

# More bang for your buck: B61 service-life extension upgrades

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Despite being more than 50 years old the B61 nuclear bomb is still in service with armed forces around the globe. As this weapon enters into its sixth decade it is being extensively upgraded to enhance its precision and, by default, its lethality. *Thomas Withington reports*

Production of the B61 freefall nuclear bomb began in 1965 and since then 3,155 have been built, although most have now been retired. Those that remain are mainly in service with the US Air Force (USAF) or supplied by the US government to NATO members.

The bomb is undergoing a programme of upgrades, under which the physics package from the legacy B-61/4 variant will be teamed with a new guided tail kit containing an inertial navigation system (INS) to improve the weapon's precision.

Development of the original B61 began in 1963 at Los Alamos National Laboratory in New Mexico and during the intervening years 13 different variants were developed, with nine of these eventually deployed. Today the B61-3 and B61-4 (about 500 weapons), B61-7 (about 120 weapons), and B61-11 (about 20 weapons) are in service. Of these, open sources state that about 460 are thought to be deployed operationally at USAF bases with nuclear-capable aircraft and about 180 are deployed with the air forces of NATO countries.



*Workers at the US nuclear weapon assembly and disassembly facility at Amarillo, Texas, pictured with two B61 nuclear bombs. (National Nuclear Security Administration)*

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There are some important differences between these B61 variants. For example, the B61-3, one of the first variants produced, has variable yields of 0.3 kilotons (one kiloton is equal to 1,000 tonnes of conventional explosive) 1.5 kT, 5 kT, 10 kT, 45 kT, 60 kT, 80 kT, and 170 kT. Additionally, it has a 12-digit permissive action link (PAL). PALs are alpha-numeric codes of different classes that are entered into the weapon on the ground before a mission to arm the bomb and prevent its unauthorised use. Most PALs can only be entered incorrectly into a weapon a finite number of times before that weapon becomes unserviceable and needs to be reset by the US nuclear weapon assembly and disassembly facility at Amarillo, Texas, also known as the Pantex Plant. A total of 485 B61-3s were made from 1979, 50 of which are inactive in the US nuclear stockpile and 135 of which have been dismantled.

The B61-4, meanwhile, has fewer yield options than the B61-3 with a variable explosive power of 0.3 kT, 1.5 kT, 10 kT, and 48 kT. This weapon, which entered production the same year as the B61-3, has a similar Class F PAL to the B61-3. A total of 400 were constructed, of which 50 remain inactive and 154 have been dismantled.

Another variant, the B61-7, began production in 1985 and has a variable yield of 10–360 kT with a six-digit Class D PAL. The B61-11 has a similar yield, which may be extendable up to 400 kT, and a Class D PAL. In terms of production numbers, 439 B61-7 bombs were built, 300 of which are inactive and 19 of which have been dismantled, while 41 B61-11s were constructed from 1995, 15 of which remain inactive, with six dismantled.

Variants that are no longer in service include the B61-0, B61-1, B61-2, B61-5, B61-6 (a modified version of the B61-0), B-61/8 (modified B61-5s and B61-6s), and B61-9 (also a modified B61-0). The B61-10, which had variable yield options of 0.3 kT, 5 kT, 10 kT, and 80 kT, began production in 1990 with 206 examples made, all of which have now been retired.

All B61 variants have an aircraft monitoring and control system that can be employed to set the weapon's yield while in flight. Variable-yield weapons are intended to enable targeting flexibility. For example, it would require less explosive power to destroy a small target such as an air-operations centre than would be needed to destroy a railway marshalling yard spread across a large area.

The B61 has several burst options, including parachute-retarded or freefall airburst, parachute-retarded lay-down, or freefall ground burst methods. These will be executed according to the target and the delivery profile of the aircraft.

Although the USAF Boeing B-52H Stratofortress strategic bomber can technically deploy the B61, open sources have stated that the aircraft is not assigned these weapons. This leaves the Northrop Grumman B-2A Spirit as the only strategic bomber in the USAF fleet cleared to carry the weapon. This could be because of doubts regarding the B-52H's ability to penetrate heavily defended airspace.

The B61-11 is the variant carried by the B-2A. It is thought that several B61-11s, perhaps the entire inventory of 20, are stored at Whiteman Air Force Base in Missouri, where the B-2A is based. This bomb is designed to penetrate buried targets and, according to open sources, its reinforced steel body, which may include depleted uranium, enables it to penetrate up to 6 m (19.7 ft) of frozen ground.

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