the site.[4]

Geographic isolation aside, the German-Japanese Village project, started in 1943, was only one element of a multifaceted, multidisciplinary, multinational effort, the origin, development, operation, implication, and overall significance of which is anything but trivial or simple. Surprisingly, very little, if any, extensive research has been conducted directly about Dugway Proving Ground's Japanese Village.[5]

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[1] Alexander Arrington. *Sentinels on the Desert*. Utah Historical Quarterly: Winter 1964, Vol. 32, No. 1. 34.
[2] Dugway Proving Ground, U.S. Army. *Newcomer and Visitor Guide*. 3-11.
[3] EM-Assist. *Ethnographic Interview Transcript: Interviewee #1*. 13.
[4] EM-Assist. *Ethnographic Interview Transcript: Interviewee #6*. 6.
[5] This is also true of its literal neighbor, German Village, but marginally less-so. One book by Oliver Clemens seems to have been produced directly about this topic, but this text has proven difficult to acquire and was produced in German for a publisher or journal specializing in architecture. Additionally, one is lead to assume that this text's main focus is probably German Village.

This leads to three fundamental questions that inform the organization of this paper: 1) What made Japanese Village possible? Or, rather, what is the context in which Japanese Village was devised? 2) How, if at all, and to what extent, can the Japanese Village be understood? In other words: what is the history of Japanese Village? And 3) what is Japanese Village's orientation (directly and indirectly) within the larger historical, military, scientific, moral, ideological, and cultural discourses and histories? Japanese Village is rarely referenced directly, and when it is referenced, it is usually as a footnote in a history of some other facet of the war effort or is portrayed from some other perspective. It is rare to find a book or article that devotes more than a paragraph or two at most to the whole project undertaken at Dugway, let alone one devoted to discussion of the Japanese Village. As my research to date makes evident, there are further avenues of this subject that remain to be thoroughly explored. This paper, through the lens of international studies and Japan studies, will attempt to consolidate some of those perspectives and those historical footnotes into a narrowly holistic picture of the curious instance of the Japanese Village.

German-Japanese Village can be said to be born of two interwoven developments before and during WWII. The two developments that this paper explores are 1) the doctrinal switch by the American air force from precision to carpet bombing, and 2) the development of incendiary weaponry. The project at Dugway is symbolic of a turning point. It is not the first nor the last representative case studying the effects of civilian bombing, nor of incendiary weaponry development, but it is a unique, concrete example of official government endorsement.[6]

[6] The official *German-Japanese Villages Fact Sheet*, as well as Blanthorn's *History of Tooele County* (and another history of Tooele County) and modern newspaper articles in the *Deseret News* state that President Roosevelt himself explicitly endorsed and even suggested the construction of "mock cities" for testing. The citations on these documents are, at best, dubious (and probably reference one another), and, in spite of further inquiries at the National Archives, the Roosevelt Library, Utah Historical Society, and Dugway Proving Grounds itself, no substantial evidence of this statement has yet been found. More than likely this refers to a vague reference in Elmer Gwyn Thomas's memoirs (p. 50) saying that prior to meeting Major Burns he received notification "from Washington." When I pointed this out, I was informed that the Dugway Proving Grounds technical library had, as a result, officially withdrawn the *Fact Sheet* from distribution.

Within American policy, where (and from whom) did the idea of incendiary carpet bombing arise? This is a good example of rapid change as a result of the U.S. entering WWII. In fairly short order, America went from little to no knowledge of "the physical processes by which bombs, whether high-explosive or incendiary, caused damage" to strategic incendiary bombing. Moreover, upon American entry into the war, the means of testing and measuring the efficacy of what explosives they had (on those rare occasions when researchers consciously thought about their engagement) was surprisingly crude.[7]

There is no simple way of understanding Japanese Village, historically or culturally. Some of the "innovations" that lead to the successful firebombing of Japan in 1945 commonly attributed to General Curtis LeMay and General "Hap" Arnold might very well have their true origin points at Dugway. Culturally, it is even less clear where this project should be positioned, as we will also see, but the varied and (even) theatrical interpretation, representation, and presentation attached to this history also puts it in a unique position that demands study.

2. LAYING THE FOUNDATION FOR THE GERMAN-JAPANESE VILLAGE

Firebombing Japan was not a new concept before Dugway Proving Ground authenticated it. As Patrick Coffey writes in *American Arsenal*, "Gen. Billy Mitchell had suggested the possibility of burning Japan's 'paper and wood' cities as early as 1924. In November 1941, George Marshall threatened to 'set the paper cities of Japan on fire' if war came."[11] Moreover, in 1939 the Air Corps Tactical School already emphasized, in their courses, Japanese urban vulnerability to incendiaries.

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[7] Lynn Eden. *Whole World on Fire.* 63. Lynn describes early testing methods as strangely primitive, consisting quite literally of paper and plywood with holes drilled into it. The military had "virtually no understanding of explosive shock waves or of structural response to shock—both essential for predicting blast damage."

[11] Patrick Coffey. *American Arsenal: A Century of Waging War.* 117-118.

Understandings of Japan, it seems, were founded as much on popular, albeit limited, knowledge of Japanese culture as on official policy.

Such ideas, too, had grown stronger leading up to war, so much so that the destruction of "industry" had become a kind of shorthand or euphemism for civilian bombing.[12] Moreover, in light of desperate civilian arming in Japan, and "noting the Japanese government's announcement that all men from fifteen to sixty and all women seventeen to forty would be called up for defense...the Fifth Air Force's intelligence officer declared on July 21 that ... 'THERE ARE NO CIVILIANS IN JAPAN."[13] Even if he didn't invent the idea, LeMay summed up American rationalization of carpet-bombing in his succinctly blunt manner in his memoirs (though it is important to realize that his viewpoint here benefits from established orthodox rhetoric only truly clear in hindsight, and that contemporaneous viewpoints were more muddled):

> *No matter how you slice it, you're going to kill an awful lot of civilians. Thousands and thousands. But if you don't destroy the Japanese industry, we're going to have to invade Japan. ... Do you want to kill Japanese or would you rather have Americans killed?*[14]

Prewar understanding, however, paints a slightly different, albeit simpler, picture, as Michael Sherry sums it up in *The Rise of American Air Power*: "More menacing than ever, Japan also appeared more vulnerable."[15]

Nonetheless, it is wrong to think that America had carpet bombing in mind as a tactic or a policy from the start. In fact, quite the opposite is true. Roosevelt, in a 1939 appeal, called civilian bombing "inhuman barbarism," and yet in 1943 found the firebombing in Hamburg an "'impressive demonstration' of what America might achieve against Japan," but by that time German-Japanese Village experimentation was already underway in Utah.[16] Furthermore, in a grimly ironic way, the

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[12] Conrad C. Crane. *American Airpower Strategy in World War II.* 168-169.
[13] Michael S. Sherry. *The Rise of American Air Power.* 311.
[14] Curtis LeMay, quoted in McFarland, Stephen L. *America's Pursuit of Precision Bombing, 1910-1945.* 198.
[15] Sherry. *The Rise of American Air Power.* 58.
[16] Franklin D. Roosevelt. September 1, 1939. *An Appeal to Great Britain, France, Italy, Germany, and Poland to Refrain from Air Bombing of Civilians*; Sherry. *Ibid.* 156.

machines most responsible for the implementation of civilian air bombing (the B-29s) were initially "designed with precision bombing in mind."[17]

Why the shift in approaches? Partially, the answer lies in the rigidity of Air Force policy in that timeframe. Moreover, "throughout the interwar years American airmen had no incentive to develop an incendiary weapon" due to their already established emphasis on precision bombing.[18] Between 1939 and 1941 the British Air Force, as a result of consistently ineffective daylight precision bombing attempts, as well as the newly introduced goal of "breaking down of German morale," shifted their tactics to area-bombing.[19] Nonetheless, in spite of pressure from Britain, early on the U.S. Air Force clung to the "precision doctrine," as Lynn Eden calls it in the book *Whole World on Fire,* for a multitude of reasons, among them: 1) the (overly) ambitious and visionary nature of the concept, 2) fear of domestic and political backlash as a result of mass civilian bombing, 3) early legislation theoretically restricting the air force to a defensive role in war, and, perhaps most importantly, 4) existing planning, training, and equipment were already oriented for precision—not area—bombing.

Such notions, however, about the accuracy of aerial bombardment turned out to be appreciably overestimated. By at least one account, only 5% of bombs on U.S. missions in that timeframe fell within even one mile of their targets.[20] Other early reports state that only one bomb in five landed within a five-mile radius of its target.[21] "The main difficulties arose," as John Kreis writes in *Piercing the Fog*, "from a combination of crew inexperience, operating the aircraft at extreme range limits, and, worst of all, atmospheric conditions over the targets."[22] Nonetheless, by 1943 the Army Air Forces "without ever publicly or privately admitting it abandoned its unquestioning faith in prewar bombing doctrines."[23]

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[17] Coffey. *Ibid.* 117-118, 108.
[18] Werrell, Kenneth. *Blankets of Fire.* 41, 47.
[19] Kerr, E. Bartlett. *Flames Over Tokyo.* 9-10.
[20] Eden. *Ibid.* 70-72.
[21] Richard B. Frank. *Downfall.* 41-42.
[22] John F. Kreis. *Piercing the Fog.* 338.
[23] Historian quoted in Frank. *Ibid.*

Just as the underlying rationale for the change in bombing strategy had evolved over time, so, too, did the technology of incendiary weaponry. The research and development of scientific and technological advancements that coincide with Dugway Proving Ground's German-Japanese Village project proceeded through a series of phases. It wasn't until 1940 that the Air Corps acquired its first incendiary bomb, the M-47. In 1941 the U.S. got their second incendiary bomb, a British innovation referred to as the M-50. It was in 1942 that the U.S. developed the M-69 (earlier referenced as the M-56) incendiary bomb that would be most utilized in the firebombing of Japan near the end of the war.[24] The trail of development and, most importantly, testing of incendiary weaponry is an important building block in understanding both why and how Dugway Proving Ground's German-Japanese Village was constructed.

Material limitations played a key role in defining the village's development. Rubber was an essential part of the first incendiary bomb, the M-47 (which used predominantly rubber and gasoline), but by 1940 the U.S. had been cut off from its supplies in Germany. Unsurprisingly, the Standard Oil Development Company of New Jersey, headed by chemist Robert "Bob" Russell, "observed this expanding market with great interest."[25] The M-50 bomb, however, adopted from Britain's Air Force in 1941, and used by the Germans as well, relied on magnesium. Hap Arnold, spurred on and frustrated by similar shortages in magnesium, pushed for "development of incendiary munitions which were to be at least as effective as the German Kilo magnesium bomb and readily capable of mass production without utilizing important strategic materials or facilities."[26]

By late 1941, The National Defense Research Committee (NDRC), the Chemical Warfare Service, and the Army Air Force had also seen the writing on the wall: rubber and magnesium sources in

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[24] Kerr. *Ibid.* 11-16.
[25] Charles S. Popple. *Standard Oil Company (New Jersey) in World War II.* 52-53.
[26] E. P. Stevenson. *Incendiary Bombs.* In *Chemistry: A History of the Chemistry Components of the National Defense Research Committee 1940-1946.* Ed. Noyes, W. A. 388.

the Pacific, threatened by the Japanese, might soon come to an end as well.[27] Before that, though, scientists and engineers had organized of their own accord: by 1940, in light of incendiary developments in Europe and an increasing threat from Japan, a meeting was held at Harvard University among the president of MIT, the president of Harvard, as well as a MIT chemical engineer Hoyt C. Hottel and Harvard organic chemist Louis Fieser (both of whom will shortly become very important to this paper), and Robert Russell, the aforementioned president of Standard Oil Development Company.[28]

The program to develop a reasonable incendiary alternative was formalized by the Chemical Warfare Service on October 7th, 1941. Louis Fieser headed the Harvard group in an attempt to solve this problem, and the NDRC paired with Standard Oil to facilitate development.[29]

Hoyt C. Hottel, an MIT graduate in chemical engineering, during the war became Section Chief on Fire Warfare for the NDRC. In an interview with the Chemical Heritage Foundation, Hottel provides a clear explanation about the timeframe leading up to war: "Come 1939, a lot of people thought that the war was something we'd be in sooner or later and our state of preparedness was poor."

Hottel had already begun his research into flamethrower technology.[31] Before completing his degree, Hottel had been approached by Standard Oil Development Company with a job offer which he declined at the time in favor of completing his doctorate. This contact, as we have already seen, would prove very important in the war years.

Similarly, Louis Fieser, an organic chemist and professor emeritus at Harvard, soon to be known as the inventor of napalm, also had been drawn into the studies of incendiaries. By summer 1941, he had been drafted by the NDRC (much to his chagrin) to "terminate work on explosives and to work instead on poison gases, vesicants."[32] This shift from explosive and incendiary work to toxic gas seemed to

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[27] Rexmond C. Cochrane. *The National Academy of Sciences: The First Hundred Years, 1863-1963*. 404-405.
[28] Hoyt C. Hottel. Chemical Heritage Foundation. *Transcript of Interviews*. 17-19.
[29] James Phinney Baxter, III. *Scientists Against Time*. 290.
[31] Hottel. *Transcript of Interviews*. 18. Hottel was a giant in the field of fire research during and after WWII. His flamethrower technology for attacking Japanese-style cave fortifications was also developed at Dugway Proving Ground, but this topic is beyond the scope of this paper.
[32] Fieser, like Hottel, went on to be (and was) famous in his own right: he later received the Nobel Prize for medicinal advancements.

Fieser to be inhumane.[33] The toxic gas program was subsequently delayed, and Fieser, in the interim, started thinking about a gelled-fuel incendiary in earnest (the genesis of napalm).[34] It was undoubtedly a relief, then, when he became, instead, the head of the Harvard group of scientists charged with developing an alternative incendiary thickener.

Such are some of the key players and their motivations, but the means of testing incendiary efficiency were also in their infancy. Standard Oil initially tested their prototype incendiary bombs "against specially designed targets simulating attics." These A-frame attics were essentially, as Hottel put it, "two-by-fours forming the frame and a few boards laid over them and on the floor." Even before Standard Oil had begun their testing, Fieser had been "building small wood structures and putting thickened fuels under them".

By 1942 the incendiary bombs were available "in sufficient quantities for airborne testing."[35] The question remaining was: what was the best formula for the M-69? Among the groups involved, three formulas for incendiary munitions became dominant: Standard Oil's Formula 122—nicknamed "applesauce" for its appearance resembling the food; Fieser's jellied gasoline called napalm; and an alternative developed by John G. Woodhouse (also of Harvard) from the du Pont incendiary program called the IM-gel (short for isobutylmethacrylate).[36]

It was decided that airborne tests were necessary to assess the bomb's worth, so large scale tests were set up at Jefferson Proving Ground in Indiana from July 11th to the 21st, 1942. For the scientists, this test was also to determine which of the three formulas to use for filling Standard Oil's new bombs. The first airborne test on somewhat appropriately sized and constructed targets was the bombing of

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[33] It's interesting to note that Fieser, in spite of this, refused to accept any moral responsibility for napalm. He is quoted in a January 5th 1968 issue of *Time Magazine* as saying "I have no right to judge the morality of napalm just because I invented it." https://www.chemheritage.org/historical-profile/louis-fieser-and-mary-fieser

[34] Louis F. Fieser. *The Scientific Method.* 14.

[35] Hottel. *Transcript of Interviews.* 22-23; Baxter. *Ibid.* 291-292.

[36] Fieser. *Ibid.* 45-49. The du Pont program is one that I have seen no other references to in conducting this research other than in Fieser and Hottel's first-hand testimony. It is a potential avenue for further research.

condemned buildings including "a deconsecrated Catholic church, some stores, a banker's home, some chicken coops, pig pens, rail fences" among other structures. In these tests, B-52s and Dive Bombers dropped the bombs and the results were judged by a group representing NDRC (including Hottel) and witnessed by three generals and "a great many technical people."

Bitter rivalry was apparent among the groups. In spite of at least one occasion of a dramatic dud during testing at the Jefferson Proving Ground, du Pont's IM-gel incendiary received the highest ranking, with Fieser's Napalm a close second. The IM-gel, however, was subsequently judged inferior due to problems with transport.[37] Standard Oil's "applesauce" was also soon forgotten, and Fieser's napalm became the weapon of choice.

In response to German and English incendiary raids, Standard Oil's Robert Russell said at the time, "the possibilities inherent in incendiary bombing have greatly brightened in recent months. The mass raid has made its first appearance; its practicality as a destructive offense is now clear. Better and better incendiaries are becoming available—though not yet in full production..."[39]

Three factors therefore had led to proceeding with construction of the Japanese Village: 1) a particular incendiary device had been selected and tested; 2) policies had shifted gradually away from reliance on precision bombing; and 3) According to the Office of Scientific Research and Development's book *Chemistry: A History of the Chemistry Components of the National Defense Research Committee 1940-1946*: "Although the Jefferson tests added to the knowledge of functioning of the bombs in an airborne attack, the nonrepresentative character of the target led to some question as to the significance of the results."[40] Therefore, the stage had now been set for "representative tests" and the development of German and Japanese Villages at Dugway Proving Ground.

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[37] Hottel. *Transcript of Interviews.* 23-24; Fieser. *Ibid.* 45-52.
[39] Ronald Schaffer. *Wings of Judgement.* 108.
[40] Stevenson. *Ibid.* 392.

3. DUGWAY PROVING GROUND'S GERMAN-JAPANESE VILLAGE: A HISTORY

Dugway Proving Ground is an excellent representation of how quickly things began to happen in the United States after the attack on Pearl Harbor on December 7th, 1941. On December 8th, 1941, the United States declared war on Japan. On the 3rd of January1942, Major General William N. Porter, the chief of the Army Chemical Warfare Service throughout WWII, sent Major John R. Burns to Salt Lake City to "investigate the possibilities of a testing ground in Utah."[41] Once there, Major Burns met with the Army's district engineer and Chief Quartermaster Elmer Gwyn Thomas and began making plans. This went on for several days. According to his memoirs, when Thomas asked Burns where he wanted the testing site built, he responded "anywhere on the desert."[42]

The desert he was referring to was the Great Salt Lake Desert. When the survey was completed, Major Burns submitted his report to General Porter and by no later than January 14th, 1942, the Chemical Warfare Service requested the 126,720 acres of land Thomas and Major Burns had picked out.[43] On February 6th, 1942, a mere two months after Pearl Harbor, President Franklin D. Roosevelt withdrew an initial 126,720 acres of largely unused land in Tooele County, Utah from the public domain for use by the War Department (Executive Order 9053). By April the President had added an additional 138,180 acres, but the government also purchased land from private owners and the State of Utah during the timeframe.[44] All in all, Dugway Proving Ground, commanded by Major Burns, was officially established on March 1st, 1942, but some sources claim that it was established as early as February 12th, 1942.[45]

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[41] New York Times. *Gen. W.N. Porter, Led Chemical Warfare.* 2/23/1973. 36; Fisher Brophy. *The Chemical Warfare Service: Organizing for War.* 135.
[42] Thomas. *Memoirs.* 50.
[43] Arrington. *Ibid.*
[44] Ouida Blanthorn. *A History of Tooele County.* 263; Dugway Proving Ground, U.S. Army. *History.* http://www.dugway.army.mil/History.aspx; Arrington. *Ibid.* It should be noted that several sources claim Dugway Proving Ground to be over 800,000 acres at this point, but it's unclear what the total at the time was compared to that more modern number.
[45] Brophy. *Ibid;* Historic American Engineering Record, National Park Service. *Written Historical and Descriptive Data: Dugway Proving Ground.* HAER No. UT-35. 15.

The initial construction of Dugway Proving Ground was disrupted by the logistics of putting together such a large operation in such an unforgiving topography. Thomas writes in his memoirs that "the camp was built on sand dunes – after the building [sic] were put up the sand came up to the window sills in spots." Two inches of gravel were spread over 130,000 yards and 300 acres of grass was planted and fenced to try to stop wind erosion. By April 1st, roads were paved and general construction of the army depot had started.[46]

Although there were challenges in the construction of the village, Dugway Proving Ground had been chosen as the site for building representative German and Japanese structures because of frequent days of clear visibility.[47] According to Hottel, another reason (and one that underlines the tensions between scientists and military officials) is Standard Oil's insistence that "generals don't believe what scientists do, they only believe what they can visualize."[48] Yet an even more immediate reason for choosing Utah was that the existing site was isolated; compared to the wide emptiness of Dugway Proving Ground, Edgewood Arsenal in Maryland, the other potential site for the village "offered little room for further development or field testing."[49]

Planning for the full-scale structures began in February, 1943.[50] Between March 12th and 18th, 1943, the Chemical Warfare Service Technical Division contracted Standard Oil to create full-scale representative test structures at Dugway Proving Ground.[51] Then, under the auspices Fieser's Harvard group, Hottel and the NDRC, the Chemical Warfare Service, and Standard Oil, a meeting was set in March, 1943 in Elizabeth, New Jersey to consult leading architects for the construction of full-scale, representative test structures. Among the architects were Eric Mendelsohn (who would design German

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[46] Arrington. 34-36; Thomas. *Ibid.*
[47] Stevenson. *Ibid.* 393.
[48] Hottel. *Transcript of Interviews.* 25.
[49] Historic American Engineering Record. *Written Historical and Descriptive Data.* HAER No. UT-35. 18.
[50] Kerr. *Ibid.* 29. This initial planning stage is also cited in Noyes *History of Chemistry*, p. 392.
[51] Standard Oil Development Company. *Design and Construction of Typical German and Japanese Structures at Dugway Proving Grounds, Utah.* 1-2.

Village) and Antonin Raymond (who would design Japanese Village). As Jean-Louis Cohen writes in *Architecture in Uniform*, "Each of them brought his own specific expertise to bear."

Mendelsohn's correspondence and archives have left no first-hand accounts of his involvement with German-Japanese Village, but from an architectural and historical standpoint (most likely simply because the structures still exist, as opposed to Japanese Village) German Village itself has a much more involved historical foundation.[52] That being said, several biographies of Mendelsohn give absolutely no mention of his wartime involvement. The inverse seems to be true of Antonin Raymond. Although he spoke out about his work at Dugway in his autobiography, little detail or insight specifically about the Japanese Village has been recorded by "official" channels.[53]

In the interwar years, Raymond had designed the Standard Oil Company of New York's headquarters and staff housing in Yokohama. This connection, his long history in Japan, the success of his book *Architectural Details* (which was self-published in Tokyo in 1938 and distributed in the U.S. in 1939), as well as Raymond's subsequent lecture tour across America prior to Pearl Harbor (leading him, perhaps, fatefully, to talk at such think-tank universities like Hottel's MIT, among others), identified him as the most logical choice for the job of architect for development of the Japanese Village at Dugway Proving Ground.[54]

Only 10 days after being contracted to create the German-Japanese Villages, on March 28th, 1943, Standard Oil broke ground on their new construction project.[55] Over $530,000 was allotted for the German-Japanese Village, but actual costs ran over one million dollars. Furthermore, "due to the urgency of the project, the contractor was able to recruit prisoners from Utah jails to work with the

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[52] Jean-Louis Cohen. *Architecture in Uniform*. 232, 239.
[53] According to Kerr in *Flames Over Tokyo* (p. 30), there are other people involved at Dugway with the actual construction and development, and they would be useful starting points for further research: Philip Sawyer, who "laid out Japanese factories" as well as Alfred Gemperle, a "buyer of oriental furniture for a large...importer" and a Hollywood studio called RKO that helped with photography and furniture. Also, according to Dugway Proving Ground's *Fact Sheet* (p. 1) a Russian named Boris Laiming was a contracted expert with a "hobby" of studying fires in Japan.
[54] Kurt G. F. Helfrich and William Whitaker, ed. *Crafting a Modern World: The Architecture and Design of Antonin Raymond and Noemi Raymond*. 47, 53.
[55] Standard Oil Development Company. *Ibid.*

craftsmen." By May 11th, 1943, just 44 days after construction began, both German Village and Japanese Village were completed.[56]

All in all, 12 Japanese double-dwellings (24 tenement style residences) and 6 German apartments were constructed. Most importantly to Standard Oil, interested as they were in proving the value of their M-69 incendiary, an array of different roofing styles were utilized for more comprehensive testing, but beyond that, authentic design, construction methods, materials, and furnishings were also considered. The only thing out of the norm in these test sites were the forty-foot wide fire breaks and fire walls constructed to protect the structures.[57] One could also argue that the only thing truly amiss was the lack of people. The planned use of the site also necessitated the building of a new hilltop water pump system, as well as an observation bunker 450 feet away.[58]

The amount of care and consideration that went into construction and development is staggering. Japanese Village was, according to Standard Oil, designed to "represent typical workers' dwellings in the industrial districts of the larger Japanese cities." Care was made to establish particularly narrow roads between the Japanese structures to better represent the congestion in urban centers of Japan. The percentage of roof-area coverage was modeled after the "large industrial centers": Tokyo, Yokohama, Kyoto, Kobe, Nagoya, and Osaka. These locations, as listed in the Standard Oil report, can be understood as their theoretical targets. More impressively, the "usual American stud-frame type" construction was done away with in favor of the traditional and "complicated keyed or mortised joints" of typical Japanese structures. It is a testament to the surreal underpinnings of this project to imagine prisoners from Utah carefully reconstructing unfamiliar and complicated Japanese architectural styles.

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[56] Dugway Proving Ground. *Historical Testing: German & Japanese Villages.* 1. The cost is also corroborated by Elmer Gwyn Thomas's memoirs (p. 50). The fact about prisoners is repeated in *Dugway Ethnographic Interview #6*, p. 5. Baxter, in *Scientists Against Time*, cites the construction, rather, as taking from March 29th and ending on May 15th 1943, but this does not line up with other sources and Baxter does not cite where this information came from.

[57] Standard Oil Development Company. *Ibid.*

[58] Historic American Engineering Record. *Written Historical and Descriptive Data.* HAER No. UT-92-A. 10.

Authentic *shoji* and *fusuma* screens and panels were also produced. Appropriately comparable and obtainable wood was used and even dried to represent typical moisture content in Japan.

And yet the cultural *sensitivity* of this project did not end there. For the purpose of accurately measuring flammability, furnishing was also used in both the German and Japanese structures. It is also on this factor, perhaps the most surprising of the project, where there tends to be some minor disagreement among those who have mentioned it in their writings. According to the official Standard Oil report: *tansu* (storage chests), *futon* (bedding), *zabuton* (sitting cushions), *hibachi* (stoves/braziers), low tables, radios, and shoe cabinets were furnished. This section of the report, impressively, notes such cultural nuances as shoes storage in the hallways since shoes are not worn in the house in Japan and that *futon* are stored in the closets during the daytime. Additionally, tests were conducted with the *amado* shutters open (in daytime) and closed (at night) to measure the different effects. As a testament to the authenticity and quality of the furnishings, one of the soldiers interviewed later stated that he and his friends stole the *futon* sleeping mats from the Japanese Village for furnishing his own apartment, implying that the furnishings supplied were of higher quality than was generally available to military personnel. The most notable inclusion on the list, however, for reasons we will discuss shortly, is *tatami* (straw floor mats).

Some accounts tend to exaggerate the furniture by claiming that even chopsticks were placed on the tables in the Japanese structures.[60] Given the detail of the recorded descriptions of the furnishings, the suggestion that chopsticks were included is probably hyperbole perpetuated by later accounts. *Tatami* mats were considered vital to the production, and on Standard Oil's insistence (since they, more than any other element of furniture, affected the way bombs penetrated the floors), a factory was set up to produce facsimile mats, and "without military orders and without any evidence" a tremendous surplus

[60] Kerr. *Ibid.* 31.

of *tatami* were "acquired" from Japanese-American homes, temples, stores, and clubs in Hawaii.[61] (The "typical" furnishing of the German structures, in comparison, is somewhat more disturbing in its blunt acceptance of the civilian nature of the project, and figures included in the same report list beds, closets, sofas, dining sets, and even cribs.)[62]

Initial testing began on May 17th, and ended on July 16th, 1943, but additional tests were conducted into 1944 to refine the M-69 into cluster bombs.[63] The structures were destroyed and completely rebuilt at least three or four times.[64] Parts, when applicable, were cannibalized and reused.[65] Reviews of Dugway Proving Grounds efforts by the Military Intelligence Division of Great Britain in late 1943 showed great reservation about adopting the M-69 against Germany, and that more tests would have to be done to prove their worth in the European theater. Regarding using M-69's in Japan, however, the Military Intelligence Division had this to say about Dugway's results:

> *There is no doubt that for attack in Japanese and other Far Eastern targets the M.69 bomb in a satisfactory projectile cluster would be more suitable than the 4-lb. incendiary bomb, and that if attacks on forests or crops from medium or high altitude were again to become requirement this bomb should be at least as effective as anything used hereto.*[66]

Employees around at the time, in interviews conducted much later, state the only high clearance individuals were allowed to watch the actual explosions, but that a greater number of people were allowed to observe the set ups and the aftermath of the incendiary testing.[67]

Planes dropped a variety of bombs, but most notably the M-50 and M-52 thermite-based bombs, as well as the M-69 napalm-based bombs, on the structures. Although attempts were made for high altitude bombing, they proved fruitless and were abandoned in favor of low-altitude testing at

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[61] Hottel. *Transcript of Interviews.* 25; Kerr. *Ibid.* 30.
[62] Standard Oil Development Company. 1-2, 10-14. Figure 12. EM-Assist. *Ethnographic Interview Transcript: Interviewee #8.* 14. In spite of the care to detail on the structures, it's interesting to note the strange transliterations of Japanese city names used by Standard Oil: "Tokio" and "Yokohomo" to name a few, though admittedly these might be more representative of concurrent understandings rather than carelessness. Otherwise the transliteration is mostly accurate.
[63] Popple. *Ibid.* 129; Dower, John. *Cultures of War.* 176.
[64] Mike Davis. *Dead Cities and Other Tales.* 67; Patrick R. Eckman. *Dugway Mystery Depot to Continue Test Work.*
[65] EM-Assist. *Ethnographic Interview Transcript: Interviewee #6.* 4.
[66] Military Intelligence Division, Great Britain. *Dropping Trials of Incendiary Bombs Against Representative Structures at Dugway, U.S.A.* 2.
[67] EM-Assist. *Ethnographic Interview Transcript: Interviewee #4.* 6.

approximately 5,000 feet.[68] Additionally, some tests were not conducted by plane but dropped by tall scaffolding and utility poles, as one employee recalled.[69] Compared to other sites running tests on simulated structures, Dugway had a slightly different approach that skewed their results when compared with other groups.

According to another British Intelligence report, at Dugway, the emphasis was on the speed in which fires could be extinguished; at the other sites emphasis was placed on how well fires could be started. In other words, at Dugway, "hits" were almost guaranteed, but elsewhere the landing of the incendiary was not definite.[70] Results were categorized in three ways: "any fire beyond control of the well-trained and properly equipped fire guards in 6 minutes was classified an A fire; a fire which was ultimately destructive if unattended was a B fire; and a fire judged nondestructive was a C fire." The M-69 produced 37% A fires in German structures and 68% in the Japanese structures (in both cases, the other bombs produced *no* A fires), and was judged overall to be the best. As a result, plans for using the bomb on Japan were drawn up by the Air Force as early as the fall of 1943.[71] Tables 1, 2, and 3 summarize comparative data from the UK and US testing.

Table 1 - 1943 Comparative data reproduced from British Intelligence: Tests where incendiaries landed indoors.

Site	No. of Tests	"A" Fires	"B" Fires	Total "A" + "B"	Percentage of "A" Fires	Percentage of "B" Fires
B.R.S. (Static Tests)	12	0	3	3	0	25
Edgewood (Static Tests)	12	6	3	9	50	25
Dugway (Static Tests)	35	29	6	35	83	17
Dugway (Dropping Tests)	27	23	2	25	85	7

[68] Hottel. *Transcript of Interviews.* 27.
[69] EM-Assist. *Ethnographic Interview Transcript: Interviewee #4.* 5, 7.
[70] H. M. Llewellyn. Military Intelligence Division, Great Britain. *Comparison of the Japanese Targets and Test Results at the Building Research Station, Edgewood Arsenal and Dugway Proving Ground.* 2. These other test sites, including that at Eglin Air Force Base and Japanese structures alluded to at Tondu, Glamorgan, are good places for this research to potentially continue.
[71] Stevenson. *Ibid.* 393-394.

Table 2 - 1943 Comparative data reproduced from British Intelligence: Tests where incendiaries landed near furniture[72]

Site	No. of Tests	"A" Fires	"B" Fires	Total "A" + "B"	Percentage of "A" Fires	Percentage of "B" Fires
B.R.S. (Static Tests)	4	0	2	2	0	50
Edgewood (Static Tests)	9	6	3	9	67	33
Dugway (Static Tests)	14	10	4	14	71	29
Dugway (Dropping Tests)	18	16	2	18	89	11

Table 3 - 1943 Test Results at Dugway – Hits Recorded on Representative Structures[73]

Fire Class	Japanese Houses			German Houses		
	M-50	M-52	M-69	M-50	M-52	M-69
A	22%	26%	68%	0%	0%	37%
B	20%	14%	13%	26%	18%	16%
C	58%	60%	19%	74%	82%	47%

At a Fire Research Conference in 1983, Hottel gave a historical account of how a large portion of Japanese village met its untimely demise at the hand of a surveyor who waited too long to give the signal for extinguishment. It is unclear, but at a later timeframe a large portion of German-Japanese Village burned completely down, consuming the Japanese Village in its entirety. The only remnants of Japanese Village are a few charred but repurposed rafter beams in the two German Village structures left standing today.[74] Workers at the time said now there's "nothing there other than some…scraps." Judging by these ethnographic interviews (taking into account the possibility for error in memory), it seems to be clear that Japanese Village existed until at least 1950, but was gone by 1952, and that when it did burn down "it burned down so fast and so hot that…they couldn't contain it."[75]

4. THE RAMIFICATIONS OF GERMAN-JAPANESE VILLAGE

The developments made and verified at Dugway Proving Ground's German and Japanese Village sites had sweeping ramifications throughout the war. Before the testing had even finished in late

[72] Llewellyn. *Ibid.*
[73] Kerr. *Ibid.* 32.
[74] Hoyt C. Hottel. *Stimulation of Fire Research in the United States After 1940 (A Historical Account).* 4; Dugway Proving Ground. *Ibid.* 2.
[75] EM-Assist. *Ethnographic Interview Transcript: Interviewee #2.* 4; *Interview Transcript: Interviewee #6.* 3. *Interview Transcript: Interviewee #4.* 7.

1943, the NDRC is quoted as writing "it might be worthwhile getting some thought started along these lines in General Staff circles in advance of the tests [at Dugway], so that quicker action can be taken if the tests give confirmation to the fire-raising possibilities."[76] By November requirements had been "revised sharply upward" for incendiary production.[77] And "by the end of the war" as James Baxter writes in *Scientists Against Time*, "approximately 30,000,000 M-69 bombs had been produced." In March, 1944, 20 tons of M-69 bombs were dropped on Japanese-occupied Ponape (Pohnpei) Island, but it wasn't until December 13th or 22nd, 1944 that the first M-69 was dropped on Japan in Nagoya. On December 18th, 1944, however, 511 tons of M-69 bombs were used in China at Hankow (modern Wuhan) under the explicit directions of General LeMay (who at the time was in charge of air operations in China and India). LeMay, as quoted in Robert Neer's excellent work *Napalm, An American Biography*, said "everything which was hit burned like crazy. And I think there was a vast similarity to the type of construction in Japan."[78] After taking over air operations for Japan, but before the most major and historically evident incendiary air raids on Tokyo on March 9-10, 1945, LeMay had already dropped over 600 tons of incendiary devices on Japan.[79]

M-47s were also included in the March 9-10th Tokyo firebombing, but these were meant to be the initial bombs that marked targets for the majority of B-29s hauling their immense loads of M-69s. As was demonstrated definitively at Dugway, planes flew in the night at altitudes between five and ten thousand feet, and dropped M-69 incendiary bombs for maximum impact.[80]

LeMay might be the person in the chain of command who definitively put these concepts to use, but it seems doubtful that Dugway Proving Ground's tests at German and Japanese Village did not impact his ostensibly "innovative" decisions. The connection is unavoidable. Two-thousand tons of

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[76] Kerr. *Ibid.* 25.
[77] Sherry. *Ibid.* 228.
[78] LeMay, quoted in Robert Neer. *Napalm.* 165-166. Baxter. *Ibid.* 293. Kerr. *Ibid.* Appendix B and D.
[79] Schaffer. *Ibid.* 124-125.
[80] Kerr. *Ibid.* 157-158.

predominantly M-69 bombs were dropped in the infamous March 9-10 Tokyo air raid. The flames were said to be visible over 150 miles away, almost 16 square miles (or 267,000 buildings) had been razed, and even the most conservative estimates put casualties at over 83,000. "The violence of the firestorm...on Japan," as John Dower writes in *Cultures of War*, "was not replicated until Hiroshima five months later."[81] All in all, between December 13th, 1944 and August 14th, 1956, over 100,000 tons of incendiaries were dropped on Japan on over 40 different dates by the 20th and 21st Bomber Commands, predominantly on urban areas.[82]

Patrick Eckman, a newspaper reporter in Salt Lake City, was the first allowed in to see and report on the German-Japanese Village project. Coincidentally enough, his article was published on the same day as the Tokyo firebombing: March 10th, 1945. In his article, titled *Dugway Mystery Depot to Continue Test Work*, he refers to the German housing, not as German but as Nazi Villages, and he details the supreme secrecy of the project: those stationed at Dugway were not allowed to write home, he says, and even the highest ranking officers needed special clearance to visit the construction site.

Instead of architects, Eckman refers to "private construction engineers" who spent years "in the enemy territories" but "managed to return to the United States before the outbreak of war," and instead of Japanese apartments, he refers to the "pagoda-type" structures. Compared to the M-69, which Eckman acknowledges as the most effective incendiary developed at Dugway, he says the fiercest competition was "the B-74, whose phosphorous content provoked a cry of 'inhumanity' from the Japanese." The test site, unlike its enemy counterpoint, is, here, painted as something glorious, which "rise[s] invincibly from its own ashes like the famous fabulous phoenix—a feat which its prototypes could not duplicate."[83]

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[81] Dower. *Ibid.* 179-182.
[82] Frank. *Downfall.* Appendix B; Kerr. *Ibid.* Appendix B and D.
[83] Eckman. *Ibid.*

It is hard to surmise what we are supposed to make of these comments. Are we to understand that, to Eckman, the M-69 is somehow more merciful than the B-74, which prompted such cries of inhumanity? And are we then, also, to understand Dugway's German-Japanese Village as something "invincible," "famous," "glorious," and "fabulous," unlike the houses bombed in Japan? These incongruous conclusions are common in attempts at understanding the Japanese Village.

In spite of the dispassionate tone of the testing, the surreal and emotional nature of the German-Japanese Village project was not lost on everyone. Raymond said of the construction: "It certainly was not an easy task for me and my wife to be instrumental in devising means of defeating Japan. In spite of my love for Japan, I came to the conclusion that the quickest way to terminate this war was to defeat Germany and Japan as quickly and as effectively as possible." Yet Raymond admits in his autobiography to looking down his nose at the lack of cultural understanding in the contemporaneous British designs meant to simulate Japanese dwellings for weapon testing, saying "I immediately saw that the designer had never been to Japan."[84] Professor Ken Oshima of the University of Washington writes about Raymond in his dissertation *Constructed Natures of Modern Architecture in Japan*, and here, too, the architect is a tragic and conflicted figure who could not escape the gravitational pull of the war.[85] Indeed, some texts about Raymond go so far as to see the experience as somehow artistically transformative.[86]

Encountering difficulty in getting to Japan immediately after the war, Raymond contacted General MacArthur directly "telling him I would like to return to Japan and help in my capacity as an architect-engineer. Amazingly, Raymond received a direct reply urging him to come posthaste to help with civil engineering projects. It is interesting to note that, in an ironic twist, of the centers he had helped create for the Standard Oil Company in Yokohama, "there was nothing left but twisted steel and

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[84] Antonin Raymond. *An Autobiography*. 188-189.
[85] Ken Oshima. *Constructed Natures of Modern Architecture in Japan*. 401.
[86] Helfrich. *Ibid*. 55.

broken concrete." Soon after he personally received sanctioning from General MacArthur for rapid development of industrial projects in order to rebuild Japan.[87]

Workers who encountered Japanese Village, when asked to describe any unique experiences at the site, said "well, I guess being an American, the whole thing was strange."[88] Employees called it "a rather unique place" and "spooky," and described the various ways, after WWII, that the structures had been reused: as an artillery range, machinery storage, a pigeon roost (for testing nerve gas), mannequin storage, and even as a small-scale laboratory. Some of the only tangible history remaining of those involved with German and Japanese Village are in the form of graffiti in the observation bunker outside of the testing site, and carved into the concrete where the water tower used to be. Some who had been there, less impressed, described Japanese Village as "some wooden structure, is all it was," but several indicated that they didn't feel the same now as they did then about their time at Dugway.[89]

Undoubtedly the most colorful (and perhaps slightly exaggerated) account of the events at Dugway Proving Ground come in the form of Jack Couffer's (autobiographical) book *Bat Bomb: World War II's Other Secret Weapon*.[90] Couffer, who served in the army in 1943, recounts the strange story of the development of a bat-based incendiary device (also tested at Dugway), but, most importantly for the purpose of this research, he describes German and Japanese Village, as well as its emotional impact on him, in detail. As, perhaps, one of the most involved and descriptive accounts, I have reproduced one of Couffer's passages on German and Japanese village here (almost) in its entirety:

> *Far out in a remote area of the Proving Ground two remarkable installations had been constructed, simulated Japanese and German villages. These unpeopled towns were built of the materials, in the architecture, and in the layout house to house in the most authentic way possible. ... The sterile towns stood several miles apart on the otherwise empty Utah plain, like abandoned movie sets picturing the aftermath of a devastating plague. Dust-devils swirled through the powdery lanes, curling high into the blue sky, and tumbleweeds rolled past the empty doors—as*

[87] Raymond. *Ibid.* 198, 206-207.
[88] EM-Assist. *Ethnographic Interview Transcript: Interviewee #3.* 5.
[89] EM-Assist. *Ethnographic Interview Transcript: Interviewee #6.* 6-8; *Transcript: Interviewee #4.* 6, 13; *Transcript: Interviewee #3.* 2-3. *Transcript: Interviewee #2.* 6.
[90] Also well beyond the scope of this paper: plans, officially endorsed by President Roosevelt, were drawn up to develop a weapon that used small bats as incendiary-carrying devices.

if the art director had made a mistake and built an old western ghost town with the wrong kind of houses…

Casting aside that mental picture it was easy to imagine without emotional involvement the torching of this sterile village, which resembled nothing so much as a museum model in full scale. But when again I saw in my mind's eye the town as it really would be, my flesh crawled. I was very glad I was seeing it in this way, without people. I could watch our little incendiaries do their dirty work without hearing the screams, the cries of pain, the yells of hysteria, the clanging of the fire carts, the roar of burning paper and wood, the sobs of mothers and fathers and sons and daughters.[91]

Nonetheless, Couffer's emotional recounting brings us to a brief discussion of Dugway and German-Japanese Village's place in memory and culture. Couffer's somewhat theatrical metaphor is not entirely misplaced, here, because Hollywood prop developers were contracted for the furnishings of the projects.[92] Perhaps this extended notion of theatricality (and therefore a potentially less intense emotional association to the work) helped workers and scientists to rationalize their actions.

The secrecy and surreal nature of the German and Japanese Village projects at Dugway Proving Ground doubtless have contributed to Dugway's strange place within a limited cultural consciousness. As evidenced by a 2013 work of fiction called *The Gods of Heavenly Punishment* which tells the story of Anton Reynolds [sic] and his conflicted architectural work on Japanese Village, the dramatic nature of this history seems to point to Dugway as occupying some unique space in understanding. Other contemporaneous projects at Dugway included those developing the bat bomb, testing nerve gas, and creating flamethrowers (among others).

German and Japanese Villages are, perhaps, not at the center of things at Dugway in general (certainly not any more), but I believe they are a multicultural origin point of sorts that served to compound this imagining. Searches for Dugway Proving Ground on the internet yield numerous videos and reports riddled with theories that treat Dugway as a conspiratorial equivalent to Area 51. In modern

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[91] Jack Couffer. *Bat Bomb.* 208-209.

[92] Historic American Engineering Record, National Park Service. *Written Historical and Descriptive Data: Dugway Proving Ground.* HAER No. UT-92-A. 9.

times, anthrax scares, failed crashing space satellites, mass, unexplained livestock death, some of the world's largest non-nuclear explosion testing has exacerbated this popular (mis)understanding.[93]

5. CONCLUSIONS

In terms of popular understanding of war in the Pacific and the end of WWII, I believe Dugway has a substantial place in history. The many factors, organizations, people, agendas, and developments contributing to the efforts make Japanese Village an undeniably important multicultural nexus point in WWII history. In many narratives it seems that an imaginary clock starts ticking on March 9th, 1945 with LeMay's firebombing of Tokyo and and then abruptly and forever stops five months later with the bombing of Hiroshima.[94] However, I think we can now more accurately set that clock's starting point back several years, at least to early 1943 when testing at Japanese Village began. Similarly, the commonly held notion of LeMay's great "innovations" might be recast and shown to have originated at Dugway years before the general took over for Hansell in commanding the air force in Japan.

As a result of German-Japanese Village's relatively obscure orientation within the larger narratives at work, overshadowed by orthodox understandings of the atomic bomb and discussions of how WWII ended, as well as Dugway Proving Ground's odd status within popular and cultural understanding, the vibrant history of Japanese Village seems to have continually faded over time. And yet Japanese Village was an undertaking that represents a number of important historical and cultural attributes. At the most fundamental level, it marks the moment in history when American policy shifts away from precision bombing and focuses on development of major incendiary weaponry. But that

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[93] Jared Preusz. FOX13 News. *Mislabeled Vial of Nerve Agent Responsible for Dugway Lockdown* http://www.fox13now.com/news/local/kstu-dugway-lockdown,0,4633684.story; Brown, Matthew. Deseret News: April 7, 2006. *Dugway Takes Steps to Improve its Image;* MSNBC Staff. *Genesis Space Capsule Crashes. http://www.nbcnews.com/id/5942268/ns/technology_and_science-space/t/genesis-space-capsule-crashes/#.WgkAlxOPKL4;* Davidson, Lee. Deseret News: April 9. 1995. *What Inspired Dugway N-Test Stories?*

[94] Stewart Halsey Ross. *Strategic Bombing by the United States in World War II.* 6.

aspect of the Japanese Village is only one dimension of the project's significance. Just as the tests at Dugway Proving Ground represent the sum total of what America understood about incendiary weaponry, it also represented our cultural understandings (or misunderstandings) of Japan in 1943.

The paradoxical nature of such impressive cultural sensitivities, juxtaposed with such blatant and unwavering approaches to civilian bombing—rationalized, perhaps, by an overarching feeling of surreal theatricality—warrant serious further research. Today, in spite of several attempts to add German Village to the National Register of Historic Places, the applications have been rejected and, consequent to a lack of funds, have allowed the site and the few remaining artifacts to deteriorate and to remain inaccessible.[95]

With the limited available documentation and the physical record of the Japanese Village gone forever, the curtain seems to have already fallen, as it were, in the remote recesses of the Utah Desert. Perhaps it is appropriate that the project's history and symbolism is now left to the researchers who—working in the shadows of the extensive histories of Hiroshima and Nagasaki—seek to recreate the complete story that captures and memorializes a strategic—but little examined—moment in the history shared by the US and Japan.

6. BIBLIOGRAPHIC ESSAY

As stated in the introduction, there is no direct history of Japanese Village. At one point an effort was made to create an "interactive experience" of German Village, but those conducting the research, it seems, had little luck in successfully gathering information or contacting those with first-hand experience.[96] Instead there is an interwoven network of different histories that all converge, at one point or another (usually in minor ways) with the project. As such, in the course of this paper I have attempted

[95] Lee Davidson. Deseret News: April 7, 2006. *'German Village' May Soon Crumble.*
[96] EM-Assist. *Ethnographic Interview Transcript: Interviewee #6.* 9.

to note those places where a perspective is missing, but I would like to make plain that I am positive that there is more to this story than I have compiled to date.

The most limited element of the research is that which directly pertains to Japanese Village between roughly the years 1943 and 1945. There are several companies that were in one way or another "in charge" of the project. The company hired to generally oversee the development of German-Japanese Village, Standard Oil Development Company (New Jersey), can be said to have produced the primary sources available. Most notably, after the first few rounds of testing, Standard Oil produced an article in 1943 for the Technical Division of the Chemical Warfare Service called *Design and Construction of Typical German and Japanese Test Structures At Dugway Proving Grounds, Utah*. This is the only document created by Standard Oil I have been able to identify so far that directly reports their work on Japanese Village in Utah. Standard Oil made another highly technical report in that time period, *Penetration and Performance Tests of Small Incendiary Bombs in a Typical Central German Structure* (produced not for the Chemical Warfare Service but the Office of Scientific Research and Development, 1945), but this report is not so useful to this particular research except to note that no such similarly detailed documentation has been uncovered for or about Japanese Village. Nonetheless, this discrepancy brings up a necessary point: It's important to recognize that Japanese Village's history is inextricably linked to that of German Village. One history cannot truly exist without the other.

At the same time, another indirect contributor to the history comes from the UK. The Military Intelligence Division in Great Britain also produced concurrent and comparative documentation of the tests regarding Japanese Village in Utah such as *Dropping Trials of Incendiary Bombs Against Representative Structures at Dugway, U.S.A.* in 1943, and *Comparison of the Japanese Targets and Tests Results at the Building Research Station, Edgewood Arsenal and Dugway Proving Ground,* in 1945.

Historical and eyewitness accounts of personnel, employees, organizations, businesses, scientists, architects, elements of the army and air force, as well as the historians concerned with understanding these groups, form the second wave of sources used. These include ethnographic interviews of employees at Dugway Proving Ground, as well as historical and descriptive histories of German-Japanese Village produced for the National Park Service by the Historic American Engineering Record (HAER) to petition German Village for conservation within the National Register of Historic Places.[97] The last set of sources encompasses discussions of broader historical elements that do not necessarily reference Dugway's German-Japanese Village project directly but are nonetheless relevant in connection with Dugway's weapon-development or the inescapable cultural, popular, ideological, and moral elements present in any discussion of this topic.

Inspired by a mention of the Japanese Village by Professor Kenneth Pyle at a graduate seminar on Hiroshima and Nagasaki at the University of Washington, I came to find the HAER reports available through the Library of Congress. From there, I began my research in earnest by reaching out to Dugway Proving Ground, as well as Florida's Eglin Air Force Base.[98] Dugway Proving Ground archivists supplied copies of fact sheets about German-Japanese Village and the transcripts of eight ethnographic interviews done with employees. The archivists at Dugway pointed me towards the Utah Historical Society, a group that was able to provide the memoirs of the district Army Engineer's efforts, as well as an article in the *Utah Historical Quarterly* pertaining to Dugway's incendiary development projects.

Further research endeavors were undertaken with help from a variety of sources:

- The National Archives
- KSL Broadcasting in Salt Lake City, Utah,
- University of Washington's Professor Ken Oshima,
- The Chemical Heritage Foundation,
- The Franklin D. Roosevelt Presidential Library,
- The Air Force Historical Research Agency,

[97] In at least two instances over the years HAER has filed Historical and Descriptive documents regarding these structures, but German Village, in a state of disrepair, has not been (and in all likelihood probably will not be) put on that list.
[98] Eglin, an Air Force base in Florida, conducted similar tests but its efforts are beyond the scope of this research.

- The U.S. Army Center of Military History.

Oftentimes requests for information ineffectually bounced from one source to another. Overall, Professor Ken Oshima, the National Archives, Dugway Proving Ground's Technical Information Center, and the Utah Historical Society proved most helpful in tracking down pertinent sources and accommodating my persistent and nagging inquiries about this subject matter.

Following the diverse trails suggested by this array of sources led me to pursue other resources. E. Bartlett Kerr's *Flames Over Tokyo: The U.S. Army Air Forces' Incendiary Campaign Against Japan* is perhaps the most thorough and important historical work pertaining to this subject. A volume in The Office of Scientific Research and Development series *Science in World War II,* edited by W.A. Noyes, called *A History of the Chemistry Components of the National Defense Research Committee 1940-1946,* and the official histories published by the U.S. Army: *The Technical Services* series, such as *The Chemical Warfare Service: Organizing for War* were both invaluable.

In addition to these sources, a series of texts formed the vital core of my research. Antonin Raymond's *Autobiography*; the interviews with Hoyt C. Hottel conducted by the Chemical Heritage Foundation Oral History Project; Michael S. Sherry's *The Rise of American Air Power: The Creation of Armageddon;* Ronald Schaffer's *Wings of Judgment: American Bombing in World War II;* Louis F. Fieser's work *The Scientific Method: A Personal Account of Unusual Projects in War and Peace*; John Dower's *Cultures of War*; and Robert M. Neer's incredibly thorough dissertation entitled *Napalm, an American Biography.*

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