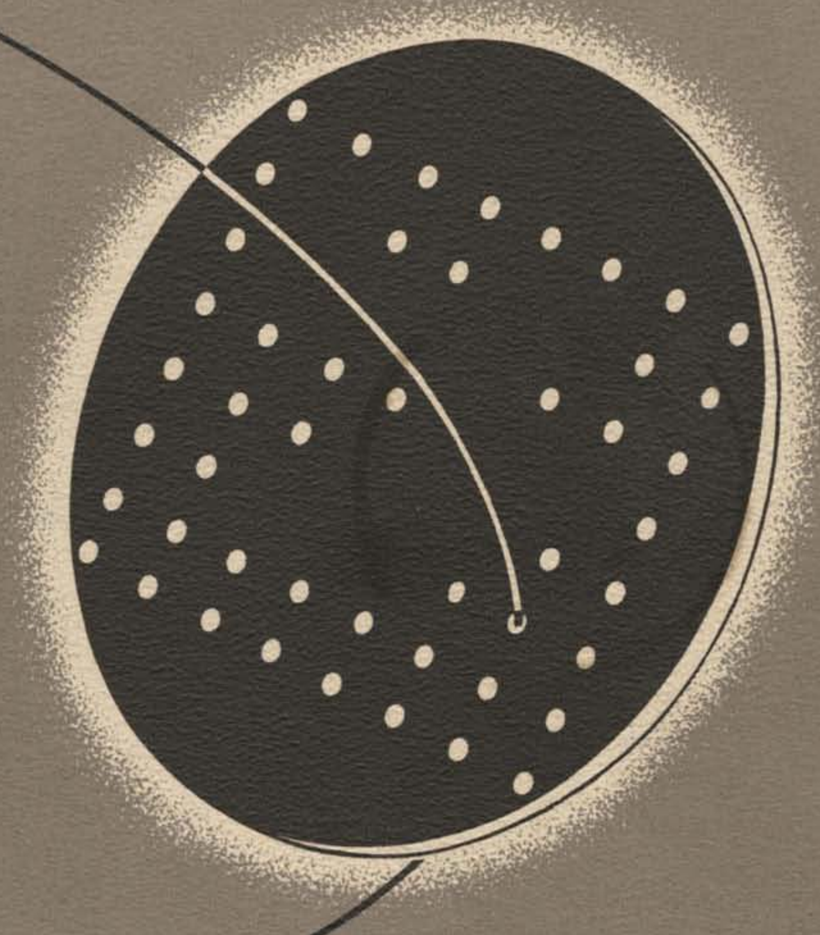
Whirlwind 1



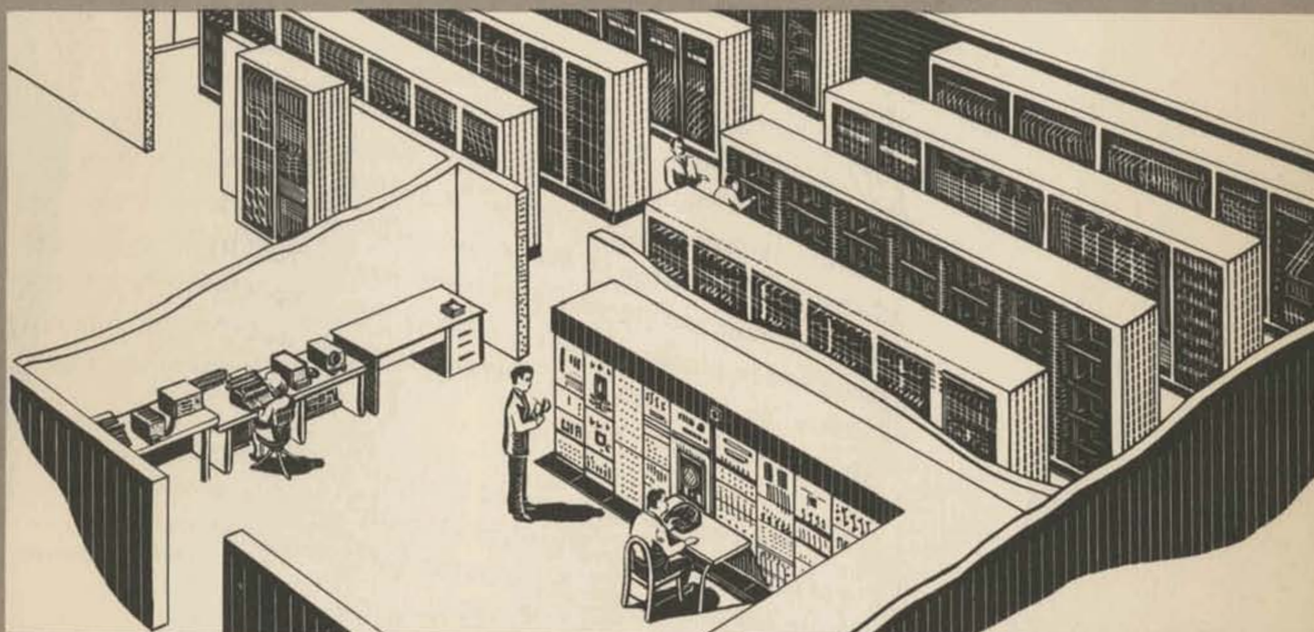
ELECTRONIC COMPUTER DIVISION

SERVOMECHANISMS LABORATORY

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Whirlwind 1

A HIGH-SPEED ELECTRONIC DIGITAL COMPUTER



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CAMBRIDGE 39, MASSACHUSETTS

This booklet gives a general description of the Whirlwind I digital computer developed at the Servomechanisms Laboratory, Massachusetts Institute of Technology. Project Whirlwind was initiated by the Office of Naval Research, and for a considerable period was supported exclusively by them under contract N5ori60. It is now supported jointly by the Office of Naval Research and the United States Air Force.

The results that have so far been achieved represent the combined efforts of many; the following have played leading parts in the development of the computer:

H. R. Boyd	H. Fahnestock
S. H. Dodd	N. H. Taylor
R. R. Everett	C. R. Wieser

P. Youtz

This booklet was prepared by R. R. Rathbone

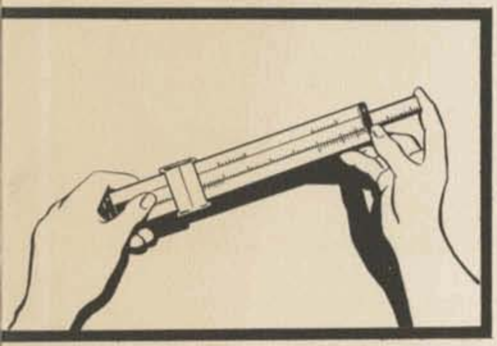
Jay W. Forrester

J. W. Forrester
Project Supervisor

15 August 1951

Computing Devices

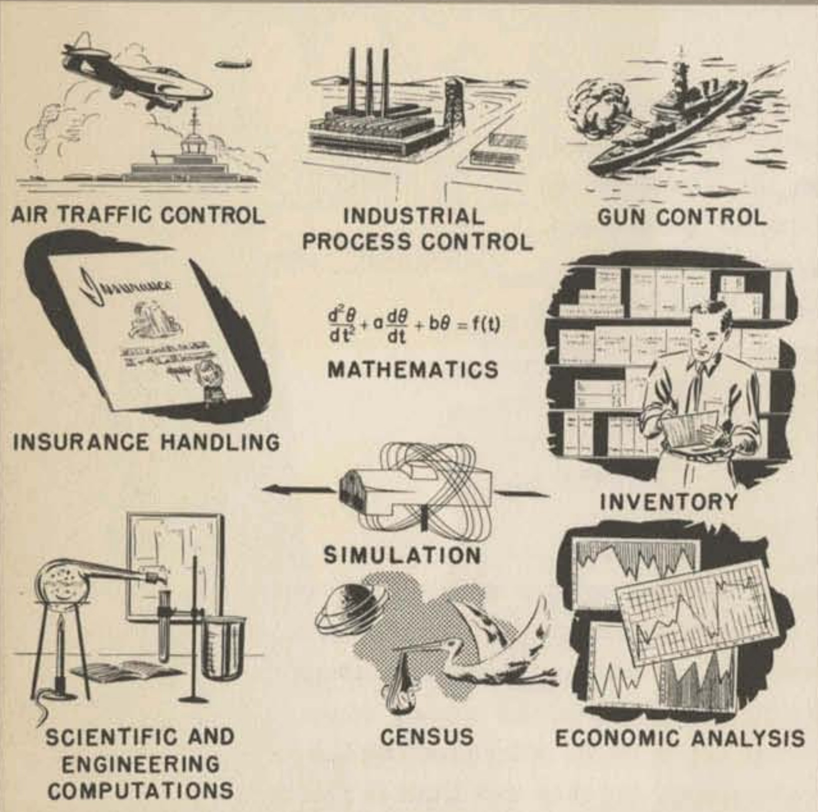
A digital computer counts. Only discrete quantities are used by the machine during a computation, and these are represented numerically. For example, the abacus is a simple digital device on which calculations are performed by sliding counters along digit rods. The precision of a digital computer is determined by the number of digits in the machine (in the case of the abacus, the number of rods and counters), and may be increased by the addition of more digits.



In contrast, an analog computer measures; the quantities it uses are continuous. For example, the slide rule, an analog device, provides continuous mathematical measurements. The precision of any particular analog computer, however, has a definite upper limit, determined by the precision of its fabricated parts, and once this limit is reached, precision cannot be increased without a redesign of the whole machine.

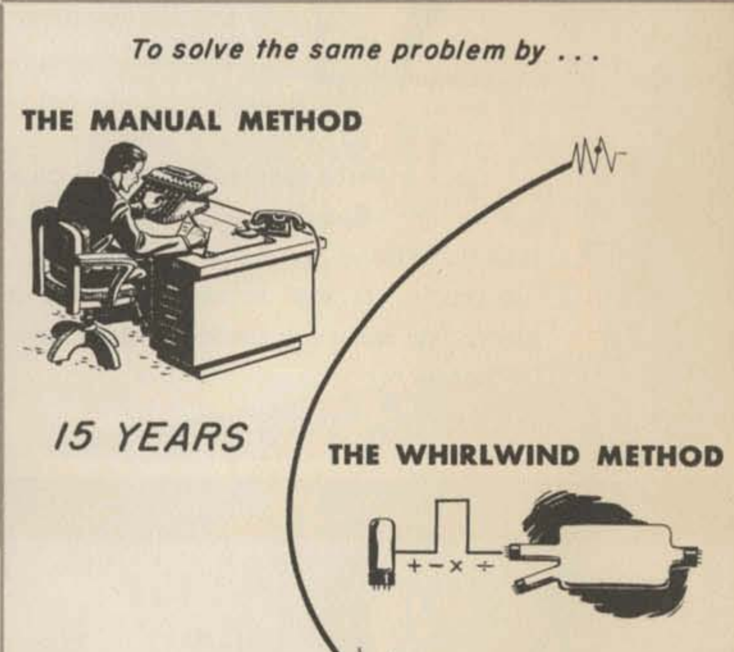
Modern electronic digital computers operate automatically. Usually, high-frequency pulses travel along transmission lines from one element to another and cause electronic circuits to be turned on or off. The resulting electronic states of these circuits represent the numbers in the problem.

Whirlwind 1



Whirlwind 1 is a general-purpose electronic digital computer. Although it will handle only one type of problem at a time, its program can be changed in a few seconds to accommodate the variety of problems involved in the processing of information.

Whirlwind 1 can solve complex mathematical problems by repeated use of the fundamental processes of addition, subtraction, multiplication, and division — at a rate of several thousand times per second.



Summary of Whirlwind I Specifications

TYPE OF COMPUTER . . . . General purpose, high-speed

DESIGN . . . . Electronic, digital

NUMBER SYSTEM USED . . . . Binary

REGISTER LENGTH (basic) . . . . 16 Binary digits

METHOD of HANDLING NUMBERS . . . . Parallel digit transmission, addition, and storage

TYPE of INTERNAL STORAGE . . . . Electrostatic storage tubes

CAPACITY of INTERNAL STORAGE . . . . Initially 256 registers; when complete, 2048 registers

ACCESS TIME to INTERNAL STORAGE . . . . Initially 25 microseconds; when complete, 6 microseconds

BASIC FUNCTIONAL DESIGN . . . . 0.1-microsecond pulses, representing instructions or numbers, are distributed via gate tubes, which pass pulses only when a coincidence signal from a memory device, such as a flip-flop, is present

PULSE REPETITION FREQUENCY . . . . 2 megacycles in arithmetic element, 1 megacycle elsewhere

ADDITION TIME (in microseconds)

To add two numbers already in the arithmetic element 2

To get one number from storage and add it to one already in the arithmetic element . . . . Initially 60, goal 24

To get two numbers from storage, add them, and to transfer the answer to storage . . . . . . Initially 180, goal 72

AVERAGE MULTIPLICATION TIME, INCLUDING ROUNDOFF (in microseconds)

To multiply two numbers already in the arithmetic element 20

To get one number from storage and multiply it by one already in the arithmetic element . . . . Initially 75, goal 39

To get two numbers from storage, multiply them, and to transfer the product to storage . . . Initially 195, goal 87

INPUT AND OUTPUT . . . . Typewriter, perforated paper tape, magnetic tape, magnetic drum, oscilloscope display

ERROR DETECTION . . . . By built-in identity checks and miscellaneous alarms

TROUBLE LOCATION . . . . By automatic marginal-checking system which locates deteriorating components during test periods