

High Mileage

Just how many hours can you wring from an airplane? As the operators, mechanics, and parts suppliers who keep DC-3s in the air

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A 40,000-hour DC-3 sits in the grass at Hook Field in southern Ohio, ready to start the night shift for Miami Valley Aviation. Paint is peeling off the nose, and what remains on the rest of the airplane is faded and filthy. The windshields leak. Inside the cockpit, a lip on the instrument panel catches incoming precipitation. It inevitably overflows onto the upper left pant leg of the captain. "When you get out of the airplane, it looks like you've been scared real bad," says Miami Valley chief pilot Kevin Uppstrom, who has 10,000 hours in DC-3s. The engines leak too. Oil and exhaust have trailed black streaks across the top of the wings, and black pools often form below them.

It wasn't always so. Serial number 42-93518 rolled off Douglas Aircraft's Oklahoma City assembly line in May 1944 as a C-47A, a military variant of a DC-3, joined up with the Ninth Air Force the following month, and by October 1945 was declared surplus. Re-christened the Sam Houston, it flew passengers for Dallas-based Pioneer Airlines between 1946 and 1952, then rejoined the Air Force as a C-117C transport. For the next 20 years it remained in government service. Miami Valley acquired it in 1989, and now tail number N36AP, along with five other DC-3s operated by the company, hauls freight. Tonight's critical cargo is packed in crates lashed to the floor: automobile bumpers.

On any given night (or day), from Middleton, Ohio, Charlotte, North Carolina, Miami, Salt Lake City, Oakland, or Fairbanks, DC-3s fly low and slow, stuffed with auto parts, drums of diesel fuel, blue jeans, machine tools, medical supplies, your mail, and virtually any other commodity controlled by the canons of just-in-time inventory and cash flow management. Sixty-five years after it first flew, the DC-3 is still one of the cheapest ways to move loads of up to three tons, especially over distances of less than 500 miles.

For an operator like Miami Valley Aviation, the basic math is inescapable. Good DC-3s with mid-time engines can be had for around \$150,000, the same price as a new Cessna Skyhawk four-seat, single-engine trainer. The "-3s" have direct operating costs a little less than those incurred by a B200 King Air twin turboprop: about \$600 to \$700 an hour. Hanging rebuilt engines on a DC-3 costs, at \$35,000 to \$45,000 a side, about the same as re-engining a twin-piston, six-seat Beech Baron. And each of these airplanes has only a fraction of the carrying capacity of the DC-3.

That's one reason it's still in harness. According to aviation historian Henry Holden, author of *The Legacy of the DC-3*, about a hundred DC-3s are still in service with U.S. revenue-producing operations. Another 200 are still flying on this continent simply because the airplane is a celebrity. The DC-3 did for commercial aviation what the Model T did for the automobile industry, according to Ron Davies, a curator at the Smithsonian Institution's National Air and Space Museum, who worked at Douglas (and later McDonnell Douglas) between 1968 and 1981. "By 1940, 87 percent of the commercial airplanes flying in the United States were DC-3s and the remainder were largely its progenitors, the DC-2s," says Davies. And, he adds, pilots loved the airplane. "Its performance on the ground and in-flight is excellent and has never been equalled," he says. For pilots, few airplanes were as straightforward. "If you could taxi it, you could fly it." But the aircraft wouldn't fly today for love or money were it not for an abundant, if disparate, supply of parts and support.

"I can buy good, low-time DC-3 airframes all day for \$90,000," says Pat Keesler, materials manager and resident parts impresario for Basler Turbo Conversions in Oshkosh, Wisconsin. For every DC-3 in the air, Keesler estimates that there are another four sitting derelict somewhere, just waiting to be cannibalized. Douglas built almost 11,000 DC-3s and C-47s between 1935 and 1945 and licensed manufacturers in Russia and Japan, which together produced at least another 4,000. Over the years, Basler has acquired DC-3 airframes from Arizona boneyards and from Canada and has also found them as far away as Africa, France, New Caledonia, and Thailand.

Since 1990, Basler has been "remanufacturing" DC-3s under its own Supplemental Type Certificate, an amendment to the Federal Aviation Administration's specification for a particular aircraft type. In the course of six months, a DC-3 undergoes 32 major changes on its way to becoming a BT-67 (see "Turbine-Charged," previous page). Besides the extensive modifications, Basler replaces corroded parts with new ones, and Keesler's job is to keep the parts available while maintaining a minimal inventory. Not a problem, as far as he's concerned. "There are a lot of guys out there with barns and warehouses full of this stuff waiting for their ships to come in," Keesler says. "Well, they're going to have to wait another 50 or 60 years. There are more parts out there than there is a market for." Keesler gets most of the parts he uses from a supplier he refers to as "the Bobs."

Bob Westbrook and his employee Bob Autry run Standard Aircraft Parts out of a 25,000-square-foot warehouse and Quonset hut complex in Ontario, California. Westbrook started Standard in 1962 after working on C-47s for Southern California Aircraft Company during the Berlin Airlift. Today, Standard supplies airframe parts for DC-3s, -4s, -6s, and -7s, but sells more DC-3 parts than anything else.

Westbrook is proud of his low-overhead location and the fact that in 37 years he has never bought a single trade advertisement. People who operate DC-3s know where to find him. His company owns a single computer; Westbrook's wife uses it for billing. Standard's inventory of

150,000 parts is tracked on Kardex, a file card system akin to a library's card catalog and somehow appropriate for a 1930s-era parts inventory. "It works fine for us," he says.

After Boeing acquired McDonnell Douglas in 1997, it sent out a letter announcing termination of product support for the DC-3 and pointing operators to Standard. Eight years ago Standard bought Douglas' remaining DC-3 airframe parts inventory and tooling. "Thirty-three truckloads on a 20-foot bobtail truck," Westbrook says. He took everything: ailerons, elevators, wingtips, gas tanks, rudders, bearings, bolts, brackets, and washers. Over the years he has also acquired parts inventories from the air forces of Australia, Argentina, Canada, Denmark, France, and South Africa and has sold them back to South Africa and Australia (and repurchased some of those).

Standard counts a hundred active DC-3 clients (those who have purchased parts within the last six months) and a thousand inactive. They call from as far away as New Guinea. Business, Westbrook says, has never been better. He knows he picked a winner. "This is the best airplane ever made," he says. "If you give some of these smaller operators jets, they wouldn't know what to do with them. This airplane was designed so you could get to parts and replace them whole. It's like working on an old car."

From the beginning, Westbrook has stocked small, easily transportable parts--"Those are the things that wear out the fastest: bearings, bolts, and brackets," he says--and he figures his inventory will last for at least 10 more years. "We don't keep a lot of the large stuff, like stabilizers," says Westbrook. For those, the road leads to San Antonio.

Tradewinds Aircraft Supply got into the DC-3 business in the mid-1960s, when Trans Texas Airways dumped their DC-3s for Convairs. Tradewinds bought up Trans Texas' inventory of 22 aircraft and spares, then augmented that by purchasing a large DC-3 parts inventory from a Dallas broker. Today, Tradewinds sells DC-3 airframe parts "from nose to tail" worldwide, according to manager Richard Ormond. He stocks 20,000 line items and, like Standard, keeps track of it all on Kardex.

There are endless variants of and modifications to DC-3s--The military alone made more than 50 modifications to the C-47--and Ormond thought he had seen them all until a customer called looking for a left-hand aileron trim tab for a DC-3 then owned by Dow-Corning. Ormond patiently explained that DC-3s weren't made with left-hand trim tabs; in response, the customer sent him a photo. "They had the only DC-3 made with a left-hand trim tab," he admits. More common modifications are main landing gear doors and oversize engine cowls and oil coolers, which Ormond stocks, and shortened, squared-off wingtips, which he doesn't. Although Standard Aircraft Parts, Tradewinds, and other established parts houses have the largest supply of DC-3 parts, for some parts, operators can also find cheaper sources. Basler's Keesler shows me a crate of new landing gear oleos--landing gear legs with shock absorbers. They came from a source who faxed Keesler out of the blue, announced he had oleos, and suggested that Keesler "Make offer." Keesler says he gets lots of faxes offering grosses of DC-3 airframe parts, some with deals so good that he buys the inventories sight unseen. He does

business with a half-dozen hoarders regularly, none of whose names he will reveal. "There are a lot of people out there who want to know who these guys are. I ain't about to educate 'em," he says.

James Ray, manager of museum restoration programs at Delta Air Lines, is similarly taciturn when asked about parts suppliers for Delta's newly restored DC-3, number 3278 (see "Delta Queen," next page). Ray built his own database of approximately 50 parts suppliers during the DC-3 restoration and previous Delta projects, including the restoration of one of two remaining Travel Air S-6000-Bs, the airline's first aircraft. It's obvious that there's competition for the smaller parts suppliers, and finding them can involve time-consuming detective work. "A lot of the principals who have parts rat-holed aren't on the Internet," says Ray, though the Internet can be a useful source, he says. He found 20 percent of the parts he used in the DC-3 restoration there, including an authentic, fabric-covered cord for the galley telephone. "The Internet is also a great place to find aging aircraft Airworthiness Directives and virtually everything we need to know about the airplane," says Ray. For everything operators need to know about the airplane's engines, there's another resource.

Precision Engines in Everett, Washington, is one of the world's most respected overhauers of radial piston engines. It holds FAA Parts Manufacturing Authority for over 1,200 Wright and Pratt & Whitney radial engine parts, including those for the R-1830 Twin Wasp, the engine used on most DC-3s. (Wright engines powered some early DC-3s; however, the R-1830 showed up in 1936, and all C-47s used it.)

Every other year Precision sponsors the World Radial Engine Symposium in an effort to answer customer questions and urge proper maintenance and operating procedures. The last symposium attracted 120 participants from around the globe. While some were hobbyists and warbird buffs, the vast majority were revenue haulers. One of them was Don Elliott, the director of maintenance for Miami Valley Aviation and its fleet of six DC-3s.

"They take a lot of oil," says Elliott, who was reminded at the symposium of one of the things he experiences almost daily in the field: With oil starvation the chief engine killer, the engines must be pre-oiled before each flight. An electric motor is used to pump oil into the engine before it's started. Even with this precaution, only 50 percent of the engines will run without help for 1,400 hours, the FAA's "Recommended Time Between Overhauls" for the R-1830.

"Our new pilots don't believe me when I tell them, on average, they will shut down an engine in flight every 500 hours," says Miami Valley's Kevin Uppstrom, who has more than a little experience with single-engine DC-3 flying. Then, of course, there's the natural temptation to push the remaining engine too hard, which often results in its failure on the next flight out, according to Uppstrom.

"I've pulled 'em off everywhere I can think of," says Elliott. "We've got it down to a science."

Premature engine death can boost DC-3 hourly operating costs into the range incurred by a light corporate jet and is the main reason virtually all operators using the airplane for passenger service or sightseeing rides have abandoned it. (Freight operators can generally charge more and therefore survive the economic bite inflicted by unpredictable engine life.) An R-1830 engine that is lovingly coaxed to its overhaul time usually costs around \$30,000 to rebuild. Salvaging one that scatters from abuse starts at \$45,000.

"The engine situation is what's killing the airplane," says historian Henry Holden. "There comes a point [after multiple overhauls of the same engine] that you just can't get pressure out of the cylinders anymore."

Somehow, the DC-3 labors on. "Ten years ago, I would have said they're going to be gone in ten years," says Miami Valley's Don Elliott, whose company flies freight in a \$2 million Falcon 20 jet and four Beech 18s; it also owns two Learjets, a King Air 200, and three Piper Aztecs. "The DC-3s have bought us everything we have here," says Kevin Uppstrom, and Elliott agrees.

At least part of the reason for its long life could be a sentimental attachment to an airplane that made history. Elliott says that every time he goes to an airport to work on one of the DC-3s that lost an engine, people of all ages stop to watch, and oldtimers tell him stories of the first time they flew--always, it was in a DC-3. So, are the revenue operators hanging on for sentimental reasons?

"Nah," says Elliott. "It's the fact that they can still make money with them. We still get over a thousand hours a year out of them."

Elliott thinks the engines will soldier on, but he's not sure the airplane will survive federal regulations. "I heard at the Precision engine symposium that the EPA was [considering a ban] to say absolutely no more lead. My biggest concern is that they'll outlaw 100-octane standard aviation fuel."

Mike Hudon, product support manager for Precision Engines, sees a different threat to the DC-3's survival. "There are plenty of parts and pieces out there," he says, but the number of people with experience in DC-3 maintenance and operations is declining. In other words, the aircraft's institutional memory is fading.

To spread the knowledge of DC-3 operations to those unable to attend Precision's engine symposium, the company distributes a maintenance and operating video, including a fascinating post-mortem that graphically demonstrates the damage caused to metal (and wallet) by a host of stupid pilot tricks, including chop drops--pulling the throttles back and letting the propellers drive or "reverse load" the engines during aggressive descents--closing cowl flaps to expedite engine warm-up, and setting improper manifold pressure. As the offenses are recited, the abused engine components flash onto the screen: scored blower seals, wrecked pinion teeth, scuffed bearings, carbonized valves.

Sharing this knowledge becomes more urgent as DC-3s are increasingly flown by a generation of young, time-building pilots whose only previous exposure to radial engines may have been in a museum and who fly for companies whose customer mantra is "How fast can you get it to me?" But that generation is also key to the airplane's survival.

At 24, Miami Valley Aviation pilot Chris Price flies an airplane more than twice his age. He wanted to fly DC-3s so bad that he made three trips to Ohio from his native California on his own dime and basically badgered Kevin Uppstrom into hiring him. In the cockpit of tail number N36AP, Price notices a grass-skirted hula doll atop the instrument panel, a fellow pilot's lucky talisman. He carefully removes it before throwing the sequence of switches on the overhead panel to start the engine. "It's a lot like playing a guitar," he says of cranking the giant, 1,200-horsepower radials. "Starter, count nine blades of rotation, mixture forward, boost pumps, magnetos. Works nine times out of ten.

"My friends are all going to work for the commuters" on their way to careers with the major airlines, says Price. "Before I did that, I had to be here. This sets you apart from the rest of the crowd."

A few weeks later at a Delta hangar in Atlanta, John Mitas, 78, who first turned a wrench on a DC-3 in 1948 for Delta Airlines, reflects on the restoration project he's just participated in. Toward the end of the four-year project, the team couldn't find a key for the aircraft's cabin door. Mitas remembered he had held on to his DC-3 cabin door key from 50 years ago. In fact, he still carried it on his key chain. But number 3278 had run through 11 different owners since Delta sold it in 1958. Surely someone had rekeyed that lock. On a lark, Mitas tried his DC-3 key in the door. It worked perfectly.