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MILESTONES

Genesis of the bunker busting bomb

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TESTING IS NOW UNDER WAY ON THE US AIR FORCE'S 30,000 LB HEAVYWEIGHT DEEP bunker-busting Massive Ordnance Penetrator (MOP) bomb planned for carriage on the B-52H and B-2A, but this class of weapon first made its mark during World War II. After a stunning debut during the 1940s, large bunker busters effectively vanished from inventories until the recent contract was awarded to Boeing for the MOP design.



British design engineer Sir Barnes Neville Wallis is best known for his efforts in developing the geodesic frame design in the Vickers Wellesley and Wellington bombers, but more so for his role in developing the Upkeep mine used to great effect during the famous Dambuster raids on German Möhne, Eder and Sorpe dams in the Ruhr Valley. What is less appreciated is that he effectively invented the modern bunker-busting bomb.

Wallis first conceived the idea of a deep penetrating heavy bomb in 1940, and he published a paper on the 'ten tonner' bomb and its smaller six tonner sibling. The design lay dormant until 1943 when reports emerged of heavily fortified bunkers being constructed by the Todt organisation to house V-2/A-4 ballistic missile batteries at Watten, Wizernes and Siracourt. Subsequent intelligence identified the V-3, a gigantic multi-barrel underground super gun, 140m long with 150 mm calibre barrels, fixed at London. The RAF and USAAC had already run into difficulties with the heavily fortified submarine pens in French ports. With 16 to 20 ft thick steel reinforced concrete roofs and walls, these structures were effectively impervious to the standard thin casing demolition bombs carried by British and American heavy bombers. The bomb casings disintegrated on impact.

Air Chief Marshal Sir Wilfred Freeman approached Wallis and asked how soon the 1940 bomb concept could be developed and put into production. Wallis is reported to have asked for four or five months. There were many challenges to be overcome. Delivery of these bombs required a modified Avro Lancaster, capable of safely lifting these enormous weapons. A more accurate bombsight was required, with aircrew training to match. Only two foundries in Britain could manufacture the unique steel castings Wallis needed for the bomb casing, which required unique heat treatment. Very few manufacturers could precision-machine the bomb casings, this taking up to a month per bomb. New fuse designs were required along with new dollies and trailers to move the bombs. New machinery was required to pour the RDX explosive filler into the casings.



An Avro Lancaster modified to carry the 12,000 lb Tallboy bunker buster bomb.
top: A recently constructed Canadian replica of the Tallboy.

Soon after, Air Chief Marshal Sir Arthur Harris designated 617 Squadron, the elite Dambuster squadron, as a special duties squadron to be armed with the new Wallis bombs. The Dambusters were to become 'snipers' who could not afford to miss, given the expected cost and scarcity of the new penetrating bombs. The 617 Squadron Lancasters were fitted with a new gyroscopic Stabilising Automatic Bomb Sight (SABS), with the aim of hitting within less than 100 metres of the aimpoint from 20,000 ft. The SABS required pressure, temperature and drift inputs, presenting technical and operational challenges.

With the advent of the V-1 bombardment of Britain, the MoD bureaucracy sought to halt the development of the bombs but Wallis convinced Freeman to authorise the smaller 12,000 lb weapon, designated the Tallboy, as it could be carried deep into German defended airspace.

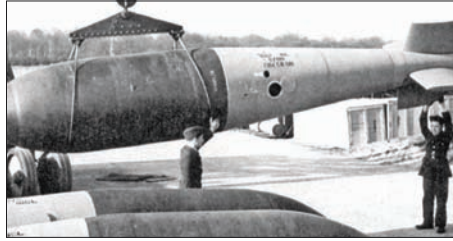
The first two prototype Tallboys were tested at Ashley Walk test range. The first drop saw the weapon accelerate to a supersonic terminal velocity and then almost topple due to compressibility effects, wholly compromising accuracy. Wallis pragmatically altered the tail-kit design, canting the tail surfaces to impart rotation as the bomb descended. The gyroscopic effect would then overcome unwanted aerodynamic forces.



A Tallboy after release from a 617 SQN Lancaster.

20,000 ft AGL with an optical sight, leading to the assignment of DH Mosquitos to 617 Squadron for low level marking of such targets. Concerns about the Tallboy's ability to penetrate thick concrete resulted in a recommendation by Wallis to drop the bombs into the soil next to the target, so the shockwave hit the bunker from below, where it was not well protected.

With D-Day, 617 Squadron was diverted to chaff bombing to deceive German coastal early warning radars but soon after was tasked with the first operational Tallboy delivery. The first target was the Saumur Tunnel near Loire, via which the



The Americans modified the B-29 to carry licenced Tallboys and Grand Slams, later used in the Korean War.

Wehrmacht intended to reinforce its crumbling lines with a fresh Panzer Division. A Mosquito dropped marker flares into the tunnel entrance in a dive bomb delivery, upon which the Lancasters released their Tallboys. Multiple 100 ft craters were produced along the rail line, and one round penetrated the soft chalk hillside and caved in the roof of the tunnel.

The second Tallboy raid released 15 rounds into the waters of Le Havre port, sinking a squadron of Kriegsmarine E-boots (fast torpedo boats), which were causing heavy losses to convoys reinforcing the beachhead. The tidal waves produced smashed the pen doors, and three rounds penetrated the concrete roofs of the pens. A day later the E-boot base at Boulogne was attacked in the same fashion. Unexpended rounds, given their cost, were flown home for reuse. The final kill tally for these raids was 133 boats sunk, mostly E-boots.

The third Tallboy strike was a daylight raid against the enormous domed V-weapon bunker at Watten near the Pas de Calais, as part of Operation Crossbow, soon followed by a raid on the Wizernes domed bunker. After that, a bunker used to store V-1 buzz-bombs and A-4 ballistic missiles at Creil near Paris was attacked, with a Mosquito used to report weather and wind conditions, and a borrowed 8th AF P-51 Mustang used to mark the aimpoint. After that, the same tactics were used to deliver five Tallboys against the Mimoyecques V-3 site. Watten and Wizernes were later reattacked, and in a subsequent raid, a railway tunnel at Rilly la Montagne, used to store V-1s, was attacked.

The success of the Tallboy provided Wallis with arguments to fund the development of the scaled-up 22,000 lb Grand Slam, with the intent of busting the Kriegsmarine U-boot pens. While work proceeded on the Grand Slam, 617 Squadron attacked the U-boot pens at Brest on August 5, putting six Tallboy rounds through the reinforced roofs.

Subsequently Tallboys were used against the Dortmund Ems Canal, the lock gates of the Basel Kems Dam, and unsuccessfully against the Sorpe Dam, which survived the Upkeep raid. In September 1944, Tallboy-armed Lancasters deployed to Arkhangelsk in the USSR to attack the Tirpitz as it hid in a Norwegian Fjord. Enough damage was inflicted to force the ship to Tromso Fjord for repairs where a November Tallboy raid from Lossiemouth resulted in its capsizing.

In December 1944 the E-boot pens at Ijmuiden in Holland were attacked, followed by January raids against the U-boot pens at Ijmuiden, Bergen, Poortershaven and later Hamburg.

The first two Grand Slams were delivered in March 1945 against the Arnsberg and Bielefeld viaducts, also attacked with 14 Tallboys. A re-attack using six Grand Slams collapsed the target.

On April 16, the pocket battleship Lutzow was attacked and sunk at Swinemünde using Tallboys.

The last RAF Tallboy sortie was against Hitler's mountain retreat at Berchtesgaden, destroying the Waffen SS barracks.

Two Grand Slams were used against the Farge U-boot pen near Bremen on March 27, penetrating seven metres of reinforced concrete. They were also used against the Brest and Huuge U-boot pens, the Nienburg bridge near Bremen, and the fortified naval gun batteries at Heligoland. A total of 41 were expended.

The last planned 617 Squadron Tallboy and Grand Slam sorties were to have been flown from Okinawa in January 1946, against Japanese mainland bridges as a prelude to the invasion as part of the RAF Tiger Force, but the raids were pre-empted by the Hiroshima and Nagasaki strikes.

The USAF was impressed with the Tallboy and Grand Slam and licensed the weapons as the M109 or T-10 and M110 or T-14. US Tallboys and Grand Slams used mostly rolled plate casings with forged nose cones. Boeing B-29 Superfortresses were modified to carry both, either a single centreline



The massive Farge U-boat pen did not survive Wallis' bombs.

Grand Slam or pair of Tallboys on wing root pylons. These weapons were used with some success in the subsequent Korean war, including command link guided VB-13 Tarzon variants.

The final evolution of the Tallboy was the US Air Force's gargantuan 43,000 lb class T-12, intended to be dropped by the B-36 Peacemaker but this was cancelled in August 1954, with nuclear weapons subsuming its role.