In Flight USA

May 2000

Pilot Report: Ovation 2

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History of Instrument Flight

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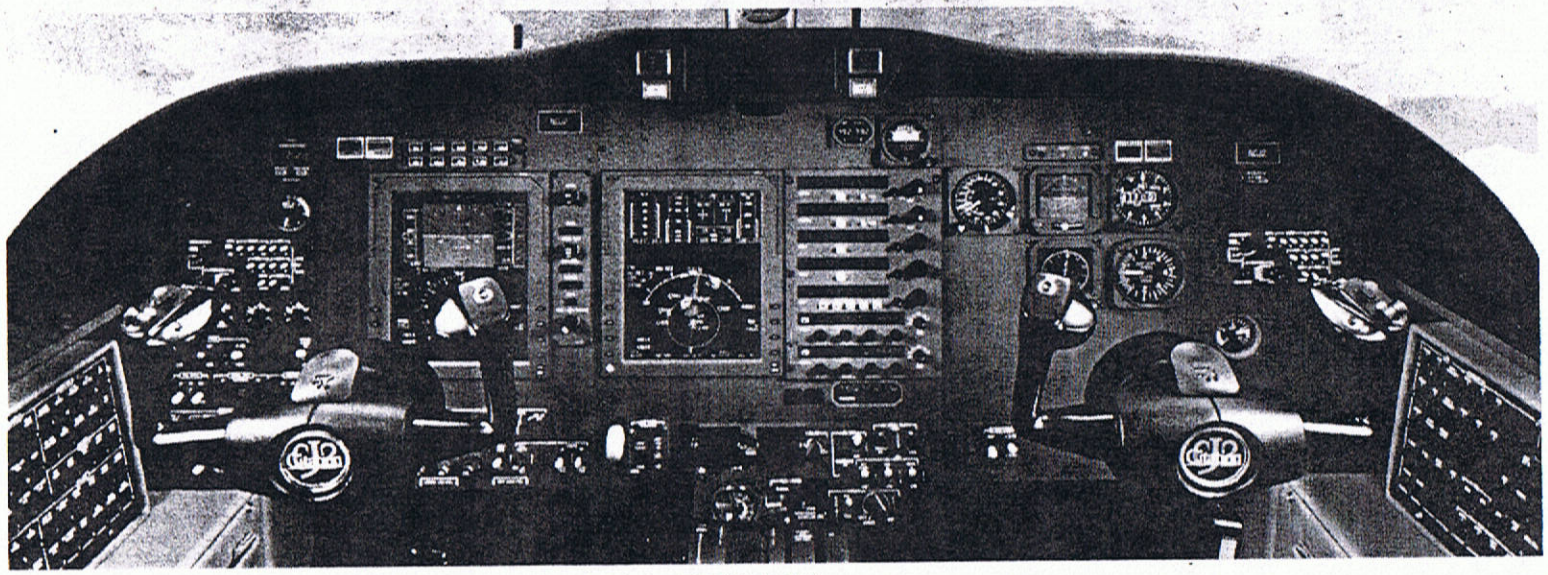
FLIGHT TRAINING & CAREERS

The Evolution of Instrument Flying and ATC System



Cessna's CJ2 panel: The speed of the state of the art- a far cry from Doolittle's first IFR flight in 1929.

By Harry Kraemer

It was May 1918 and President Woodrow Wilson was on hand to witness the first take-off of a U.S. Air Mail plane. The airmail pilots were some of the earliest pioneers of instrument flying. They started an evolution that would continue through to the present with our current day automated/glass cockpits.

Lighted beacons defined the first airways. The early beacons were equipped with a valve on the side that automatically turned the beacon on when the sun set or there was dense fog. As long as the sun would shine, the beacon would stay off. In clear weather, the beacons could be seen for 70 miles or more. By 1926, there were approximately 500 beacon lights along 2,665 miles of airway. By 1946, the number of beacons increased to 2,112 along 124 air routes.

The beacons would flash the Morse Code for the letters W, U, V, H, R, K, D, B, G and M, in that order. The airway would start with "W" and the sequence would start again with

For landing at night or in bad weather, a half-billion candlepower floodlights were used. The early planes were equipped with two flares, each on a parachute. When a pilot had to make a forced landing or a landing in bad weather, he would pull a lever in the cockpit and release one of the flares. As the flare would drop and clear the plane, the parachute would open and the flare would ignite to illuminate the ground below the aircraft for landing.

In 1926, a philanthropist named Daniel Guggenheim created a fund for "The Promotion of Aeronautics." About $2,500,000 was set aside for this intensive research program, which had two objectives: the dissipation of fog and solving the problem of flying in the clouds or fog. (The tests on the dissipation of fog were found to be unsuccessful and were later stopped.) The Guggenheims saw aviation's potential and the need for technical advancement. They also set up aeronautical engineering schools at universities and painted the names of towns on rooftops to aid pilots in navigation.

In August 1928, Lt. James H. Doolittle was selected to run the "Full Flight Laboratory" located at Mitchell Field, N.Y. Doolittle flew several flights using instruments of the day, and he came to the conclusion that they were not reliable or accurate enough for controlling the airplane in the clouds. He first examined two German instruments (the Anschutz and the Gyrorector) and found both to be unsatisfactory. He then sketched out an instrument that combined heading and attitude information and showed this to Elmer Sperry of the Sperry Gyroscope Co. (Sperry had invented the turn-and-bank indicator as early as 1917.) Sperry thought it would be better to make two separate instruments and developed the Sperry Horizon and Directional Gyro. Later in his test, Doolittle also determined that the current altimeter was not accurate enough. The current altimeter could only measure to the nearest 50 feet, and Doolittle wanted one that could measure to the nearest 10 feet or better. He asked Paul Kollsman of the Kollsman Company for help, which resulted in the development of the Kollsman Precision Altimeter.

Doolittle was using two planes for the experiments, one for instrument landings and one for cross-country flying. The Consolidated NY-2 was selected for the instrument landings because of its rugged construction. Doolittle's NY-2 had beefed-up landing gear to handle the anticipated hard instrument landings. The Vought Corsair O2U-1 was selected as the cross-country plane.

Equipped with Sperry's new instruments, Doolittle made hundreds of simulated blind landings in the Consolidated NY-2. He soon perfected blind landings. Next, to solve the problem of precision navigation, he turned to several radio experts of the day, including The Bureau of Standards, Pioneer Instrument Co., Taylor Instrument Co., the Bell Telephone Laboratories, and the Radio Corp. of America. It was decided that a homing beacon and a fan-marker would be used to guide the aircraft to the runway for a blind landing. The now famous date of the first instrument takeoff, flight and landing was September 24, 1929. Doolittle was completely enclosed in the cockpit the entire flight.

In late 1929, Walter Folger Brown, an Ohio lawyer and politician, stepped into the picture. Though Brown had no previous avia-

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Instrument Flying

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tion experience, he became a dominant figure in shaping the course of commercial air transport and instrument flying. By 1930, Brown was a postmaster general and saw the need to equip planes with better navigation equipment. In early 1930, Brown lobbied in Congress for changes in the airlines. By April 1930, we had new regulations that provided bonuses to the airlines for using multi-engine aircraft equipped with better navigation equipment. By the mid-1930s, we had very much improved our navigation aids.

It was during the early 1930s that an engineer named Hugo Leuteritz, employed by the Radio Corp. of America, was working on his own developing radio navigation equipment essential for long-distance over-water flights. Leuteritz soon developed land-based, direction-finding equipment that could do the job. His system had a range of about 600 miles. During the summer of 1935, Leuteritz developed a similar system with a range of 2,400 miles.

During 1933, Wiley Post decided to fly around the world solo. To assist Post on his trip, the Sperry Gyroscope Company installed the first autopilot prototype in his plane, the Winnie Mae. The Army had a new radio that homed in on commercial broadcast (automatic direction finder) and decided to let Post try it on his trip.

In 1928, the National Bureau of Standards had started research on a precision instrument landing system, though the work was discontinued in 1933. It was then taken over by the Washington Institute of Technology, and the same group of scientists who pioneered the research at the bureau continued their work there.

By the late 1930s, Pennsylvania Central Airlines was using this new system called Air-Track and advertised that it had made the first instrument landing on a scheduled airline. This system was very much like our current day ILS. It was during World War II that the transponder was invented and originally was used to identify enemy aircraft. The first transponders only had 64 codes and didn't report altitude.

Eisenhower made a number of improvements in our aviation system during his presidency. Aviation was experiencing a rapid expansion during the 1950s. Conflicts between the military and civil aviation (whether to use DME or TCAN as a standard short-range navigation system) had just about stopped all efforts to develop a common ATC system. During 1956, the first en route radars were coming into the picture. By 1959, the first Air Route Traffic Control Center was commissioned, and in January 1960, the PIREP system was instituted.

It is hard to believe that it has been only 70 years since Doolittle's famous flight. We now are flying glass cockpits with auto-land systems. However, even with all our technology and automation, our landing minimums today are still higher than Doolittle's, which shows just how great his accomplishment was in 1929.

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