

Big Bang

By Walter J. Boyne

In 1962, Operation Dominic regularly lit up the sky above the Pacific Ocean with nuclear yields up to 700 times the size that destroyed Hiroshima.



In 1962, with the Cold War at a particularly tense moment, the United States and the Soviet Union competed in the staging of fantastically complex atmospheric nuclear tests. The US effort, code-named Operation Dominic, featured the best brains in American nuclear science.

The nuclear blasts produced under Dominic were many and awesome. They regularly lit up Pacific Ocean skies (and the space above) with nuclear yields ranging from fairly small up to some 700 times the size of the 12 kiloton weapon that leveled Hiroshima.

Dominic required the use of more than 100 aircraft, 40 warships, and 28,000 uniformed service members. Highly

Everyone has stopped to watch the awe-inspiring development of the mushroom cloud. Not visible are the scores of aircraft still gathering data from the drop, some at a safe distance, some penetrating the cloud itself at grave danger to the crew.

prestigious scientific laboratories lent their talent and support to the Atomic Energy Commission and Defense Department. Widely scattered diagnostic stations soaked up data over an area exceeding 15 million square miles.

Dominic was planned and executed in record time. For all that, it proved to be the largest and the most successful nuclear test program in US history. And, oddly enough, the impetus for Dominic came as a result of a failed arms control effort.

The ground crew who serviced the Operation Dominic B-52s did an amazing job at Barbers Point NAS, Hawaii. They worked hand in hand with the specialists who conducted the sensitive and intricate loading operations.



USAF photos via Walter J. Boyne

In 1958, the US, Soviet Union, and Britain tacitly entered into a joint moratorium on nuclear testing. Up until that point, all three nuclear powers had more or less freely carried out their own atmospheric testing, to the alarm of nuclear disarmers around the world. The moratorium was politically popular.

In 1961, newly elected President John F. Kennedy sought to extend the existing joint moratorium that had held for three years. Kennedy's efforts proved futile, however. He was impaired in his ambitions by, among other things, the political fallout of the abortive US-backed Bay of Pigs invasion, which sought to overthrow Cuban leader Fidel Castro, a Soviet client.

Here Come the Soviets

On Aug. 30, 1961, Moscow announced its intent to resume atmospheric nuclear testing.

True to its word, the USSR in the next month began a major series of 59 nuclear tests. These included the detonation of the largest atomic device ever seen. The "Tsar Bomba" exploded with a force equivalent to some 63 megatons of TNT. Soviet bomb makers had tried a radical approach and had succeeded, ratcheting up Western fears about mounting Soviet capabilities.

Even more important, however, the resumption of tests sparked a new outburst of world concern about nuclear fallout and its effects on humans.

Kennedy thus found himself in a tough spot. The US had, in fact, begun Operation Nougat, a series of tests of low-yield devices, but the tests were conducted underground in Nevada. "Going atmospheric" was certain to provoke a new round of world condemnation.

Kennedy made his choice; on Oct. 10, after the Soviet Union's first new blasts, he approved resumption of America's own atmospheric testing. Washington issued a public announcement of the move on Nov. 2, 1961. The Atomic Energy Commission already had put together contingency plans for weapons that would weigh less but of-

fer higher nuclear yields. Given that head start, the US planned to resume live tests within a few months.

The President gave final approval on March 2, 1962. A start date of April 1 was laid down. Operation Dominic was born.

The Joint Chiefs of Staff assigned responsibility for the operation to Joint



It was not unusual to work 24 hours while a mission was going on. Backup pilot, assistant operations officer, and information officer Capt. Walter Boyne stands in front at left. Crew commander Maj. Bob Edmund stands at right with the phone.

A typical “mushroom cloud” was impressive, extending for thousands of feet, but it was not nearly so awesome as the flash of the explosion itself, burning much brighter than the sun.



USAF photo via Walter J. Boyne

Task Force 8. Army Maj. Gen. Alfred D. Starbird, a 6-foot-5-inch-tall combat veteran who had already supervised a number of nuclear tests, was selected as its commander. He was to report jointly to the AEC and JCS. Starbird's scientific deputy was to be William E. Ogle of the Los Alamos Scientific Laboratory in New Mexico. Air Force Maj. Gen. John S. Samuel was deputy commander of JTF 8.

Starbird's first problem was that most of the personnel with experience in atmospheric tests had been reassigned to other duties. A massive recall of knowledgeable test talent was necessary to meet the stiff requirements and ultra-tight schedule of Operation Dominic. In contrast, the Soviet Union had maintained its test programs intact and was able to proceed swiftly.

JTF 8 set the main goals for the expedited test program:

- Proving, through testing, of existing and new thermonuclear weapon designs.
- Determining whether airborne diagnostic analysis was sufficiently accurate to replace the land-based systems.
- Checking effects of a nuclear weapon on electromagnetic pulse phenomena.
- Exploring effects of a detonation environment on incoming ballistic missile warheads.

The program was concerned about the degree to which both ground and air

crew personnel were exposed to radiation and what the effects might be. This was a particularly sensitive area; radiation effects of past nuclear tests had led to the deaths of many participants.

All B-52 drops were designed to be air bursts, minimizing contamination problems. The obvious hazards to the air crews were also noted, the most dangerous being the possibility of a premature explosion of the weapon after drop.

Islands in the Sea

Operation Dominic unfolded over a vast Pacific area, extending from a spot a few hundred miles off San Diego to Johnston Island, some 3,500 miles southwest. Operational command centers were located at Christmas Island and Johnston Island.

The test explosions ranged from a depth of 650 feet underwater to a height of 248 miles—that is, in near space.

Twenty-four of the airdrops were made in a target area south of Christmas Island, while five were made in the Johnston Island area. All five successful space shots were made at the Johnston Island site.

In 1962, Christmas Island was a possession of Britain. Britain had conducted hydrogen bomb tests in 1958 on the island. At the time of Operation Dominic, some 400 Gilbert Island natives lived there, harvesting copra from the coconut palms.

The naval tests were demonstrations of the most advanced weapons in the inventory. In Operation Frigate Bird, the submarine USS *Ethan Allen* was operating nearly 1,725 miles east-northeast of Christmas Island.

It fired a Polaris A-1, on May 6, 1962, in the first ever complete test—from launch to detonation—of an American strategic missile. The missile's re-entry vehicle flew more than 1,000 miles downrange before blazing into the atmosphere to detonate in an airburst of some 600 kilotons at 11,000 feet. The target area was about 500 miles from Christmas Island.

In the other Navy program, Operation Swordfish, the destroyer USS *Agerholm* was positioned 460 miles south-southwest from San Diego. An operational anti-submarine rocket, the RUR-5 ASROC, with a nominal 10 kiloton yield was selected at random for the test.

The test was used to demonstrate the ASROC's effectiveness against a target and examine what its side effects might be for US Navy defensive systems. To determine this, four destroyers and a submarine were placed one and two miles distant from the target raft. The test was also to check on the radiation hazard to the launching vessel.

The regular destroyer crew carried out its mission successfully, firing the ASROC

Of the hundreds of B-52s built, RB-52B serial No. 52-0013 was one of the few that actually dropped a live nuclear weapon. On Dominic missions, its call sign was Cow Slip Two. 52-0013 is on exhibit at the National Atomic Museum located near Kirtland AFB, N.M.



at the raft floating about 4,400 yards away. The rocket impacted within 20 yards of the raft, detonating 40 seconds later at a depth of 650 feet. The explosion left a huge circle of radioactive foam that took days to dissipate.

An American possession, Johnston Island served as the site for Operation Fishbowl, the space element of Dominic. An atoll of just over one square mile in size, Johnston is located 860 miles west-southwest of Hawaii.

Operation Fishbowl consisted of five successful missile launches designed to detonate in space nuclear weapons with yields running from a very low kiloton rating to more than 1,000 kt. These tests sought to provide data on the effects of nuclear detonations as defensive weapons against incoming re-entry vehicles.

The Johnston Island missile tests incurred Dominic's only major operational failures. On four occasions, malfunctions forced the range officer to destroy the missile. In one, the vehicle and weapon blew up on the launchpad, contaminating the area with radioactive material. The repair and cleanup delayed resumption of the program for nearly three months.

However, five successful spaceflights provided invaluable data as they lit up the atmosphere in a wild mixture of colors. On July 9, the spectacular exoatmospheric effects of a blast were watched in awe by people more than 800 miles away in Hawaii and 1,600 miles away on Kwajalein.

The blast, code-named Starfish Prime, took place at an altitude of 248 miles and gave a 1,450 kt yield. An enormous area of the sky was illuminated with a varicolored aurora lasting for several minutes in some places.

The electromagnetic pulse from the detonation caused power surges on Oahu that set off burglar alarms and knocked out some street lighting. Starfish Prime caused damage to solar panels on several orbiting satellites.

Tightrope, Checkmate

The warhead on this test was a direct descendant of the familiar Mk 28 thermonuclear bomb and was also used on Thor, Atlas, Jupiter, and Titan missiles.

The penultimate Johnston Island shot, dubbed Kingfish, used the Thor missile. It was a massive success. With detonation at an altitude of 60 miles,

Kingfish's yield of just under 1,000 kilotons created a fireball at about 600 miles altitude and disrupted Pacific radio communications for three hours.

Launching nuclear weapons by the rockets of the time was clearly more challenging than making airdrops. After three consecutive failures of the Thor missile, two attempts were made using the Nike Hercules. Both failed. The last Johnston Island launch, dubbed Tightrope, used the Nike Hercules successfully. One successful shot, Checkmate, used an Army Recruit first stage and the XM33 Strypi rocket.

All of the Dominic airdrops were made by B-52 bombers provided by Strategic



Here, Boyne (r) is shown the latest information from Christmas Island. Communications with headquarters was surprisingly light, perhaps because the flight operations were the most routine of the complex series of events taking place.

Air Command and the Air Force Special Weapons Center. They flew missions out of NAS Barbers Point, Hawaii. Twenty-four drops from April 25 through July 11 brought about the release of more than 23 million tons worth of explosive energy just south of Christmas Island.

On test missions, aircraft included B-47s, WB-50s, KC-135s, RC-121s, C-130s, U-2s, C-54s, C-118s, B-57s, and H-21s. These aircraft were employed directly in the tests. Additional aircraft of every type were used in other roles.

The Los Alamos and Lawrence Livermore Laboratories each furnished 12 nuclear devices, ranging in size from a diameter of 12 inches to 56 inches, in length from 25 to 149 inches, and in weight from 160 to 9,162 pounds. Efficiency was measured by the yield-to-weight ratio (kt/kg) which ranged up to 4.96 on the Bighorn test.

Each detonation offered data for a broad variety of tests—for instance, regarding chorioretinal burns, the effectiveness of protective gear, the attenuation of radar signals, and airborne thermal measurements. Other experiments generated information on electromagnetic pulse effects and shock overpressures.

The yields were determined after detonation by radio-chemical sampling. One important result was a determination that advanced airborne diagnostic systems could collect data from nuclear airdrops.

On each mission, a B-52 would arrive in the test area and then fly a 16-minute race-track pattern. During these 16 minutes, the ground- and air-based instrumentation was fine-tuned, with adjustments made for any variations in weather. The target could be one of seven different barges moored in the target area, each equipped with strobe lights, beacons, and radar reflectors.

The dozens of orbiting support aircraft meshed like gears in a clock, each one timing its position so that it would be in the optimum spot to gather data when the nuclear device detonated. The drop aircraft's path to the east-southeast was monitored on a second-by-second basis by JTF 8 headquarters. After the detonation, effects were measured in increments of one-millionth of a second.

On three of the 24 missions, the B-52 executed a breakaway maneuver to escape the blast. On the remaining 21 missions, BUFFs flew over the target and used a parachute-retarded bomb to slow descent and give the bomber crew ample time to escape.

The average accuracy for the drops was 897 feet, while the average timing error



USAF photo via Walter J. Boyne

Operations officer Lt. Col. Richard McVay stands in the center of an admiring SAC crew, next to the young Hawaiian woman who provided the cake. McVay had flown as an observer on two previous missions that had aborted. When word came in that the current mission was successful, an impromptu celebration took place.

was 3.5 seconds. On four missions, there was a zero error in timing. There were two occasions when the device within the bomb failed, resulting in what was termed a “fizzle.” These malfunctions were not charged against the B-52 crew, but against the Livermore Radiation Laboratory where they were designed.

Far Brighter Than Daylight

The drops were made at altitudes ranging from 25,000 to 45,000 feet, at a 450 knot airspeed. The resulting mushroom clouds usually rose to about 60,000 feet.

One Dominic veteran recalled the events in this way:

“The night was smooth but absolutely pitch black, without a light showing anywhere. Because we were using a parachute-retarded bomb, we elected not to use either the thermal curtains or protective goggles. ... The pitch black night simply disappeared as the bomb’s blazing heat illuminated the sky from horizon to horizon, far brighter than daylight. It was as if the bomb had destroyed the night. The explosion was not just a flash, but a sustained light that seemed to grow even brighter before it slowly began to dim. As the long seconds passed, the light collapsed in a curious fashion, like a deflating balloon, coming back in from the horizon. And then it was night again.”

He went on:

“Our radar/bombardier was a crusty veteran of World War II, better known for his salty wit than his philosophy. As soon as he released the bomb, he hurried up to

the cockpit to view the results. When the light finally subsided, he said in a quiet tone, ‘They should make every head of state see this once a year. Then they’d know what they were playing with.’”

The general assessment was that Operation Dominic had been conducted with amazing accuracy and skill. It provided data that improved US nuclear weapon technology, ensured the safety and reliability of weapons in storage, and increased the yield-to-weight ratios.

Each nation closely monitored the other’s tests, with Russian “fishing trawlers” constantly on patrol just outside the areas designated for tests. US Navy ships and aircraft maintained a constant patrol to ensure that they kept their distance.

In October 1962 came the Cuban Missile Crisis. It brought the two superpowers close to the nuclear brink, injecting a huge dose of caution into thinking in both Moscow and Washington.

The two superpowers signed another atmospheric test ban agreement in 1963. Underground testing continued for years, but never again did the US or USSR conduct an atmospheric test. ■

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