



Eastern Air Lines

FLYING JET ON GROUND—These two photographs show the world's first flight training device, for the Boeing 727 jetliner about to be put into service, to be run by a digital electronic computer. Right, Howard W. Mehrling, chief electronics engineer for Eastern Air Lines, and Science Service reporter Ann Ewing are pictured outside the flight simulator as computer engineer John M. Hooke climbs it toward cruising altitude in a practice run. One of the hydraulic rams that give up-and-down motion, a first for flight trainers, can be seen on the side. Left, Miss Ewing checks instructions from the instructor while flying the Boeing 727 simulator.

AVIATION

Jet Flying—Two Feet Up

The takeoff of the Boeing 727 jetliner was smooth and unbelievably quiet. Despite the strong impression of actual flight, we were stationary—By Ann Ewing

▶ ANYONE WHO CAN FLY a little plane could fly the new air age big jets after the plane is aloft.

I know because I flew the new Boeing 727 jet—not actually in the air but in an Eastern Air Lines equivalent for actual flying, the world's only simulator for the middle-range 727 jetliner which will fly on regular schedule in mid-January.

It was wonderfully like the real thing. There was the faint roar of engines, feel of take-off and a bounce on landing, and actual up-and-down motion as if in the air. There was also a co-pilot, John M. Hooke, to take off and land and to iron out the mistakes I made, the first woman to fly the land-locked trainer.

But we never went more than two feet off the ground. We did not have a crack-up, even a simulated one. However, we did put the giant training device, run by a digital computer, into a simulated spin.

My pilot experience is from more than a decade ago when I learned to solo and earned my license in an Aeronca that had two seats and one engine. This helped on my assignment to fly the tri-jet Boeing 727 in the simulator.

This glorified Link trainer bears about as much resemblance to the "idiot box" of World War II as the first Wright airplane does to a jetliner. It is the first version of a flight simulator married to a digital-type electronic computer.

Because a digital computer is used, changes in flying characteristics can be made quickly and inexpensively merely by substituting new taped instructions instead of replacing parts, the time-consuming

method required for the analogue computers of previous simulators.

In driving a car, there are four directions of motion: left and right and forward and backward. But in flying a plane, there is the added motion of up and down.

First to Use Up-Down Motion

The Boeing 727 simulator being used by Eastern Air Lines to train pilots is the first in which the actual up-down motion is reproduced. When I pulled the nose up to climb, I could feel the cockpit actually rise into the air although I could not see it because the windows were covered.

The maximum up-down motion is two feet, more than enough to give a very realistic impression of actual motion on take-off and landing, as well as of pitching during flight.

Although the simulator never goes more than two feet off the ground, it is approved for use by the Federal Aviation Agency exactly as an actual airplane is. It was developed by Link Division of General Precision, Inc., under the direction of Dr. John M. Hunt, head of research and engineering.

The first flight simulators were Link trainers. They were small units, but their instruments reflected the way a pilot-in-training flew the land-based plane.

Black cloth covered the windows so the pilot had no references except his instruments to show his flight progress. Thus it was easy for those with no experience, and even those with experience, to fly the Link trainer upside down, as I did one time in the

Link, and as pilots years ago did accidentally in actuality.

Relatives of the early Link trainers are the devices used in high school and other driving classes to teach beginners how to handle an automobile. In these instruments, the trainee sits at a realistic automobile wheel with dashboard and sees the road unrolling before him. Various emergency situations are introduced and his reaction time measured.

In the Boeing 727 simulator differing emergencies can be realistically duplicated and the pilot's reactions noted. Enough practice at this both in the simulator and in real life makes the pilot's motions in response to a fire in, say, engine number three, a reflex action, thus saving valuable time and perhaps, lives.

The basic instruments for flying a plane under visual flight rules are the same for an Aeronca as for a jet. However, for the Boeing 727 there are three indicators for such engine factors as throttle setting and fuel that must be monitored, compared to one for an Aeronca.

Because each airplane has its own flying characteristics, even pilots who are checked out in other Eastern Air Lines jets are spending six hours in the Boeing 727 simulator and 26 in the actual plane before they are checked out to fly passengers.

Despite its high initial cost of \$1,500,000, the flight simulator will eventually save Eastern Air Lines money. This is because modern jet aircraft costs approximately \$800 per hour to operate. Without use of the simulator each three-man crew would have to spend an extra six hours, or \$4,800, in the real plane.

These figures do not include the minor, but often costly, accidents that can occur in training flights.

To permit the simulator to perform navigational tasks, the equipment includes a projector and screen that displays the airplane as it proceeds over an airway. It also includes flight instructions heard through the earphones as if they came from "the tower."

• Science News Letter, 84:374 Dec. 14, 1963