



**MAP OF LOCH STRIVEN (incl. Ardtaraig) IN RELATION TO THE ISLE OF BUTE**

## **Bouncing Bomb ('Highball') Tests - Loch Striven**

SOURCE: [http://www.secretscotland.org.uk/index.php/Secrets/LochStriven#Estate\\_sale](http://www.secretscotland.org.uk/index.php/Secrets/LochStriven#Estate_sale)

Barnes Wallis, an engineer with Vickers Armstrong, came up with the idea of a bouncing bomb that would skip across the water like a skipping stone and then sink alongside the target before exploding at a set depth. The initial design, known as Upkeep, was intended for attacking dams in Germany and was successfully deployed in the famous Dambusters raid, later made into a successful film of the same name.

The system also had possibilities against battleships such as the Tirpitz, which was then holed up in a Norwegian fiord. Battleships were encased in a considerable thickness of armour plating, and when moored were surrounded by anti-torpedo nets. However, the plating thickness at the bottom of the hull was much thinner, and therefore much more vulnerable. Attacking aircraft could drop bouncing bombs further from the target, and could then turn away more easily. A smaller, lighter bomb capable of being carried by a smaller, lighter and faster aircraft was required, and it was the testing of these Highball bombs that was mostly carried out in Loch Striven in Argyllshire. There would be carried by Mosquito fighter bombers of 618 Squadron based at [RAF Turnberry](#) in Ayrshire.

The Highball bomb was around 3 feet (915 mm) in diameter, weighing 1,200 lbs (600 kg) and described as spherical, although it had flattened sides. The bombs used in the tests contained no explosives and are generally described as being made of steel filled with concrete. However, we have received so far unconfirmed information that some were made of wood, or filled with wood, sawdust and glue by CE Morris Furniture of Glasgow. Prior to launch the bombs were spun up by the opening of an air duct under the aircraft, after which they had to be dropped at a set speed, altitude, and precise distance from the target. Once the design of the bombs had been perfected the rest of the flights were used for crew training, as the precision required to get the bombs to sink beside the target, but not hit it, was immense. If a bomb did hit the target it usually became dented, and this could affect the underwater dynamics, and it would

not explode under the ship. Highballs were often referred to as Naval Stores which is assumed to be naval slang but could have been a code name.

The old French World War I battleship Courbet was chosen as the target ship and moored in the loch with a set of nets underneath, intended to catch the bombs so that they could be recovered easily. However, the depth of water she was initially moored in, and the size of the nets used meant that few were recoverable, and she was moved to shallower water where larger catch nets were deployed. The bombs had a white stripe painted on the side, and the tests were filmed by the [Marine Aircraft Experimental Establishment](#) based at Helensburgh, which then interpreted the films using the white stripe to calculate the speed of rotation.

The number of bombs used in the tests is unknown, nor how many were recovered. Estimates of bombs used vary between 100 and 200.

Ultimately, it was decided to attack the Tirpitz using midget submarines, [X-Craft](#) (also tested and crews trained in Loch Striven), rather than Highball. Training and testing continued throughout the war, and it was later decided to deploy the bombs against Japanese capital ships. A new target ship, another outdated World War I battleship, the British HMS Malaya, was used. Her plating was so thin that she was seriously damaged just by errant bombs hitting her hull. A mess deck was flooded, and it was reported that she developed a serious list. Although the aircraft crews were sent to the Far East, it was again decided not to use the bouncing bomb, despite all the time and effort that had been expended into making it a viable option.

## **Archaeological Dives**

An initial dive in May 2010 was carried out to assess bottom conditions and visibility. Between Monday 12th and Saturday 17th July 2010 a series of 12 dives were made in the loch ranging from 30msw to 60msw using specialist breathing mixes to combat the effects of nitrogen narcosis and prolonged decompression requirements, to allow the divers to safely search for the Highball Bouncing Bombs from the Barnes-Wallis tests carried out during WWII. The project was initiated by Dr. Iain Murray of Dundee University. The diving was carried out by members of the Archaeological Divers Association which is a non-profit division of The Underwater Science Group and lead by the Managing Director, Ted Crosbie. The other divers were Phil Grigg, Rob Cromey-Hawke, Jez Armitage and Lindsay Brown. The Danish shipping company, Maersk donated £1,200 towards the dive.

Following upon a side [sonar](#) scan of the Loch bottom several areas were selected for a diving survey. Initial results were disappointing as nothing was found. However, on the Friday the divers came across a length of very heavy chain lying on the bottom and followed it to one end where they came across a huge anchor. They retraced their path and came across the first Highball lying alongside the chain. It showed little or no weed growth or accretion. As they followed the chain further they found a further 7 Highballs also in good condition although 2 were dented presumably from hitting the target vessel. At least one bomb had remnants of the white stripe still visible.

## **Press release**

The following was received from Ted Crosbie along with the linked video clips from the dive when the bombs were discovered.

In May 2010, a pre-project dive was conducted in Loch Striven to examine bottom composition and visibility and from that point the project was given the go ahead in July as planned. Divers who had completed underwater archaeological training with the Archaeological Divers Association and who had the required skills for operating at the planned depths were then selected and the team of five divers headed into the waters to start their initial reconnaissance search on the 13th July 2010. The dive team consisted of: Ted Crosbie (Dive Supervisor), Phil Grigg, Rob Cromey-Hawke, Jez Armitage and Lindsay Brown, and diving continued until Saturday 17th July 2010.

In total, 12 dives were made in the loch ranging from 30msw to 60msw using specialist breathing mixes to combat the effects of nitrogen narcosis and prolonged decompression requirements, to allow the divers to safely search for the Highball Bouncing Bombs. The team also used a Remotely Operated Vehicle (ROV) donated by Sheerwater Marine Services Ltd and logistical support was provided by the

Professional Diving Academy in Dunoon. All boat diving operations were conducted with the indefatigable support of Richard Home, a local fisherman (W151 Ashleigh M). Plans are now underway to complete an additional two-week survey, "Project 8-ball" at the beginning of September (2010) using state of the art electronic closed circuit rebreathers; thus allowing additional time on the seabed to map the entire site for insertion into the Historic Environment Record for both Scotland and Great Britain. Team members will be using high definition photography and videography; photomosaics and three dimensional site recording software. Upon completion of an holistic survey of the site, including its environmental impact, there are additional future plans to recover some of the Highballs for conservation and restoration and placement at Brooklands Museum in Surrey as there are currently no living records from the Loch Striven test site.

The project, in the majority, was funded by the parent company Underwater Science Ltd, and received additional funds from the Maersk Shipping Company and BAE Systems Ltd, which originally built and filled the Highballs. The project was supported by Peter Blacker, who owns the Glen Striven Estate adjacent to where the Highballs were found, as well as the Barnes Wallis Trust. Diving support services were provided by Phil Grigg Technical Diving.

## **Future Plans**

The team plan to return in two months to continue their survey work to locate and plot the positions of further Highballs and other archaeologically interesting wreckage . Ted Crosbie forecasts that it could take up to 2 years to complete the task and to include an obstruction shown on sailing charts. This had been thought to be a pile of anti-submarine nets but the [sonar](#) scan suggests a wreck, possibly a chariot or an [X-Craft](#) mini submarine.

Finally it is hoped to raise one or more of the bombs for display in Museums, one will be presented to the Brooklands Museum in Surrey where the Barnes Wallis collection is held. If more are raised then they will be placed in local museums. It is worth noting that at present there are no complete Highballs on display anywhere.

## **Estate sale**

During May 2011, it was announced that the Glenstriven estate in Argyll, where the bomb drop tests were carried out, was to be placed on the market. The tests were described as part of a news item about the sale:

Mr Blacker said he had always been aware of the estate's connection to one of the most important chapters in the history of the Second World War.

Last summer, a team from Dundee University visited the estate and found 14 test bombs still lying at the bottom of the loch. There are also still black marks on the rocks by the loch from the tar burned to create a smokescreen to hide the tests.

A member of the Berry family, who owned the estate at the time of the tests and were the only people allowed to stay in the area, told Mr Blacker of the secrecy surrounding the operation.

He said: "The security people came into the main house at Glenstriven and moved all the family to the back of the house, shut the curtains and the bombers would come down the loch."

Loch Striven was chosen because the landscape resembled the area of Germany where the bombs were to be dropped. The practice bombs were made from concrete and aimed at an old ship in the middle of the loch.

After the success of the tests, the bombs were used in the famous Dambuster attacks in Germany.

Two dams were destroyed by the RAF's 617 Squadron in Operation Chastise in one night in 1943.

This summer, the team from Dundee University plans to return to Glenstriven and try to recover the sunken bombs. Mr Blacker has been promised one as a souvenir.

- Estate where Dambusters tested bombs up for sale - Herald Scotland. May 26, 2011. <sup>[5]</sup>

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**More information regarding Loch Striven and the Isle of Bute during WWII:** [www.bute-at-war.org](http://www.bute-at-war.org)