Heroes of the Bombe story

Alan Turing was a leading young Cambridge University mathematician when he was recruited to work as a codebreaker. After he was told about the Poles' success against Enigma, he realised that if you could guess some part of a message, known as a "crib", he could design a machine to search for potential Enigma key settings. He called the machine the "Bombe", similar to the name (Bomba) used by the Poles in an earlier attempt to decrypt Enigma messages. Unfortunately Turing's original design needed many 'loops' in a menu to avoid far too many invalid stops. This made it difficult to find a viable menu, and the original Bombe would not have sufficient throughput for the codebreakers' needs.

Gordon Welchman was also a mathematician and codebreaker who worked on Enigma. He spotted that the Enigma had a weakness which could be used to eliminate most of the Bombe's possible but irrelevant key settings. He noted that the key wiring inside an Enigma machine meant that if at some moment typing "A" produced "L" in the coded message, then had the operator instead typed "L", an "A" would have appeared in the coded message. By modifying the Bombe's wiring to exploit this, it was possible to reduce the possible keys in much less time, which could be checked in. As a result, on many days the British could find that day's Enigma key before breakfast enabling other messages to be read for the rest of the day as quickly by the Allies as by the enemy.

When and where to see the Bombe

The Bombe is housed at The National Museum of Computing.

Volunteer guides are available to explain and demonstrate in more detail how the Bombe works. For safety reasons, access to the gallery has to be limited when maintenance is being carried out, normally on Mondays.

Group and corporate visits can be arranged. Contact corporates@tnmoc.org for details.

Fancy becoming a codebreaker? Exclusive Masterclasses are available, subject to availability. Please contact corporates@tnmoc.org or call us on 01908 374708.

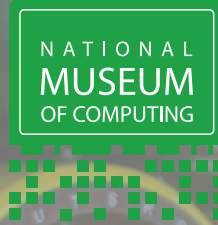Details of museum events can be found on: www.tnmoc.org/events

Location

The National Museum of Computing

Block H

Bletchley Park

Milton Keynes

MK3 6EB

Opening Hours

Tuesday - Sunday

10:30 am - 17:00 pm

For further details visit www.tnmoc.org

NATIONAL MUSEUM OF COMPUTING

Turing-Welchman Bombe

General Dwight D Eisenhower (Allied SupremeCommander) wrote to Menzies (Head of Bletchley Park) in 1945 saying that its activities had

"saved thousands of British and American lives and, in no small way, contributed to the speed with which the enemy was routed and eventually forced to surrender."

Find out how it was done …

Introduction

The Second World War was a war of movement often over long distances. On land, at sea and in the air, commanders needed secure communications with mobile units. Essential to success were secure, portable, two-way wireless links. The German solution was to adapt a commercial coding machine called Enigma.

By 1939, the Enigma machine was widely believed to be unbreakable. However, cryptographers in Poland, on Germany's eastern border, had been breaking Germany's Enigma messages throughout the 1930s despite repeated German upgrades.

In western Europe, only as war loomed, did British and French codebreakers start to study Enigma messages but without much success.

In 1939, threatened with invasion, the Poles decided to share their secret success with their closest allies, the French and British. To their allies' surprise, at a meeting in August 1939, the Poles presented them with working replicas of German Enigma machines.

With the outbreak of war, the Germans made further changes which made the Polish methods of code-breaking unworkable. What was needed now was to mechanise the codebreaking.

Enter Alan Turing and Gordon Welchman…

Breaking Enigma Messages

How did the Bombe help the Allies win the War?

German commanders communicated with field units encoded by messages encoded on Enigma machines and sent by wireless using Morse code. Each high command, about 24 in all, had its own wireless network and daily key settings.

British listening posts (called "Y stations") eaves-dropped on messages, copied them down and sent them to Bletchley Park.

Every day, Bletchley Park used Bombe machines to find that day's key for each network. Once the key was found all messages sent using that key could be read as quickly at Bletchley Park as by the Germans.

Analysts at Bletchley Park assessed the intelligence value of each message. Depending on its importance, the contents might be sent to Allied commanders or even Churchill himself.

It was vital that the enemy did not realise that Enigma had been broken, so great care had to be taken to avoid arousing their suspicions. All Allied commanders had a dedicated Special Liaison Unit (SLU) which passed information to them without revealing its source.

Liaison unit based at a Libyan airfield with a mobile wireless station in an adapted car Photo: Geoffrey Pidgeon

Reconstructing the Bombe

John Harper (right), founder of the Bombe Rebuild Project, explains the Bombe to HRH Duke of Kent at the official switch on in 2007

1996	Research begins
1997	Construction of Bombe frame starts
Sept 1997	Frame delivered to Bletchley Park
2000	Frame completed
2001	Gearbox, Clutch and DC Motor running off own DC Power Supply
2002	All moving parts moving under DC power
2006	Construction complete except drums
Aug 2006	Checking machine complete. Typex Machine now working as an Enigma machine. Also first Static menu working.
July 2007	Official 'Switch On' by His Royal Highness the Duke of Kent. Machine now fully reliable.
April 2018	Bombe moved to The National Museum of Computing

The Bombe is owned by the Turing-Welchman Bombe Rebuild Trust and is on long-term loan to TNMOC. "Cantab" in the code name of the project to build over 200 Bombes by BTM Ltd during the Second World War