Barnes Wallis

by Don Kerley

Whenever one hears the name, Barnes Wallis, the automatic response is "Oh, the bouncing bomb guy," or perhaps, "The designer of the Wellington bomber." These are two of his accomplishments, but this amazing man had many more of equal importance.

Wallis was born in Ripley, Derbyshire, in 1887, the son of a medical doctor. The family was not wealthy and could not afford to send him to one of the famous public schools. They did, however, get Wallis enrolled in Christ's Hospital, which was not a hospital but a private school, where all the boys were taught, housed and fed at no cost to the family. There he had the good fortune to have Charles E. Brown as his science teacher. This outstanding teacher had five of his former students elected Fellows of the Royal Society. In later years, Wallis wrote "Uncle Chas. (as we affectionately called him) did not teach science in the sense usually attached to the word; he used science to teach us to think, to reveal to us the powers we ourselves possessed."

After Wallis finished his schooling, he began working in the shipyards, where he progressed to the drawing board and worked along with H.B. Pratt, who had earlier worked at Vickers on the dirigible, *Mayfly*. Pratt did some mathematical analysis predicting that the *Mayfly* would break its back. His prediction came true and the ship was never rebuilt. In 1913, the German government placed an order for ten new Zeppelins. Someone at Vickers remembered H.B. Pratt's work and brought him back to work on airships. Pratt asked Wallis to join him at Vickers. In spite of all the enthusiasm for airships, there was confusion at the highest levels and the project was cancelled.

Wallis and Pratt joined the army but, in 1915, a coalition government was formed and the need for airships became urgent. Corporals Pratt and Wallis were found and made Sub-Lieutenants H.B. Pratt and B.N. Wallis in the Royal Navy. One of Wallis's first successes was the design of an airship mooring mast, usable in all weathers for gassing and fuelling and from which the airship could be directly launched. He also designed the airship *R80*, which was completed and flew in 1920 and was faster and lighter than had been expected. A year later, the government decided to discontinue airship development. Wallis took time off to obtain a degree and considered becoming a schoolteacher, even though he was Britain's foremost expert on the subject of airships.

A very wealthy fellow citizen, Dennistoun Burney, believed that the most efficient way to fly to the far-flung parts of the British Empire was by airship. Burney obtained permission to build such an airship and asked Wallis to be part of the team. Wallis would only accept if he were in total charge of the design. Burney accepted and work began on the privately financed *R100*. At the same time, the government-backed *R101* was being built. In 1930, the *R100* flew to Montreal, Canada, a distance of 3,300 miles and arrived with five tons of fuel left. After a 12-day visit, the *R100* made the return trip to Britain. The government-backed *R101* airship's trial flight was to India. It struggled across the Channel and crashed at Beauvais, France. Of the 54 persons aboard, all but six were killed. This tragic accident marked the end of the airship age for Britain.

During his work on the airships, Wallis developed a construction technique that produced strength and lightness. New aluminium alloys provided the lightness and 'geodesics' provided the strength. 'Geodesics' is a branch of mathematics dealing with curved surfaces, like finding the "great-circle" route between two points on a globe. The geodesic frame of an aircraft provided great strength eliminating bulkheads and braces, in effect, a self-stressing, hollow structure. The hollow wings provided room for additional fuel tanks. In 1934, the Air Ministry wanted a new bomber and placed an order with Vickers for a bi-plane bomber. Wallis and the Vickers Company knew that a monoplane would be superior, but could not convince the Air Ministry. They built both models, the monoplane being built at their own expense. The monoplane, designed by Wallis, flew in 1935 and convinced everyone that it was vastly superior to the bi-plane. They named it the *Wellesley*. It was a single-engine, low-winged monoplane, with retractable undercarriage. In 1938, two *Wellesleys* flew non-stop from Egypt to Australia, a distance of 7,162 miles, in two days. The *Wellesley* was quickly replaced by the *Wellington* bomber, which was vastly superior to the Fairey *Battle* and the Bristol *Blenheim*, which were being produced at that time. The *Wellington* was used as a submarine killer, torpedo bomber, a reconnaissance aircraft, and even on minesweeping operations. There

Wellingtons, fitted with a giant magnetic coils, flew 40 feet above the waves detonating magnetic mines. Wellingtons carried the bomber war to Germany until the four-engine bomber came on stream. Wellingtons, Whitleys and Hampdens took part in the August 1940 attack on Berlin.

Wallis was opposed to carpet-bombing. He believed accurate bombing by very large bombs would be more effective. This belief drove him to become an expert on high explosives as a means of destroying extremely large targets, such as major dams, with accurately placed devices. He devised a bomb capable of destroying a large dam and calculated the precise altitude, speed and distance-to-target needed to accomplish this. Even the smallest detail, such as the amount of backspin on the bomb, was calculated. The proof of his theories came with the attack on the Möhne Dam. The first bomb exploded more than five yards from the dam. The second bomb, dropped at 60 feet, airspeed 230 mph, bounced three times, hit the dam, slid down the surface of the dam, detonated at the pre-set depth, and breached the massive dam, just as Wallis had predicted. The heroism of the members of 617 Squadron will appear in a future article, this article is about Wallis's contributions.

After the raid on the dams, Squadron 617 stayed together under the command of Group Captain Leonard Cheshire and continued to specialize in Wallis's big bombs, the Tallboy and the Grand Slam. Several 12,000-pound Tallboys were dropped on the Saumar railway tunnel just after D-day, which delayed a Panzer division's arrival in Normandy. These bombs penetrated the earth as though it were butter and produced a devastating shock wave from great depth. In November 1944, highly modified Lancasters from 617 Squadron found the German battleship, Tirpitz and the Tallboy bombs penetrated the thick armour plating, ending this deadly threat to Allied shipping.

After the war, Wallis turned his attention to designing supersonic aircraft. He designed a variable geometry aircraft with wings that folded back into a delta shape. He built the Swallow, a rocket-powered, eight-foot long model, that flew at great height at 2.5 Mach, but could not convince Vickers or the British government to finance the development of a full-scale model. This was a bitter disappointment to Wallis, particularly when the government was paying for the development of the TSR2, a tactical, strike, reconnaissance, aircraft that was eventually cancelled when they found that it would be cheaper to buy the American F-111s. In 1968, Wallis was awarded a knighthood for his outstanding contributions to his country.

Sir Barnes Wallis died in 1979.