

On May 4 and 5, 1965, 25 men from the FAA met at the Boeing plant with 32 company employees. All were expert in some aeronautical specialty; together they made up the Preliminary Type Certification Board for the 737.

Rocco L. Lippis, assistant chief of the Aircraft Engineering Division in FAA's Western Regional Office, was one of the participants, and in a recent Los Angeles interview he explained the why of such sessions:

Prior to the preliminary board, all that FAA knows about the airplane is what it may look like and that the manufacturer has applied to build it. At this point, Boeing familiarizes the agency with the whole jet, what it will be made of and how it is supposed to fly. If Boeing comes up with some new system that hasn't been tested yet, or if there's a system that's causing trouble, then FAA attaches a "special condition" to it—meaning that the agency intends to look it over very carefully, Lippis said.

Minutes of that preliminary board disclose that among many special conditions attached to the 737, at least two resulted directly from the Northwest Airlines accident.

Under the first, FAA asked Boeing to instrument the pilot's seat in a flight test 737, then fly the craft through severe thunderstorms. Instruments would record how the jolts and vibrations might impair the pilot's ability to see his instruments and manipulate flight controls. They would also reveal the effectiveness of ailerons, rudders and elevators in counteracting the impact of up and down drafts.

Under the second special condition, FAA asked Boeing to put the 737 through its paces fully untrimmed (with its movable stabilizer full up or down). In that unstable condition, Boeing and FAA test pilots wrung out the airplane, rolling it into tight turns, forcing it into steep dives and punishing pullouts, and after each, the plane obediently righted itself.

Not until after the Northwest Airlines accident was Boeing's earlier 720B put through comparably demanding tests. But the 737 was, and it pased with flying colors during its eight-month, \$14.3 million flight test program.

A CONTEST FOR TIME

Many within FAA view the initial stages of certification as a kind of technological debate between the Government and the manufacturer. With all its expertise, the manufacturer presses for speedy certification of its product so as not to lose in the marketplace, where competitors are busy selling.

Before the certification process even begins, the builder is convinced that his product is airworthy—safe for passengers. And, unlike auto manufacturers, he has already sold it, promising purchasers a profitable range, speed and payload.

The FAA, meanwhile, fights a holding action, trying with relatively few technicians (there are 110 in the Western region) to inspect and test as much of the whole airplane as time and manpower permit.

By way of comparison, several acres of engineers and draftsmen sit side by side in one of Boeing's Washington State factories. Up through the engineers ranks rose J. E. Steiner, becoming chief project engineer for the incredibly successful 727 tri-jet, then Boeing vice president in charge of product development.

Steiner emphasizes another facet of the certification process—the one Boeing pursues independently, as if FAA didn't exist.

"We set criteria for every system in every airplane, and almost always ours are tougher than those required by the FAA," he said in an interview. "A group within our Service Department (which has worldwide representation) investigates every accident involving a Boeing product, feeding back analyses into the Design Department."

TESTING TO DESTRUCTION

Usually, Steiner says, Boeing telegraphs precautionary instructions to its customers before FAA can issue an Airworthiness Directive, and the customers comply.

"Although FAA doesn't require it," he said, "we're testing to destruction one 737 (sale price \$3 million), two 727s (sale price \$11 million) and two 747s (sale price \$44 million)."

For such tests, Boeing mounts a 737 fuselage in a hangar, wiring it with hundreds of stress gauges. Then the company applies pressure. Huge hydraulic jacks bear down on the wings or the tail or the landing gear, simulating the loads to be imposed by turbulence, G forces or hard touchdowns.