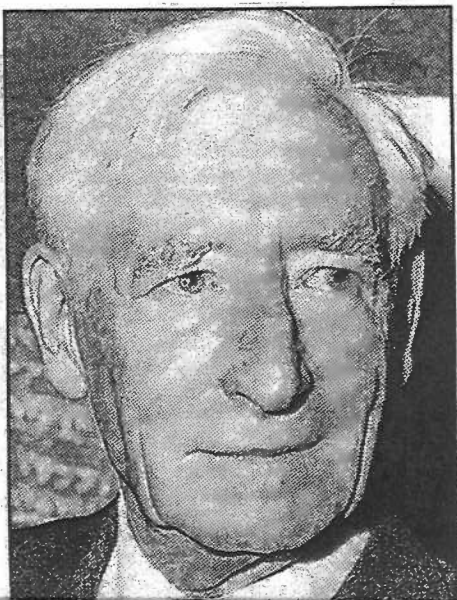


The computer that won the war

(And, pitched against modern laptops,
Colossus is still a cracking codebreaker)



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MORE than 60 years have passed since it last saw action in the titanic struggle against the Nazis.

But yesterday, Colossus – the code-breaking computer that helped turn the course of the Second World War – was back in business.

Hundreds of radio-style valves glowed red, ticker-tape sped through reels at lightning speed and, after decades of silence, the machine's whirring and clattering resumed.

Thanks to a remarkable 14-year reconstruction effort, the world's first programmable digital computer is once again in full working order.

Immediately Colossus was set the task of decrypting secret messages sent from a wartime cipher machine owned by a museum in Paderborn, Germany.

No lives were at stake this time, just the chance to prove Colossus could crack the code ahead of rival teams armed with laptops.

Experts predict the modern computers will struggle to keep up. Colossus – about the size of a shed



By Paul Harris

and occupying half a room – still takes pride of place at Bletchley Park in Buckinghamshire, the wartime codebreaking centre that is now home to the fledgling National Museum of Computing.

Colossus's speed and reliability depend on the hand-built intricacy of its components and the genius of those who designed and programmed it. Before it was invented, secret messages were taking up to six weeks to decipher, by which time the information was usually worthless.

The Germans had started to use a high-level encryption machine called the Lorenz to transmit the most important messages from senior field commanders back to High Command in Berlin.

Britain knew of the existence of Lorenz, but was floundering in its attempts to crack the codes.

Cue Tommy Flowers, an electronics engineer with Royal Mail, and Max Newman, a brilliant mathe-

matician. From February 1943, Flowers and a top-secret team spent 11 months designing and building Colossus to bring to life Newman's scientific theories and meet his technical requirements.

Even while the 1,500-valve Mark I was still on its trial run, the Mark II – five times faster and with nearly twice as many valves – was being designed to replace it.

Soon, Bletchley would have access to ten Colossus machines,

10,000

people worked at Bletchley Park at the height of its activity

overseen by a team of 550 operators working day and night.

The code war was about to be won and the foundation stone of modern computing had been laid.

The Nazis broadcast messages in complete ignorance of Colossus, which became one of the most closely-guarded secrets of the war.

Each message intercepted by an Allied listening station was con-

verted into paper tape punched with holes representing written characters. The ticker-tape was looped and fed into Colossus, where it would be scanned at up to 5,000 characters a second.

If it was successful, a pattern would eventually emerge – which codebreakers could turn into text.

So secret was the technology that Churchill ordered that the Colossus machines be taken apart at the end of the war.

Their existence was publicly revealed only when Official Secrets Act restrictions were lifted 30 years later. Engineers who worked on the original project were so proud of the all-British achievement, however, that they illegally kept their plans and circuit diagrams.

Those papers were used, in conjunction with a set of 1945 photographs, to rebuild Colossus.

Last night, Bletchley Park said Colossus had cracked two of the three messages sent from Germany and would resume on the third today. None of the rival teams had claimed any success.

Without Colossus, it is estimated that the war would have dragged

hundreds of thousands more lives.

Its success in unscrambling secret German transmissions was such that it enabled British military chiefs to work out Hitler's battle strategy and adjust their own plans accordingly.

Most notably, it allowed them to confirm the Germans had fallen for the Allies' misinformation campaign before the D-Day landings of June 1944.

In 1944 and 1945, Colossus decrypted 63million characters of high-grade German messages, enough to fill nearly 5,000 novels.

Tony Sale, a founder of the computing museum and leader of the Colossus project, said: 'Witnessing the Mark II in action is a chance to relive and admire the historic breakthrough made by Bletchley Park code breakers during the Second World War.'

'We believe the legacy of the code breakers, who paved the way for modern-day computing, should be seen, treasured and admired by everyone.'

'Colossus marks the beginning of the modern age of computing – a heritage that we are planning

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HOW IT WORKS

1: INTERCEPTION
German message intercepted by Allied listening post and converted into tape with punched holes representing letters

2: LOADING Tape made into a loop which is threaded around reels in a frame known as a bedstead

3: READING Spinning at 30mph, tape passes beneath optical reader - wartime equivalent of a modern CD drive.

4: ANALYSING Colossus's brain - the equivalent of a modern hard drive - uses statistical analysis to search for patterns within the data

5: DECODING Operators monitor these patterns seeking to isolate the encrypted message. Lights indicate quality of matches

6: OUTPUT
Message unscrambled and sent to teleprinter

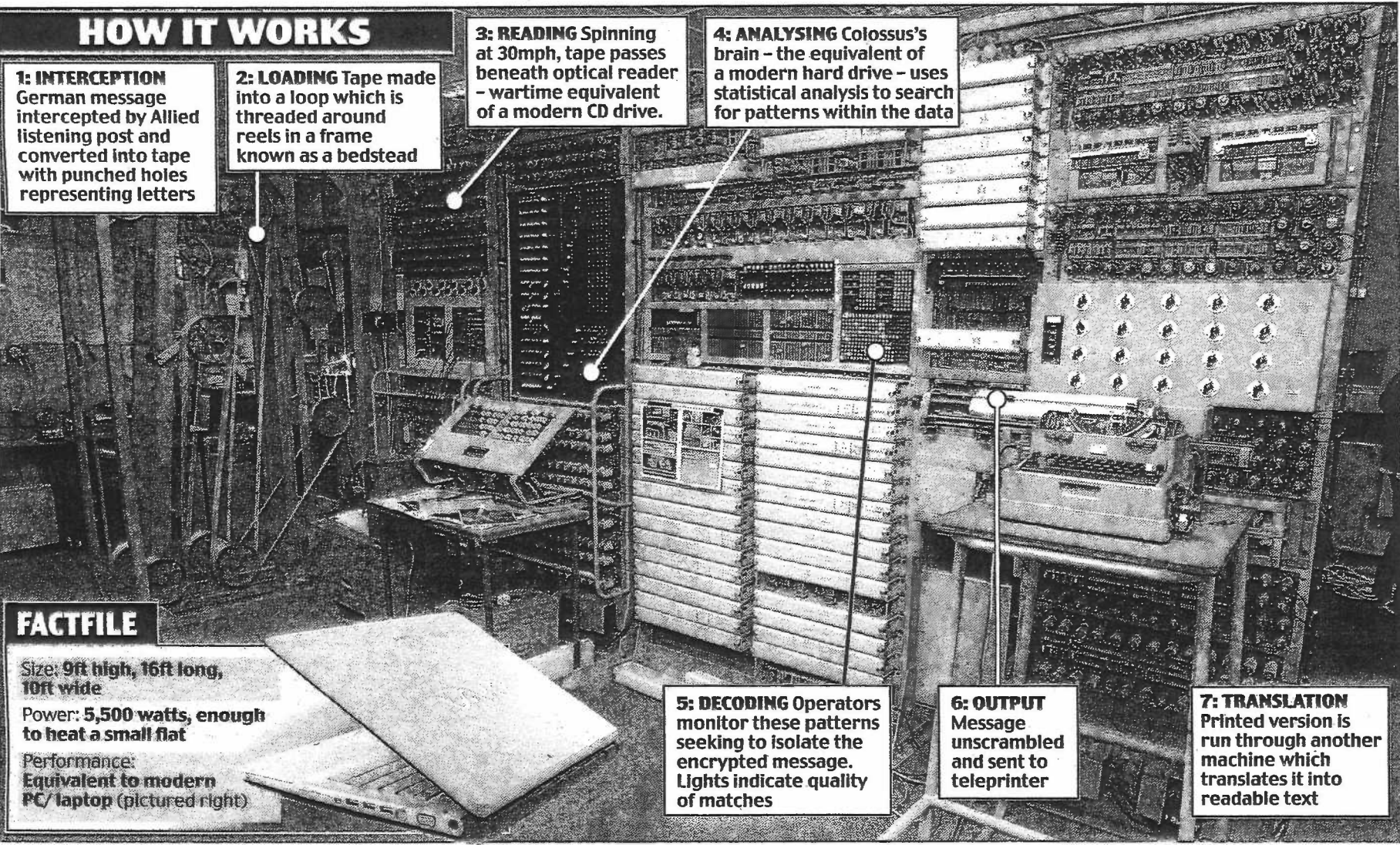
7: TRANSLATION
Printed version is run through another machine which translates it into readable text

FACTFILE

Size: 9ft high, 16ft long, 10ft wide

Power: 5,500 watts, enough to heat a small flat

Performance:
Equivalent to modern PC/laptop (pictured right)



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