

Good ideas heeded

How an open culture helped the DC-1 capture 90 percent of the world's airplane market

By Tim Sele

This year marks the 75th anniversary of the first flight of Douglas Aircraft Company's DC-1, and with it, a turning point in commercial passenger aerospace.

In 1930, the skies were dominated by the Boeing Model 80, the Ford Trimotor, the Fokker F10A Trimotor and the Curtiss Condor. In March 1931, a Fokker F10A accident took the life of famed U.S. college football coach Knute Rockne. That incident prompted the U.S. Bureau of Air Commerce to put harsh restrictions on wood-framed airplanes, essentially eliminating them from service.

In February 1933, Boeing's revolutionary all-metal Model 247 took to the skies, followed in July by the DC-1. By 1938, only five years after the first flight of the DC-1, its production version (the DC-2) and its first variant (the DC-3) carried 95 percent of all commercial airline traffic in the U.S. By 1939, the DC-2 and DC-3 carried 90 percent of airline traffic in the world.

That success raises the question: In a market crowded with talented competitors, how did a military aircraft company build a commercial transport that eclipsed all others?

One reason for the team's remarkable success was its culture of open communication. Douglas President Donald W. Douglas laid the foundation through his belief that "every step forward must be based on knowledge of what had been done before," and encouraging employees to collaborate and share information.

FROM THE BEGINNING

Let's go back to Aug. 5, 1932. Reviewing the morning correspondence, Douglas found a letter from Jack Frye, vice president of operations for Transcontinental and Western Air (TWA). In need of a new type of airplane and having been rebuffed by Boeing, Frye wrote to Douglas and others with his desired specifications.



Douglas was so captivated by the technical challenges that he didn't put the letter down until 2 a.m.

The next morning, Douglas gathered his team together to discuss the project. "Anytime any of you have suggestions, don't keep them on ice, or let them burn you up," he said. "Tell me about them in your own words. We'll need all the suggestions we can get."

Chief Engineer James "Dutch" Kindelberger was the first to jump in. Although TWA asked for three engines, he remarked they'd be "fools not to consider a twin-engine job." Arthur Raymond—who later would earn acclaim as the DC-3's designer—followed quickly: "Why not adopt some of the features of Jack Northrop's tapered wing? ... We can vary the sweepback to give us some latitude with the center of gravity."

At the time, John Knudsen "Jack" Northrop was president of Northrop Aircraft, a division of Douglas Aircraft. Northrop's fascination with elegant airframes was reflected in the DC-1—for example, in the stressed skin aluminum wing with longitudinal members and ribs that divided the structure into small, rigid structures called cells. This approach eliminated support spars through the passen-

This image from a 1959 reunion shows some of the key participants in the DC-1, -2 and -3 programs, a group of people who together changed the course of commercial aviation. From left are Arthur Raymond, Lee Atwood, George Stompl, Bailey Oswald, "Dutch" Kindelberger, Donald Douglas, Ed Burton, Frank Collbohm and J.O. Moxness.

BOEING ARCHIVES



A Douglas DC-1 is shown in 1933 against the backdrop of the Grand Central Air Terminal in Glendale, Calif., the primary airport in the Los Angeles area at the time. The DC-1 and DC-2 enabled airlines to fly both faster and more economically. BOEING ARCHIVES

“[If] you have suggestions, don’t keep them on ice.”

—Donald Douglas, Douglas Aircraft president

ger cabin and provided a remarkably efficient basic structure.

Ten days later, Raymond and Harry Wetzel hopped the train to New York to meet with TWA executives Frye and Charles Lindberg. After three weeks of negotiations, they had a contract. Lindberg and Frye shared that they initially had some trouble securing financing from the banks, which had “found it difficult to believe [Douglas] could meet the performance specifications.”

After the negotiations, Raymond took a Ford Trimotor flight home that would shape the team’s attitude on passenger comfort. He described vibrations so intense that they shook the eyeglasses off his nose, with noise levels and temperature drops that were nearly intolerable. As if to punctuate the experience, after the Trimotor landed on a wet runway, mud sucked in through vents was blown over the passengers. Back at the office, Raymond remarked to Douglas, “We’ve got to build comfort and put wings on it.”

To improve passenger comfort, Douglas brought in Stephen J. Zand, an acoustical expert, who helped lower passenger cabin noise from 98 to 72 decibels. Douglas later remarked to Zand, “If it hadn’t been for you, passengers would still be flying with cotton stuffed in their ears.”

The bulk of DC-1 test flying fell to Edmond “Eddie” Allen, then unmatched in combined engineering and piloting skill. Allen approached his role seriously: “If you’re looking for a swashbuckling movie hero test pilot, you’ve picked the wrong speaker. This business today is a science.” During testing on the DC-1, Allen’s thoughts would intersect with those of Bailey Oswald, a physicist and aerodynamicist from the California Institute of Technology.

Allen was convinced that better performance could be achieved by increasing engine revolutions per minute at altitude—which was opposite the prevailing opinion. Simultaneously, Oswald developed charts to capture and communicate how to fly the airplane to achieve maximum performance. Once flight test was complete, not only were the DC-1 and DC-2 ready for service, but they also came with an unprecedented set of performance charts that enabled the airlines to fly both faster and more economically.

FDR RECOGNIZES TEAM

The DC-1 broke five world records between May 16 and 19, 1935, and set two additional records in new categories. The DC-1 team was recognized with the Collier Trophy, presented to Douglas by U.S. President Franklin D. Roosevelt on July 1, 1936, the three-year anniversary of the first flight.

The DC-1 team, talented as they were, achieved this remarkable success through a culture of open communication. The key was how Donald Douglas had “created an atmosphere” where ideas could be shared and allowed to grow normally.

Later, Boeing seized the market lead with the Dash-80, which led to the 707 and family of 7-series jetliners. Douglas was slow to react, due in large part to its success. Although the DC-8 outsold the 707 for a time, Douglas trailed after that, eventually exiting a business where it once held 90 percent market share. ■

tim.sele@boeing.com