= Pumpkin bomb =

Pumpkin bombs were conventional aerial bombs developed by the Manhattan Project and used by the United States Army Air Forces against Japan during World War II . The pumpkin bomb was a close replication of the Fat Man plutonium bomb with the same ballistic and handling characteristics , but used non @-@ nuclear conventional high @-@ explosive . It was mainly used for testing and training purposes , which included combat missions flown with pumpkin bombs by the 509th Composite Group . The name " pumpkin bomb " resulted from the large , fat ellipsoidal shape of the munition instead of the more usual cylindrical shape of other bombs and was the actual reference term used in official documents .

= = Development = =

Pumpkin bombs were a means of providing realistic training for the 509th Composite Group 's Boeing B @-@ 29 Superfortress crews assigned to drop the atomic bomb . The pumpkin bomb was a close , but non @-@ nuclear replication of the Fat Man plutonium bomb with the same ballistic and handling characteristics . Specifications for the bomb required that it be carried in the forward bomb bay of a Silverplate B @-@ 29 bomber and be fuzed to be effective against actual targets .

Pumpkin bombs were produced in both inert and high explosive variants . The inert versions were filled with a cement @-@ plaster @-@ sand mixture that was combined with water to 1 @.@ 67 to 1 @.@ 68 grams per cubic centimetre (0 @.@ 060 to 0 @.@ 061 lb / cu in) , the density of the Composition B high explosive versions . The filler of both variants had the same weight and weight distribution as the inner sphere of the plutonium bomb . The concept for the high explosive pumpkin bomb was originated in December 1944 by U.S. Navy Captain William S. Parsons , the head of the Ordnance Division at Manhattan Project 's Los Alamos Laboratory , and United States Army Air Forces Lieutenant Colonel Paul W. Tibbets , commander of the 509th Composite Group . Prior testing was carried out with an inert version .

The name " pumpkin bomb " was given to the training bombs by Parsons and Dr. Charles C. Lauritsen of the California Institute of Technology , who managed the development team . The name was used in official meetings and documents , and probably referred to its large ellipsoidal shape . Although anecdotal sources attribute the naming of the bombs to painting them a pumpkin color , the bombs were actually painted olive drab or khaki . Photographs indicate that the units delivered to Tinian were painted in the same zinc chromate primer color (i.e. , yellow) worn by Fat Man .

While many Manhattan scientists expected that the development of the means of delivery of the atomic bomb would be straightforward , Parsons , with his experience of the proximity fuze program , expected that it would involve considerable effort . The test program was initiated on 13 August 1943 at the Naval Proving Ground in Dahlgren , Virginia , where a scale model of the Fat Man plutonium bomb was developed . On 3 March 1944 , testing moved to Muroc Army Air Field , California . The initial tests demonstrated that the Fat Man assembly was unstable in flight , and that its fuzes did not work properly .

= = Production = =

The shells of the pumpkin bomb were manufactured by two Los Angeles firms , Consolidated Steel Corporation and Western Pipe and Steel Company , while the tail assembly was produced by Centerline Company of Detroit . After initial development , management of the program was turned over to the U.S. Navy Bureau of Ordnance in May 1945 . A total of 486 live and inert training bombs were eventually delivered , at a cost of between $ 1 @,@ 000 and $ 2 @,@ 000 apiece .

All of the inert versions went from the manufacturers directly to Wendover Army Air Field , Utah , by rail , where they were used by the 216th Base Unit in flight testing of the bomb . Some test drop missions were flown by the 509th Composite Group 's 393d Bombardment Squadron as training exercises . The bombs intended as live ordnance were shipped to the Naval Ammunition Depot , McAlester , Oklahoma , for filling with explosives . The Composition B was poured as a slurry ,

solidified in a drying facility for 36 hours , sealed , and shipped by railroad to the Port Chicago Naval Magazine , California , for shipment by sea to Tinian .

= = Description = =

The pumpkin bombs were externally similar to the Fat Man bomb in size and shape , and both had the same 52 @-@ inch (130 cm) California Parachute square tail assembly and single @-@ point attachment lug . The pumpkin bomb had three contact fuzes arranged in an equilateral triangle around the nose of the bomb while the atomic bomb had four fuse housings . The atomic bomb had its shell sections bolted together , but most if not all of the pumpkin bombs were welded with a 4 inches (100 mm) hole used for filling the shell . The Fat Man also had four external mounting points for radar antennae which the pumpkin bombs did not have .

The pumpkin bombs were 10 feet 8 inches (3 @.@ 25 m) in length and 60 inches (1 @,@ 500 mm) in maximum diameter . They weighed 5 @.@ 26 long tons (5 @,@ 340 kg) , consisting of 3 @,@ 800 pounds (1 @,@ 700 kg) for the shell , 425 pounds (193 kg) for the tail assembly , and 6 @,@ 300 pounds (2 @,@ 900 kg) of Composition B filler . The shells were made of .375 @-@ inch (9 @.@ 5 mm) steel plate and the tail assemblies from .200 @-@ inch (5 @.@ 1 mm) aluminum plate .

= = Combat missions = =

Combat missions were flown by the 509th Composite Group on 20 , 23 , 26 and 29 July and 8 and 14 August 1945 , using the bombs against individual targets in Japanese cities . A total of 49 bombs were dropped on 14 targets , one bomb was jettisoned into the ocean , and two were aboard aircraft that aborted their missions .

Mission parameters and protocols were similar to those of the actual atomic bomb missions , and all targets were located in the vicinity of the cities designated for atomic attack . The bombs were released at an altitude of 30 @,@ 000 feet (9 @,@ 100 m) and the aircraft then went into the sharp turn required on a nuclear mission . After the war , the Strategic Bombing Survey concluded that the pumpkin bombs were " a reasonably effective weapon against Japanese plants when direct hits were scored on vital areas , or when the near miss was sufficiently close to important buildings to cause severe structural damage . "