Air and Space this Week

Item of the Week

Ooops! The Day We Dropped an H-Bomb on New Mexico

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I'm sure most/all of you remember the classic scene in the movie, Dr. Strangelove*, when Slim Pickens was dropped with an H-bomb, whopping and waving his cowboy had all the way to Armageddon.*

But did you know that Slim's scene almost really happened years before? On May 22, 1957, a Mark 17 hydrogen bomb, the most powerful we've ever made, was accidentally dropped just outside Kirtland Air Force Base. And one of the bomber's crewmen almost went in with it.

It turns out that the New Mexico bomb wasn't the only time America's been nuked, nor was it the only time we have had a "Broken Arrow," a "mishap" with a nuclear weapon.

THE NEW MEXICO INCIDENT

The B-36 Peacemaker was the largest piston-engine bomber ever built by the United States, the link between the B-29 Superfortress and the B-32 Dominator and the B-52. Either of its wings was longer than Orville's first flight at Kittyhawk. The Mark 17 hydrogen bomb needed a powerful ride; it was extremely heavy (21 tons) and was almost 25 feet long. Its explosive yield was on the order of 6 megatons, ~600 times the power of Hiroshima's *Little Boy*. The bomb release system was pneumatic, and had a manually-inserted safety pin holding it in place should the primary system fail. The Air Force SOP for flying with the bomb aboard was to remove the safety pin during take-offs and landings, so the bomb could be jettisoned in an emergency situation.

A B-36 was assigned to move a Mark 17 from Texas to Kirtland AFB outside of Albuquerque. 1Lt. Robert Carp, the B-36 navigator, got the call to remove the safety pin as they approached Kirkland. To get to the pin, Carp had to dangle over the massive bomb. You can guess what happened next. The release system was inadvertently activated after the pin came out, and the bomb fell through the bomb bay doors. Carp barely managed to avoid following the bomb as the plane, freed of its heavy load, lurched upward.

The whole pin situation was ridiculous, but the Air Force never kept the bomb's radioactive core in place while on routine flight. However, the bomb used a shell of high-explosives to initiate fusion, and that always stayed in the casing.

Far below, a cow chewed her cud in an idyllic pasture on property owned by the University of New Mexico. The bomb's explosives detonated upon impact, and Bossy bits were scattered for a mile in all directions, along with some mildly-radioactive debris. And Lt. Carp had some explaining to do when the B-36 landed. At least the bomb missed Kirtland AFB – and Albuquerque!

BROKEN ARROWS

Accidents involving nuclear weapons are referred to as "Broken Arrows." The New Mexico incident was hardly unique. I knew that there had been some such accidents in the news; I remember the incident off Spain where four were jettisoned, but only three were recovered right away. But I was amazed to learn that there have been 32 Broken Arrow mishaps!

Technology was primitive in the 1960s, compared to now, and keeping a number of bombers aloft and ready to strike at all times put a lot more nuclear weapons in danger of accidents (the policy was called Operation "Crome Dome"). One that I find particularly disturbing was on January 24, 1961, then a B-52 basically fell apart in flight. Two "smaller" H-bombs (3-4 megatons) were dropped, and only five of the plane's eight crew survived. One of the bombs came straight down at high speed, and buried itself more than 20 feet deep in the soil of eastern North Carolina. It was never fully recovered, although most of its radioactive components were removed (wait a second, I thought the bomb's core and casing were kept in separate parts of the aircraft, not in a bomb capable of exploding!). The other bomb starting its arming sequence, starting with the opening a drogue parachute. The bomb required a number of steps to become capable of exploding fully, and this one made it to the last switch! Again, I thought that the cores and casing were kept separate for safety! The close call scared both civilian and military leaders; we came really close to a major disaster.

The one in Spain I remembered happened on January 17, 1966. A Chrome Dome B-52 with four Mark 28 H-bombs aboard collided with its KC-135 aerial tanker during refueling. All four airmen on the tanker, and three of the seven aboard the B-52, were killed. At least these bombs weren't live, but they did have their cores in place. Three came down on land. One deployed a drogue parachute and landed with little damage. The conventional explosives in the other two detonated on impact, causing considerable local radioactive contamination. The fourth bomb fell into the ocean offshore. It took a three-month search, involving 12,000 people and the new robotic submarine *Alvin*, to find and recover the wayward bomb.

None of the Broken Arrows resulted in a nuclear explosion, but most of them produced damage and required an extensive, expensive clean-up. And a few of the devices are still missing.

WEAPONS TESTING

The development and maintenance of nuclear weapons requires testing. The Little Boy Hiroshima bomb was tested in combat because its design was extremely simple; it used an explosive charge to drive two sub-critical masses of U-235 together and go boom. The Fat Man

design was more complex, using the implosion of a sphere of plutonium to set off a fission chain reaction. That one they had to test before using it in action, and they did, at the Trinity Site not far from Alamogordo, New Mexico. A similar implosion technique was used in the early H-bombs. There was a lot of testing that was done during their development. Most of it was done in southern Nevada, but the larger bombs were tested in the (then-named) Marshall Islands (Bikini and Eniwetok Atolls), and the Aleutians (Amchitka). Early testing was done in the open, but that proved to be a very bad idea for two reasons. Dangerous radioactive debris, small enough for the wind to transport readily, proved to be a major health hazard. Further, analysis of just what radioactive elements were present in that "fallout" could reveal details of the bomb's inner workings. Testing had to be moved underground.

The bombs being tested were getting larger and larger, and the Nevada test site was relatively close to the rapidly-growing Las Vegas. The ground shaking caused by an underground test was at first an interesting novelty for those at the tables. But as the bombs got bigger, the shaking got bigger, and gamblers started complaining. A brief attempt was made to find a safe place to test farther away from the bright lights. Geologist searched for suitable places, and found one farther northeast, near the abandoned mining camp of Morey. There are no fractures or faults or other structural features that would allow the release of radiation they said. A relatively small test, code-named "Faultless," was conducted. Faultless, schmaltless; a breccia chimney was created by the explosion, and cracks shot straight to the surface. Ground water gets in, and hot water gets out. The site still requires monitoring to this day.

There was another aspect to nuclear testing, especially important now that the testing was done underground. Neither side could hide the seismic waves that were produced by test explosions, and those waves were detectable from any location on Earth. But how could the seismic signals of a test be distinguished from those generated by natural earthquakes? Answer: More testing. This time by setting off underground conventional and atomic blasts in areas in the U.S. with the same sub-surface geology as is found in the Soviet Union. This particular testing was called Operation Vela Uniform, part of a larger effort to detect nuclear testing in the upper atmosphere and in Space. A series of seven atom bomb tests were conducted: three at the Nevada Test Site in different rock types, two in a salt dome near Hattiesburg, Mississippi, one near Fallon, Nevada (Project Shoal at Gote Flat), and one on Amchitka.

OPERATION PLOWSHARE

OK, I can understand why we were conducting the nuclear testing described above. But, journey with me now down the following frightening rabbit hole. There was a big push by President Eisenhower to find and promote peaceful uses of atomic energy, not just fission reactor electricity, but from nuclear explosions as well. The Atomic Energy Commission launched its Plowshare Program in June, 1957, using the biblical reference of "turning swords into plowshares" as its naming motivation.

The first test of the plowshare concept came on December 10, 1961. There had been a ban on nuclear testing, but the USSR broke it the previous August. But our test wasn't conducted in Nevada; instead, we nuked a salt bed deep underground near Carlsbad, New Mexico. Called "Project Gnome," the goal of the test was three-fold: to see if the explosion could produce medically-valuable radioisotopes that could be harvested after the blast, to see if steam generated by the blast could be harnessed to provide electricity, and to showcase the potential value of Plowshare concept to the public. It was an abject failure. The 3.1 kiloton bomb buried 1000+ feet underground detonated as planned, producing a lot of steam, but the surface above fractured, releasing the now-radioactive steam right in front of the assembled and now-panicked media. The resulting cavity was too radioactive to mine.

The next Plowshare idea was to use atomic bombs to excavate large construction projects. The mind boggles! There was no doubt that a large atomic bomb could move a LOT of dirt; the Sedan test at the NTC used a bomb ten times larger than the Little Boy at Hiroshima to move 12 million tons of soil and create a crater almost a quarter-mile across. But Sedan also sent radioactive dust 12,000 feet to be spread by the winds into populated areas. Such fallout-producing tests caused many "downwinders" to suffer cancers (long) afterward, including those involved in filming the 1956 movie, *The Conqueror*. While many in the cast and crew of that movie also smoked heavily, they also suffered a high number of deaths due to cancer, including John Wayne, Susan Heyward, and Agnes Morehead, and the film's director, Dick Powell. Ninety-one of the 220 cast/crew on the film would develop cancer by 1980; 46 of them died from it.

President Johnson ordered a feasibility study, spurred by political issues over the Suez Canal, on using atomic bombs to blast a sea-level canal across the Panama isthmus. A follow-on study reported in 1970 that A-bomb excavation was feasible, but not necessary at the time because the existing Panama Canal's capacity was not going to be exceeded for at least twenty years.

Another Plowshare proposal was Project Chariot, which would have used several H-bombs to create a harbor in Alaska. Believe it or not, the local native Americans objected, which would not have been enough to cancel the project, but there wasn't enough potential use of such a harbor to justify its expense.

Eisenhower's grand Interstate Highway program was well-underway by the early 1960s, but there were a few sites where mountains or other obstacles made the routing incomplete. One of those was blocking the completion of I-40, in California. The Bristol Mountains north of my former research site near Amboy had been by-passed by the Santa Fe Railroad and the original Route 66 (which is still open today except for its east end). The Rt. 66 road was quite a bit longer than a path straight through the mountains; requiring significantly more fuel for the heavy train and truck traffic who used it. The AEC and CalTrans proposed Project Carryall, which would use 22 nuclear explosions to blast a path through the mountains, an idea that wasn't abandoned until 1968.

Natural gas production spiked recently, due to a technique called "fracking," where large forces applied to gas-producing zones underground were used to fracture the host rock and allow the

remaining gas to recovered. Back in the very early days of oil production, drillers found that if they dropped explosives into their wells, oil and gas recoveries went way up. But there are serious environmental costs, both short- and long-term, that are associated with fracking. Further, fracking has been usually employed near the end of an oil/gas field's life as a way of getting the last bit of recoverable oil/gas. That's why the fracking boom of the past few years is fizzling out.

Project Plowshare had a plan for fracking, and actually conducted three nuclear explosions to determine the feasibility of using atomic bombs to stimulate oilfield production! Colorado was nuked twice (Project Rulison, September 10, 1969, 40 kilotons; Project Rio Blanco, May 17, 1973, three simultaneous 33 kiloton devices) and New Mexico once (Project Gasbuggy, December 10, 1967). The Russians tried it, too. The good news was that the technique worked well; the bad news was that the oil and gas so produced was too radioactive to use.

CODA

NASA actually developed and tested a nuclear-powered rocket motor, called NERVA (Nuclear Engine for Rocket Vehicle Application), back in the 50s and 60s. They also came up with an idea that would use actual atomic explosions for propulsion, Project Orion. The plan would be to detonate atomic bombs behind a spacecraft to move it forward. The concept might actually work, but was shelved due to international treaties and concerns over environmental contamination during testing.

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