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2022-09-15 the nevada national security site pt 3

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I said up front that the NNSS remains in use for several different purposes, although the level of activity today is not nearly as high as it once was. To my best ability to remember the numbers, I think we were told that during the period of active testing the staff compliment was about 13,000. Today there are about 8,000 personnel that work at the site, between the various contractors and subcontractors. This is as good a time as any to elaborate a bit on the organizational structure of the NNSS.

One of the interesting things about the nuclear weapons complex is the extremely high level of at least semi-privatization. While the NNSA is either the largest or second largest component of the Department of Energy by budget (it depends a bit on exactly how you break down the DoEs various buckets of funding), it makes up well less than a quarter of the DoE staff. This enigma results from contracting: considered as the NNSA, the nuclear weapons complex is more than 50,000 people. Only about 2,500 are federal employees. The rest are employees of a dizzying network of contractors that range from well-known defense entities (Lockheed-Martin) to the small and surprising (San Ildefonso Services, a fully owned enterprise of the sovereign government of the Pueblo of San Ildefonso, comprising about 600 enrolled members and northwest of Santa Fe).

Very few people civilians involved in nuclear weapons are actually federal employees, and theyre limited mostly to the NNSA offices that exist to coordinate and supervise these many contracts.

This staffing analysis admittedly excludes the sizable military component of the nuclear weapons program, as each military branch has an organization dedicated to the handling and deployment of nuclear weapons as well as the personnel in the field that are actually responsible for it. For historic reasons rooted in the genesis of the Manhattan Project, though, nuclear weapons are viewed as being more a civilian matter than a military one. Although the separation has decayed over decades, it has always been the gist of the situation that the Department of Energy owns nuclear weapons, and the military is allowed to borrow them. The military, of course, has its own extensive contracting operation, and many military organizations related to nuclear weapons are extensively staffed by contractor employees.

While privatization of defense functions is mostly a newer trend, it is deeply rooted in the world of nuclear weapons. Since the very beginning, the Manhattan Project relied heavily on the work of various outside organizations, first among them universities. A substantial portion of the Manhattan Project, including most of the operations at Los Alamos, were actually performed by the University of California.

Los Alamos Scientific Laboratory and later Los Alamos National Laboratory continued to be managed as a subsidiary of UC until 2005 when both UC and DoE initiated a series of changes that saw LANL transferred to Triad National Security. UC remains one third of Triad, along with the Battelle Institute (a nonprofit heavily involved in federal research and development) and Texas A&M.

Sandia National Laboratories, originally a division of LANL and thus UC, was transferred to Western Electric in 1949 and remained a concern of AT&T and Bell Laboratories until until 1993, when it was transferred to Lockheed-Martin. AT&Ts involvement in nuclear weapons is not limited to telecom or even communications R&D; AT&T was in fact a major component of the weapons enterprise for decades. Today, Sandia is operated by Honeywell, as are several other components including the Kansas City National Security Campus.

The split between LANL, operated by universities, and Sandia, operated by engineering organizations, reflects the history and culture of the laboratories. While both conduct extensive basic research and there is plenty of overlap in functions, the broad division is that LANL is responsible for the design of the nuclear device itself (an issue at the cutting edge of physics) while Sandia is responsible for a way to deliver downrange (a matter of ballistics and mechanical engineering). Even the locations reflect this divide: LANL hidden high on a mesa, and Sandia in the desert scrub of a ballistics research range dating back to World War One and the New Mexico School of Mines (my alma mater, under its present name of New Mexico Tech) work on proximity fuzes.

These early examples of full-service federal contracting were major precedents in the creation of the GOCO or Government Owned, Contractor Operated model. While nuclear weapons facilities are *owned* by the federal government, they are almost all *operated* by either a private company or a public institution (or perhaps a coalition of some combination of the two). The operator, often called an Operations and Maintenance or O&M contractor, is paid a management fee to perform this function. A related concept is that of the FFRDC or Federally Funded Research and Development Center, an umbrella category that was created to somewhat standardize the legal nature of nuclear weapons laboratories as well as several other government-owned R&D organizations such as the DoDs Aerospace Corporation and Rand Corporation.

While FFRDCs are not necessarily related to nuclear weapons (some having been born entirely in the military or department of commerce), a large portion of them and most of the larger FFRDCs fall under the auspices of some component of the Department of Energy. Most of the DoE FFRDCs, arguably all, are either historically or currently involved in nuclear weapons. Only three, Sandia, Los Alamos, and Lawrence Livermore are directly considered nuclear weapons laboratories (these are sometimes referred to as the tri-labs). Nuclear weapons as a broad state function have many aspects beyond the design and testing of weapons, though. Savannah River National Laboratory, for example, located at the site of a former uranium refinery in Tennessee, is primarily involved in researching environmental remediation and hazmat handling methods. Expressed as a quip, Savannah River National Laboratories exists to try to find a way to clean itself up.

This is all a long preamble to explain that there are a *lot* of distinct organizations involved in nuclear weapons and it can be difficult to keep track of them. Names like EG&G, SAIC, and UC ought to be as closely connected to nuclear war as the Manhattan Project.

In the case of the NNSS, the name to know is Mission Support and Test Services or MSTS

LLC. MSTS is a coalition of Honeywell, Jacobs Engineering (builder of nuclear reactors), and Stoller Newport News Nuclear (builder of aircraft carriers). More subcontractors than can be easily listed perform various functions on the behalf of MSTS, including the amusingly named Securing Our Country which provides the private paramilitary security force at several nuclear weapons sites. Apparently embarassed at the somewhat cringy name, they now tend to insist that its SOC and it doesnt stand for anything.

The NNSS staff today is made up of the employees of all of these contractors, and most of the staff are involved in maintenance and cleanup activities. This is a common theme in the world of nuclear weapons: managing the legacy of environmental contamination and hazardous waste is just as big of a job as, and sometimes bigger than, actually designing and building weapons. Even maintaining roads becomes a substantial operation at the scale of the NNSS.

Two major facilities at the NNSS speak to this point. The Radioactive Waste Management Facility, which was pointed out to us in the distance, receives low-level mixed waste from other DoE and DoD sites that needs to be removed and disposed of elsewhere (instead of being permanently disposed of on-site, which is typically the preferred option to avoid the political controversy around transporting nuclear waste). This type of waste is made up basically of the contents of trash cans in laboratories that handle nuclear materials. Gloves, aprons, instrumental apparatus, storage containers, etc that were exposed to nuclear material and thus remain slightly radioactive due mostly to particulate contamination. There are even building materials from demolition of contaminated labs, animal carcasses from medical testing, and low-level radiation sources removed from medical equipment.

This waste is inspected, packaged, and then buried in a series of shallow trenches engineered to prevent any leakage or wind dispersion. Ongoing monitoring will be performed, essentially into perpetuity, to ensure that the containment mechanisms are effective. The RWMF benefits greatly from its remote, arid location: it is far above the water table and far away from populated areas, granting a significant safety margin.

It also benefits from its location well inside of a secured federal reservation. The RWMF is able to accept classified waste, such as components of classified designs, for burial. This capability is uncommon enough that NNSS is the final resting place of some classified objects that are not radioactive or hazardous at all, simply impractical to destroy. I have previously mentioned on this blog that the NSA lists permanent burial as an acceptable method of destruction of classified matter. Here it is, out in the Nevada desert.

Elsewhere in the NNSS, some low-level waste has been buried inside of the subsidence craters resulting from underground tests. This method is convenient and permitted for certain types of lower risk waste, much of it brought in from the nearby Tonopah Test Range. As in most federal facilities, disposal of hazardous materials is restricted by state law, and so all of these waste handling activities are conducted under permits from the Nevada Division of Environmental Protection. The state and federal governments coordinate a variety of precautions and restrictions on the transportation and handling of waste, which include a prohibition of transportation of waste on certain busy freeways and highways and selection of routes based on weather conditions.

As part of its efforts to mitigate transportation risk, the NNSS grants substantial funding to nearby fire and emergency management departments to support their general

operations and specifically radiological response capabilities.

This is not to say that NNSS activities today are all about cleanup. Another facility pointed out to us in passing, near the U1a complex, is the Device Assembly Facility. The DAF was constructed as a new consolidated building for the safe handling of nuclear weapons components, including both nuclear material and high explosives. It consists of a series of isolated underground cells, each designed for the safe containment of a huge explosion. These are accessed by a fortress-like concrete portal cut into the ground, flanked by guard towers and surrounded by multiple layers of fencing and intrusion detection. Because it can contain a substantial quantity of special nuclear material (in other words, weapons-grade plutonium and uranium), the DAF is likely the most security-sensitive facility on the site and is guarded 24/7 by a paramilitary force and numerous technical security measures.

The disconnect between public perception of security at defense facilities and the actual reality can be stupifyingly large. Media depictions give many the idea that a typical military installation is defended by laser perimeters, dog patrols, and a heavily armed response force. Of course, most military installations are actually protected by nineteen-year-old enlistees running more on Red Bull than tactical training, and response to even the most obvious security violations is more likely to take 30 minutes than 30 seconds.

The weapons complex tends to run on the more secure end of government operations, but as a group of nuns memorably demonstrated even some of the most sensitive nuclear sites are vulnerable to wirecutters and determination. The NNSS, like many military and weapons installations, both benefits and suffers from its immense size. Hard perimeter security of over 1,000 square miles simply isnt practical, and a daring person could probably walk right into the NNSS and remain unnoticed for quite some time. There may not even be a fence for much of the perimeter. Harder protective measures are found at individual security-sensitive sites. On the upside, the many miles of barren desert between actual facilities and the perimeter make it very difficult to escape undetected after triggering any sort of alarm.

Still, the DoE faces the same budget pressure as the military, and security measures have certainly decreased since the days of the Manhattan project. Los Alamos personnel in the 1940s were trained on a badge challenge procedure: when a guard trained a gun on them, they would set their ID on the ground, turn the other direction, and walk ten paces to wait until instructed otherwise. Although I hear this has changed in recent years, when I was in Los Alamos they were indecisive on whether or not it was worthwhile (or perhaps more truthfully, within their budget) to check badges in person at all. Throughout the weapons complex there are many visible remnants of security measures that once were, replaced by dwindling patrol forces that, admittedly, remain very well-trainedparticularly by the lax standards of US law enforcement.

This came to my mind contemplating the guard towers of the DAF, some of the only guard towers that can be found anywhere in a nuclear weapons installation. In my career I have worked in one environment that I would call extremely secure. It was not a weapons or military installation. It was a Federal Reserve Bank. In employee orientation, a sergeant of the Federal Reserve Police told us proudly that there has never been a successful heist on the Fed, although its been depicted fictionally several times in films. 82-year-old Megan Rice got to the Y-12 enriched uranium storage complex to commit principled vandalism... by her description and the admission of Y-12 security forces, basically by walking right in.

After the end of testing, with device assembly no longer a major activity, the DAF was converted to the National Criticality Experiments Research Center operated by LANL. Here, researchers directly handle complete nuclear weapon pits and other quantities and forms of special nuclear material that are capable of prompt criticality. The DAF serves not only to protect these materials from theft but, perhaps more importantly, to protect the outside world from the effects of a criticality accident.

On the matter of response times, as we drove through the complex we passed by another fire station. Our guide explained that the NNSS fire department had a target of a 30-minute fire or medical response to any part of the range that was in use. While the two stations put most of the NNSS within 30 minutes, when the Pahute Mesa, in the far northwest of the NNSS, is in use its necessary to stage an ambulance and fire engine at the midway point between the second station and the mesa, about 30 minutes from each. Despite the seeming danger of the NNSS, most of the fire departments time, he said, was spent on mutual aid to the rural departments around the area. There are a lot of one-ambulance towns in Nye County, and the NNSSs EMTs regularly meet up with those ambulances to take their patients into Las Vegas, allowing the rural ambulances to return to duty a couple hours sooner.

As with most nuclear installations, the NNSS has an on-site medical clinic which is both equipped to handle radiological emergencies and a great convenience to the staff. NNSS is one of the DoE sites which enthusiastically holds a VPP Star, a distinction awarded by OSHA for effective implementation of a Voluntary Protection Program. VPPs are occupational safety programs that go beyond the legal requirements, and to hold a VPP Star an employer must maintain below-average injury and illness rates. Some nuclear sites such as LANL have developed something of a reputation for a troubled safety culture, but others excel in implementing their safety programs. Surprisingly, working with nuclear weapons can be one of the safest career options many craftspeople can take.

Leaving the underground testing area, our coach briefly descended into the subsidence crater left from an underground test, the driver somewhat nervously navigating the steep road rutted by recent rainstorms. The odd thing about underground testing is just how underwhelming ground zero is. While the crater was about as deep as our coach was tall, perhaps 12-15 feet, it was only about a thousand feet across, and the bottom much smaller. At the center, a wide, rusted metal column jutted out of the ground at an odd angle, cut-off cables hanging out the top and birds nesting in an aperture in the side. This was the top of the casing of the shaft, and the only direct indication of the actual nuclear device.

Parked for a moment at the bottom of the crater, I contemplated how we were ourselves displaced downwards as a latent effect of a nuclear explosion. We tend to imagine the result of nuclear weapons in terms of Hiroshima and Nagasaki, but in the world of industrialized testing that same power is neatly managed and contained. Even the radiation effects are quite minimal. Near the center of the crater was a ring of fencing with radiation hazard signs. Our guide explained that the radiation in the crater had never measured significantly higher than background, but as part of a groundwater monitoring project a water well had been drilled from the crater down to near the detonation point. Years ago, water had been pumped from the well into a tank and then sampled to monitor contamination. Some of the water had leaked from the fittings, and so even though no radiation had been found, as a matter of policy the area where the water pooled was considered a danger and required radiological protection for entry.

Much of the safety and security of these sites comes from this type of pedantic

compliance with broad precautions. I am reminded of the story of the top secret orange. The story goes that a laboratory at Los Alamos which handled metal models of weapon pits (which were of a classified design) found that the guards sometimes werent sure whether or not a given object was a model pit and thus classified. To resolve the issue, they adopted a policy that all spherical objects within the lab must be kept in safes when not attended. Perhaps you can guess the punchline: a laboratory worker was written up for a security violation after leaving an orange on his desk. Sometimes strong systematic security requires treating fruit as presumptively classified [1].

On the way around the crater our guide mentioned that you could see a USPS truck at the rim of the crater. Not as the result of any experiment on the nuclear survivability of letter carriers, but just because it was a government surplus item that made a convenient enclosure for some monitoring equipment. Unfortunately it had disappeared: it was just there two weeks ago! our guide insisted. Like beige paint and breezeblocks, odd bits of government property that disappear as quickly (and mysteriously) as they appeared are part of the aesthetic landscape of the nuclear weapons complex.

A limited budget, an oddly strong sense of thrift, and a close relationship to the military result in extensive use of the cast-offs of other federal agencies. Federal spending is always a bit of an enigma this way. For every billion dollars spent on F-35s there are at least fifty enlisted personnel emptying trash cans under roof leaks. The DOD plunges into a multi-year, multi-billion boondoggle to replace HEMTTs while National Science Foundation grantees repurpose retired units to move their building supplies.

A remarkable example of this phenomenon is our tours next stop.

One of the better-known historical sites at the NNSS is the gun turret. It is not a gun at all, although it once held one. Collecting data from nuclear tests has always been a challenge, and even for atmospheric tests it was difficult to place instruments close enough to ground zero to collect data without taking damage from the shockwave. Somehow, the details of which seem lost to history, someone at the NNSS implemented a clever solution: a turret, borrowed from a scrapped Navy cruiser, was stripped of its three 8 guns and shipped to the Nevada desert.

A somewhat improvised gun emplacement was built on a mesa at the NNSS and the turret installed in it. In place of the guns, a single barrel made of lead wrapped in sheet metal was installed on the front. For a series of several atmospheric tests, measurement instruments were placed in the barrel and the turret was aimed squarely at ground zero. Because the lead barrel blocked both light and background radiation coming from off-axis sources, this allowed for accurate measurements of light, x-ray, and gamma output that were used in verifying performance calculations. Since the turret could be re-aimed at various test positions and was cabled to permanent underground recording equipment bunkers nearby, it allowed for a lot of saved money compared to the conventional approach of trenching long cables from recording bunkers to instruments near the device that would not survive the explosion.

As I mentioned, the history of the gun turret was not well documented. Fortunately, as our guide tells us, an NNSS employee spent some spare time carefully examining it and was eventually able to find a serial number on an original component. Research aided by a naval museum determined the origin to be the USS Louisville, which during World War II suffered strikes by Kamikaze pilots twice. The Louisville was repaired and returned to service both times, and participated in end-of-war activities

including the evacuation of prisoners of war before being sold. The turret in question was damaged in one of the Kamikaze strikes and swapped for a spare. By the time repairs were completed the war had endedand so it sat as surplus in a Navy yard for a decade before being picked up for use at the NNSS. Due to the enormous size and weight of the turret, its delivery to the NNSS was itself a complicated operation. It was shipped over sea by the Navy to Port Hueneme, and then trucked nearly 400 miles over land by a heavy hauling contractor.

There is an obvious symbolism to the gun turrets new home in the desert. Like the USS Desert Ship, a pseudo-vessel apparently run badly aground in White Sands Missile Range for testing of missile systems, the gun turret is a curiosity: a ship out of water. It is also a weapon repurposed for science... but for the science of developing better weapons. Swords may be beaten to plowshares but plowshares are not always entirely innocent. Plowshares will return, in a dramatic fashion.

At least as far as I can keep my timeline straight, the Gun Turret was our last stop before lunch, and thats a good time for a break. Keep an eye out for Part 4.

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[1] I write this story the way I do because I am honestly not sure if it is true. I believe I originally heard it at LANL where it was told in the way of an urban legend, but it has also occasionally appeared in reputable sources. Anyone who has been through LANLs employee safety training, and has experienced the instructional video on the requirement to use handrails when climbing stairs, probably finds it credible.