On 9 July 1962, the United States conducted the ‘Starfish Prime’ nuclear test, one of a series of five aimed at testing the effects of nuclear weapons in high altitudes / lower outer space. The explosion took place 400 kilometres above the Johnston Atoll in the Northern Pacific Ocean. It had an explosive yield of 1.45 megatons - approximately a hundred times that of the Hiroshima bomb (around 13 kilotons).

The event took place at the height of the Cold War and its nuclear arms race. Shortly before, in October 1961, the Soviet Union had conducted the largest-ever nuclear explosion, the 50 megaton Tsar Bomb. In 1962, political tension found its expression in an all-time high of nuclear testing: 178 tests - more than twice the annual Cold War average (see chart). Only three months after ‘Starfish Prime’, the world found itself at the brink of nuclear war during the Cuban Missile Crisis.

The ‘Starfish Prime’ test experimented with radiation belts in the Earth’s magnetosphere known as Van Allen belts, they consist of energetic particles located in the inner region of Earth’s magnetosphere. James Van Allen had discovered them shortly before, in 1958, and agreed to cooperate with the military in a study on how they could be disrupted by nuclear explosions.

The consequences for the magnetosphere were completely unpredictable at the time. Also its crucial role in shielding life from solar winds was not understood until later. The Starfish Prime test resulted in a temporary alteration of the shape and intensity of the lower Van Allen belt, which created artificial aurora borealis that could be seen across the Pacific Ocean, from Hawaii to New Zealand.
The test also revealed the destructive impact of the Electromagnetic Pulse (EMP) produced by a nuclear explosion. Located at more than 1,300 kilometers from the test site, the Hawaiian Island of Oahu received a power surge that knocked out numerous electric devices. The damage to both civilian and military electrical systems led physicist Lowell Wood to declare that if the Starfish test had taken place at the Nevada test site, the consequences “would still be indelibly imprinted in the minds of citizenry of the western U.S., as well as in history books.”

The radiation from this and other high-altitude nuclear tests also created an artificial radiation belt that, together with the EMPs, damaged or destroyed as many as one third of the satellites in lower earth orbit at the time.

The United States conducted its last nuclear test three decades later, in 1992. It was the first country to sign the Comprehensive Nuclear-Test-Ban Treaty (CTBT) when it opened for signature on 24 September 1996. Today, it is one of the eight Annex 2 States that have yet to ratify before the Treaty can enter into force. The others are China, the Democratic People's Republic of Korea, Egypt, India, Iran, Israel and Pakistan.