

# Operation Argus

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**Operation Argus** was a series of nuclear weapons tests and missile tests secretly conducted during August and September of 1958 over the South Atlantic Ocean by the United States's Defense Nuclear Agency, in conjunction with the Explorer 4 space mission. Operation Argus was conducted between the nuclear test series Operation Hardtack I and Operation Hardtack II. Contractors from Lockheed Aircraft Corporation as well as a few personnel and contractors from the U.S. Atomic Energy Commission were on hand as well. The time frame for *Argus* was substantially expedited due to the instability of the political environment, *i.e.* forthcoming bans on atmospheric and exoatmospheric testing. Consequently, the tests were conducted within a mere half year of conception (whereas "normal" testing took one to two years).

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## Original mission objectives

- Two missiles, with warheads 136–227 kg to be launched within one month of each other, originating from a single site.
- The missiles were to be detonated at altitudes of 200–1,000 mi, and also at 2,000–4,000 miles. Both detonations should occur near the geomagnetic equator.
- Satellites were to be placed in equatorial (up to 30°) and polar (up to 70°) orbits, with perigees of roughly 322 km and apogees of roughly 2,900 km or greater. These satellites were to be used to measure electron density over time, and include a magnetometer, as well as a means for measuring ambient radio noise. Measurements were to be taken before the shots to determine a baseline, as well as during and after the events.
- Sounding rockets, fired from appropriate ground locations, were to carry the same instrumentation as the satellites, except for radio noise. Ground stations to be used to study effects on radio astronomy and radar probing as well as auroral measurements.

Originally *Argus* was designated *Hardtack-Argus*, and later *FLORAL*. For reasons of security, both names were dropped in favor of the independent name Argus.

Funding was provided by the Armed Forces Special Weapons Project (AFSWP), the predecessor of today's Defense Threat Reduction Agency (DTRA). Total funds allotted for the project were US\$ 9,023,000.

## Task Force 88

The United States Navy Task Force 88 (or TF-88), was formed April 28, 1958. TF-88 was organized solely to conduct Operation Argus. Once Argus was completed, the task force was dissolved, and its records dispersed. Some of these records have been destroyed or lost in the intervening time period. Of particular note among the missing documents were the film records (which recorded radiation levels during the Argus tests). This has proved contentious due to the higher-than-normal number of leukemia claims among TF-88 participants to the Veterans Administration. Because of this, it has been difficult to resolve just how much radiation participants were exposed to.

The *Norton Sound* was responsible for missile-launching functions. She also served as a training facility for crews involved in the testing. The X-17A missiles to be used in the test were unfamiliar to those conducting the tests. Exercises including assembly and repair of dummy missiles were conducted aboard the *Norton Sound*. She also carried a 27-MHz COZI radar, which was operated by Air Force Cambridge Research Center, which was used to monitor effects of the shots.

The *Albemarle*, fresh out of an overhaul, was not listed on the TF-88 order. She set out to the Atlantic, supposedly on shakedown. She, too, mounted a COZI radar and other instrumentation for detecting man-made ionization.

The *Tarawa* served as overall command of the operation, with her commander serving as Task Group Commander. She carried an Air Force MSQ-1A radar and communication system for missile tracking. She also housed VS-32 aircraft for search and security operations as well as scientific measurement, photographic, and observer missions for each shot.

The *Warrington*, in conjunction with the *Bearss*, *Hammerberg*, and *Courtney* maintained a weather picket 463 km west of the task force, provided a plane guard for the *Tarawa* during flight operations, and carried out standard destroyer functions (such as surface security and search and rescue). The *Warrington* also carried equipment for launching Loki Dart rockets.

The *Neosho* refueled task force ships during the operation. She was also outfitted with Air Force MSQ-1A radar.

The *Salamonie* returned to the United States upon arrival at TF-88, and did not participate in any shots.

## The Tests

About 1800 km southwest of Cape Town, South Africa, USS *Norton Sound* launched three modified X-17A missiles armed with 1.7 kt W-25 nuclear warheads into the upper atmosphere, where high altitude nuclear explosions took place. Due to the South Atlantic Anomaly, the Van Allen radiation belt is closer to the earth's surface at that location. The (extreme) altitude of the tests was chosen so as to prevent personnel involved in the test from being exposed to any ionizing radiation.<sup>[1]</sup>

Coordinated measurement programs involving satellite, rocket, aircraft, and surface stations were employed by the services as well as other government agencies and various contractors worldwide.

The tests were proposed by Nicholas Christofilos of what was then the Livermore branch of the Lawrence Radiation Laboratory (now Lawrence Livermore National Laboratory) as a means to verify the Christofilos theory, which argued that high-altitude nuclear detonations would create a radiation belt in the extreme upper regions of the Earth's atmosphere. Such belts would be similar in effect to the Van Allen radiation belts. Such radiation belts were viewed as having possible tactical use in war. Prior to

Argus, Hardtack Teak had shown disruption of radio communications from a nuclear blast. However, this was not due to the creation of radiation belts.

The Argus explosions created artificial electron belts resulting from the  $\beta$ -decay of fission fragments. These lasted for several weeks. Such radiation belts affect radio and radar transmissions, damage or destroy arming and fusing mechanisms of intercontinental ballistic missile warheads, and endanger crews of orbiting space vehicles.

*Argus* proved the validity of Christofilos theory: the establishment of an electron shell derived from neutron and  $\beta$ -decay of fission products and ionization of device materials in the upper atmosphere was demonstrated. It not only provided data on military considerations, but produced a "great mass" of geophysical data.

The tests were first reported by the *New York Times* on March 19, 1959, headlining it as the "greatest scientific experiment ever conducted." Approximately nine ships and 4,500 people participated in the operation. After the completion of testing, the task force departed for the United States via Rio de Janeiro, Brazil. Followed the Hardtack I series, but preceded Hardtack II.

While the tests were announced the following year, the full results and documentation of the tests were not declassified until April 30, 1982.

## List of Argus Launches<sup>[2]</sup>

- **Argus I**
  - Time: 02:28 August 27, 1958 (GMT)
  - Location: 38.5° South, 11.5° West
  - Altitude: 124 mile (200 km)
- **Argus II**
  - Time: 03:18 August 30, 1958 (GMT)
  - Location: 49.5° South, 8.2° West
  - Altitude: 159 miles (256 km)
- **Argus III**
  - Time: 22:13 September 6, 1958 (GMT)
  - Location: 48.5° South, 9.7° West
  - Altitude: 335 miles (539 km) (perhaps the highest nuclear explosion ever)

## List of ships involved in *Operation Argus*



One of the modified X-17A missiles launches from the USS *Norton Sound* as part of Operation Argus.

- USS *Tarawa* (CV-40)
- USS *Bearss* (DD-654)
- USS *Warrington* (DD-843)
- USS *Courtney* (DE-1021)
- USS *Hammerberg* (DE-1015)
- USS *Neosho* (AO-143)
- USS *Salamonie* (AO-26)
- USS *Norton Sound* (AVM-1)
- USS *Albemarle* (AV-5)

## See also

- Operation Dominic I and II
- HAARP
- List of artificial radiation belts

## References

- ↑ U.S. Defense Threat Reduction Agency. "Operation ARGUS." *DTRA Fact Sheets*, July 2007.
- ↑ Johnston, William Robert. "High-Altitude Nuclear Explosions." 7 November 2006.
  - Jones, Doyle, Berkhouse, Calhoun, Martin, and Tempo. *DNA 6039F: United States Atmospheric Nuclear Weapons Tests, Nuclear Test Personnel Review*. Defense Nuclear Agency on behalf of Department of Defense. Prepared by Santa Barbara, California, 1982.
  - Chun, Lt. Col. Clayton K. S. *Shooting down a "Star": Program 437, the US Nuclear ASAT System and Present-Day Copycat Killers*. College of Aerospace Doctrine Research and Education. April, 2000, Maxwell Air Force Base, Alabama.

## External links

- Operation Argus film by US government (45:26)

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