

# The Pathfinder Museum



## Pathfinder Aircraft - Avro Lancaster



The Avro Lancaster was a four-engine World War II bomber aircraft made initially by Avro for the Royal Air Force (RAF). First used in 1942, together with the Handley-Page Halifax it was the main heavy bomber of the RAF, the Royal Canadian Air Force, and squadrons from other Commonwealth and European countries serving with RAF Bomber Command. The Lancaster was primarily a night bomber.

### DEVELOPMENT

The origins of the Lancaster design was in a twin-engined heavy bomber powered by Rolls-Royce Vulture engines submitted to Specification P.13/36 which was for a new generation of twin-engined medium bombers. The resulting aircraft was the Avro Manchester, which, although a capable aircraft, was troubled by the unreliability of the Vulture. It was withdrawn from service in 1942 at which point 200 aircraft had been built.

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Avro's chief designer, Roy Chadwick, was already working on an improved Manchester design using four of the more reliable but less powerful Rolls-Royce Merlin engines on a larger wing. The aircraft was initially designated Avro Type 683 Manchester III; it was later named the Lancaster. The new aircraft made its first test flight on January 9, 1941, and proved to be a great improvement on its predecessor. Most of the original Manchesters were rebuilt as Lancasters; the designs were very similar, and both featured the distinctive greenhouse cockpit, turret nose, and twin tail although the Lancaster discarded the stubby central tail fin of the Manchester.

The majority of Lancasters built during the war years were manufactured by Metropolitan-Vickers, Armstrong Whitworth, and Avro. The plane was also produced at the Austin Motor Company works in Longbridge, Birmingham later in World War II. Only 300 of the Lancaster Mk II with Bristol Hercules engines were made, see photograph at the end of this article. The Lancaster Mk III had newer Merlin engines but was otherwise identical to earlier versions; 3,030 Mk IIIs were built, almost all at A.V. Roe's Newton Heath factory. Of later versions only the Canadian-built Lancaster Mk X was produced in any numbers, built by Victory Aircraft in Malton, Ontario; 430 of this type were built. They differed little from earlier versions, except for using Packard-built Merlin engines and having a differently configured mid-upper turret. 7,377 Lancasters of all marks were built over the war; a 1943 Lancaster cost £45-50,000 (Approximately equivalent to £1.3-1.5 million in 2005 currency).

Lancasters from Bomber Command were to have formed the main strength of Tiger Force, the Commonwealth bomber contingent scheduled to take part in Operation Downfall, the codename for the planned invasion of Japan in late 1945, from bases on Okinawa.

## OPERATIONAL HISTORY

In 1942-45, Lancasters flew 156,000 operations and dropped 608,612 tons of bombs. 3,249 Lancasters were lost in action. Only 35 Lancasters completed more than 100 successful operations. The greatest survivor completed 139 operations and survived the war, to be scrapped in 1947.



*The Lancaster I NG128 dropping its load over Duisburg on Oct 14, 1944. The aircraft is carrying Airborne Cigar (ABC) radio jamming equipment, as shown by the two vertical aerials on the fuselage.*

An important feature of the Lancaster was its extensive bomb bay, at 33 feet (10.05 m) long. Initially the heaviest bombs carried were 4,000 lb (1,818 kg) "Cookies". Towards the end of the war, attacking special and hardened targets, the B1 Specials could carry the 21 foot (6.4 m) long 12,000 lb (5,448 kg) 'Tallboy' or 25.5 foot (7.77 m) long 22,000 lb (9,979 kg) 'Grand Slam' "earthquake" bombs. This required modification of the bomb-bay doors. The Lancaster had a very advanced communications system for its time; the famous 1155 receiver and 1154 transmitter. These provided radio direction-finding, as well as voice and Morse capabilities. Later Lancasters carried:

- **H2S** - Ground looking navigation radar system - though it could be homed on by German night fighters' NAXOS receiver and had to be used with discretion.
- **Monica** - a rearward looking radar to warn of night fighter approaches - a notable disaster, transmitting constant warnings of bombers in the same formation it was ignored by crews and instead inadvertently served as a homing beacon for suitably equipped German night fighters, who would then use Schräge Musik to attack the bombers.
- **Fishpond** - an add-on to H2S that provided additional (Aerial) coverage of the underside of the aircraft to display attacking fighters on the main H2S screen.
- **GEE** - A receiver for a navigation system of synchronized pulses transmitted from the UK - aircraft calculated their position from the phase shift between pulses. The range of GEE was 3 - 400 miles.
- **Oboe** - a very accurate navigation system consisting of a receiver/transponder for two radar stations transmitting from the UK - one determining range and the other the bearing on the range. As the system could only handle one aircraft at a time it was only fitted to Pathfinder aircraft which marked the target for the main force. Later supplemented by GEE-H, similar to Oboe but with the transponder on the ground allowing more aircraft to use the system simultaneously. GEE-H aircraft were usually marked with two horizontal yellow stripes on the fins.
- **Village Inn** - A radar-aimed gun turret fitted to some Lancasters in 1944.

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The most famous use of the Lancaster was probably the 1943 mission, codenamed Operation Chastise, to destroy the dams of the Ruhr Valley using special drum shaped bouncing bombs designed by Barnes Wallis, and carried by modified Mk IIIs. The story of the mission was later made into a film, *The Dam Busters*. Another famous action was a series of attacks, including one from a temporary base at Yagodnik in the Soviet Union, against the German battleship *Tirpitz* with Tallboy bombs, ended with the sinking of the *Tirpitz*.

A development of the Lancaster was the Avro Lincoln bomber, initially known as the Lancaster IV and Lancaster V. These two marks became the Lincoln B1 and B2 respectively. There was also a civilian airliner based on the Lancaster, the *Lancastrian*. Other developments were the York, a square-bodied transport, and the *Shackleton*, which continued in airborne early warning service up to 1992.

In 1946 four Lancasters were converted by Avro at Bracebridge Heath, Lincolnshire as freighters for use by British South American Airways, they proved to be uneconomical and were withdrawn after a year in service.

Four Lancaster IIIs were converted by Flight Refuelling Limited as two pairs of tanker and receiver aircraft for development of in-flight refuelling. One aircraft was flown non-stop 3,355 miles in 1947 from London to Bermuda. Later the two tanker aircraft were joined by another converted Lancaster and were used in the Berlin Airlift, they achieved 757 tanker sorties.

Argentinean models were used several times during its service in several military coups.

*Last but by no means least, a photograph below of the radial engine Lancaster II*

