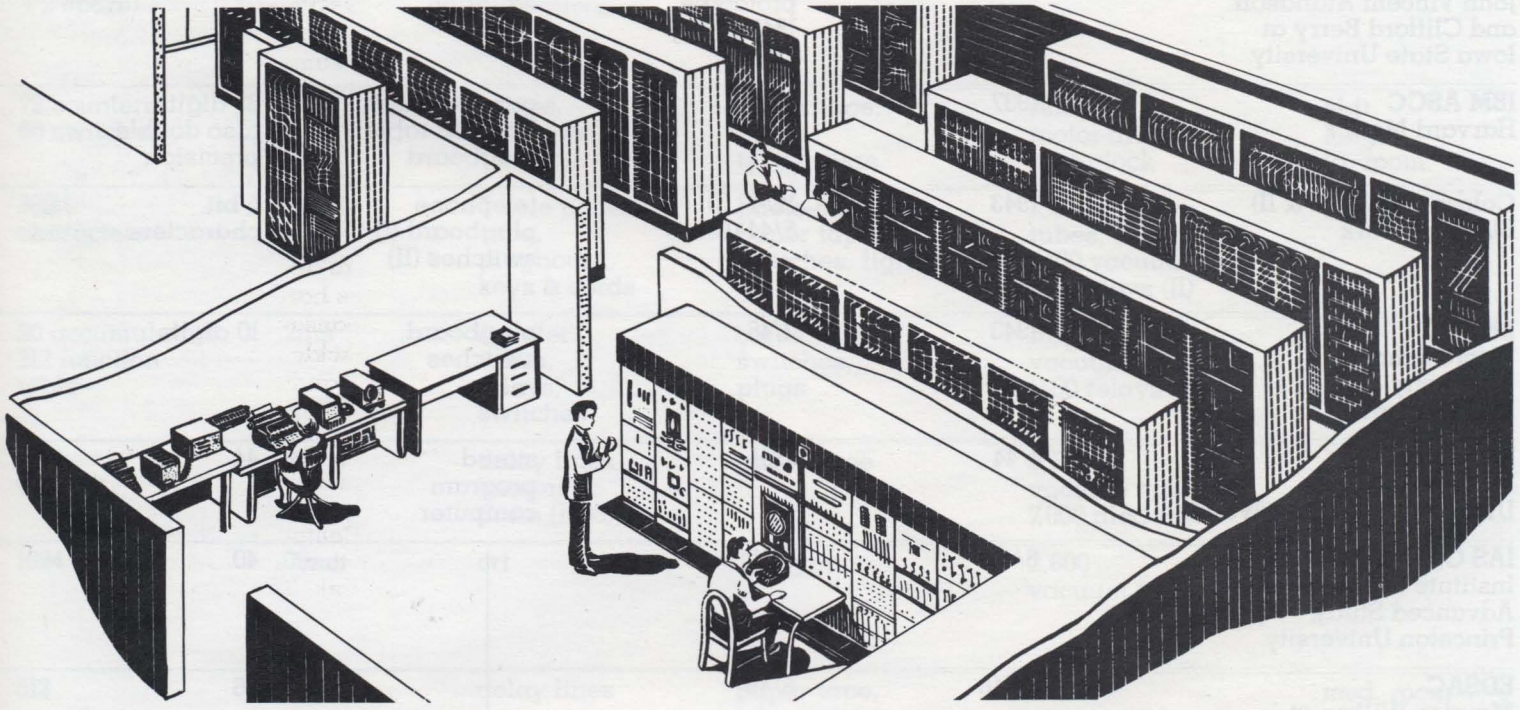
In 1944, the Massachusetts Institute of Technology contracted with the Navy to build a universal aircraft flight simulator/trainer. Jay Forrester of the M.I.T. Servomechanisms Lab became director of the project. By 1945, the original conception of an analog machine was dropped, and the Navy approved construction of a digital computer in 1946. A general-purpose computer could take care of not only flight simulation calculations, but a variety of other scientific and engineering applications. Whirlwind was completed in stages; the entire central machine was working in 1951.



The most important legacy of the flight-simulator concept was Whirlwind's real-time design. To allow the instantaneous response needed for flight simulation, Whirlwind originally used its own version of cathode-ray tube memory, at that time the fastest available type of memory. It was also, in the words of a 1952 project summary report, **"the most important factor affecting reliability of the Whirlwind I system."**

M.I.T. Project Whirlwind, Summary Report #31, 1952, p. 6. Institute, Archives and Special Collections, M.I.T. Libraries, Cambridge, MA.

An elaborate system of marginal checking identified hardware problems before they affected computational accuracy.

At the same time, new military applications which demanded higher-than-ever reliability were emerging. The Cold War was at its height, and the U.S. military was on guard against atomic attack. Whirlwind, funded by the Office of Naval Research and then by the Air Force, was part of the defense network; the production version of the Whirlwind II design, named AN/FSQ-7, was to become part of the SAGE System. Project members, dissatisfied with CRT memory performance, researched a substitute.

Several researchers in the late 1940s, including Jay Forrester, conceived the idea of using magnetic cores for computer memory. William Papian of Project Whirlwind cited one of these efforts, Harvard's "Static Magnetic Delay Line," in an internal memo. Core memory was installed on Whirlwind in the summer of 1953. **"Magnetic-Core Storage has two big advantages: (1) greater reliability with a consequent reduction in maintenance time devoted to storage; (2) shorter access time (core access time is 9 microseconds; tube access time is approximately 25 microseconds) thus increasing the speed of computer operation."**

M.I.T. Project Whirlwind, Summary Report #35, 1953, p. 33. Institute Archives and Special Collections, M.I.T. Libraries, Cambridge, MA.

Whirlwind was thus the first full-scale computer to run on core memory, the mainstay of primary memories until the 1970s.