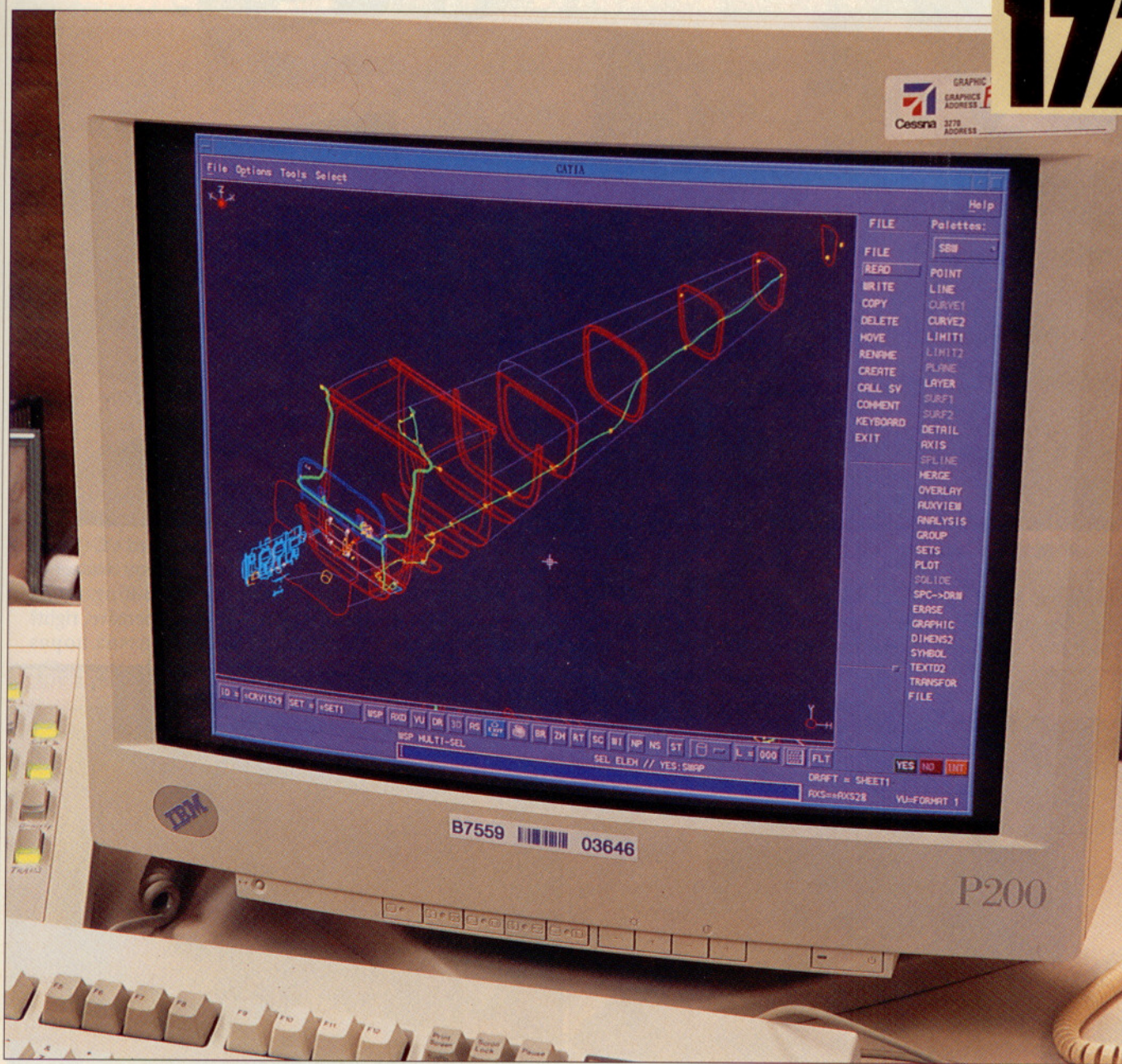


CESSNA MEETS CATIA

FIRST NEW



172



Bringing modern manufacturing technology to Cessna singles

BY PETER A. BEDELL

WE haven't heard much from Cessna since the company announced last October that it was going to restart production of its single-engine aircraft. No aircraft on display at Oshkosh, no promotional campaigns—nothing. Sure, deposits are being taken, and a “prototype” 172 (in actuality a 1978 172N) has flown with a new engine and fuel system; but what's happened in the mean-

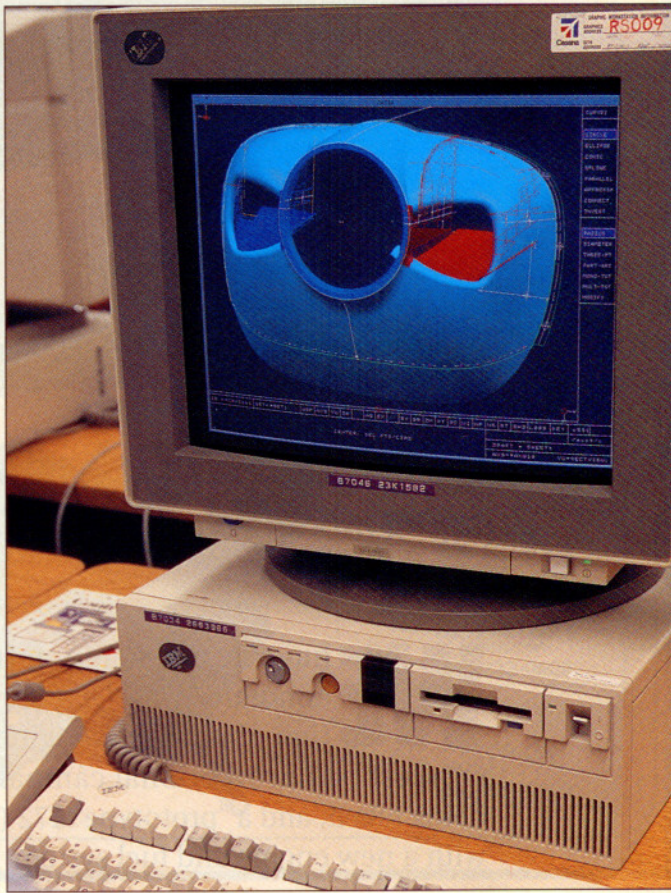


time? Actually, much more than one would think.

In two small offices at Cessna's Single-Engine Development Center are a number of engineers being trained on

the latest computer-aided design system, called CATIA (computer-aided three-dimensional interactive application). CATIA is the same application being used to design Dassault's Falcon


jets, as well as Gulfstream's G-V and Canadair's Global Express, two soon-to-be-introduced ultra-long-range business jets. Sounds expensive, right? Not exactly. In fact, Cessna hopes



CATIA will lower the overall cost of production by reducing the labor hours and cost of materials involved with plain old trial and error. According to Cessna, any new part for the new 172, 182, and 206 programs will be designed by using CATIA or CADAM (computer-aided design and manufacturing), CATIA's two-dimensional cousin.

Not only will CATIA design the part, but it will also help to design the tool that will ultimately make that part. The number of new designs to come to the new Cessnas is somewhat limited, but there are still some areas where Cessna feels its stalwart singles can use improvement—improvement that can be accomplished by using these computer-aided design and manufacturing techniques borrowed from its Citation business jets. “We’ll be able to make a far superior product using the new processes,” said Wayne Dale, Cessna’s single-engine project engineer.

As for physical hardware, Cessna’s Single-Engine Development Center’s hangar is alive with activity—with real airplanes, not just 3-D computer simulations. Two 182s; a Turbo 206; and



Cessna hopes the use of CATIA will lower the design and production costs of its new single-engine aircraft.

Cessna's "prototype" 172 (far left) has a slightly modified air-inlet box. A new cowling is being designed using CATIA (left).

the “prototype” 172, which is beginning to show signs of abuse because of constant testing, are on hand.

During our visit, the prototype was parked outside on a clear 93-degree-Fahrenheit day—its fuel being cooked under a hot Wichita sun. A coat of black paint was applied to the airplane’s wet wing to attract as much heat as possible. A strong autogas-like odor from unleaded fuel vapors permeated the air in and around the 172. An engineer from inside the hangar asked what the fuel temperature was.

“It’s 127.4 degrees,” another engineer replied. After the Cessna’s new 82-octane unleaded fuel (developed



by Phillips) is thoroughly heated, the airplane will be rapidly climbed to cooler altitudes for vapor-lock testing. The new 172 and 182 are being designed to run on the low-octane unleaded fuel, on the speculation that leaded fuels will be abolished in the future. Regular 100LL can be used in the engine, as well.

A modified cowl to enclose the new fuel-injected Lycoming IO-360 (see "Power for the New Cessnas," August *Pilot*) is one of only a few structural changes that are noticeable in the prototype. Perhaps the biggest change in appearance is in the form of stick-on graphics instead of painted-on stripes. If this technique is used in production, all of the airplanes will be painted with a base color of white and garnished with the decals. It is a vast departure from the norm of painting but seems to hold the advantage of reducing production costs. The prototype's decals didn't appear to be adhering well and had peeled away or were torn in spots. Cessna says it has solved that problem, however, and the company can always revert to painting on stripes.

A number of blue jigs and other manufacturing tools resurrected from

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The prototype's stripes are actually stick-on decals (above). It carries test equipment and an aux fuel tank for test flights (below).



indoor storage (and other less glamorous areas) reside inside one of the hangar bays. The tooling was refurbished to build two "pilot" prototypes in Wichita before it is to be transported to the new single-engine production plant under construction in Independence, Kansas. On each tool is a

log detailing its history, including every little change in the 172's production that required the tooling to be modified over the years.

It seems Cessna took care of most of the tooling by placing it in a warehouse; a log note reflects that it was prepared for storage. On the other hand, some tools weren't so lucky. Confirming many rumors, Pat Boyarski, the general manager of Cessna's single-engine business, said some of the tooling had been left outside for the past 10 years. He explained that the equipment was in fair shape even after having been exposed to the Wichita climate. But had it been outdoors in the Northeast, where humidity and corrosion run more rampant, it would not have fared as well.

A log on a tailcone jig (used to assemble the 182's fuselage from the rear window to the tail) reflects the application of preservatives to its bushings and bearings. The logs also record the resurrection process and the restoration, which includes a thorough inspection and a coat of blue paint. Currently the tools are crowded into a relatively small hangar, poised to begin producing the two pilot aircraft.

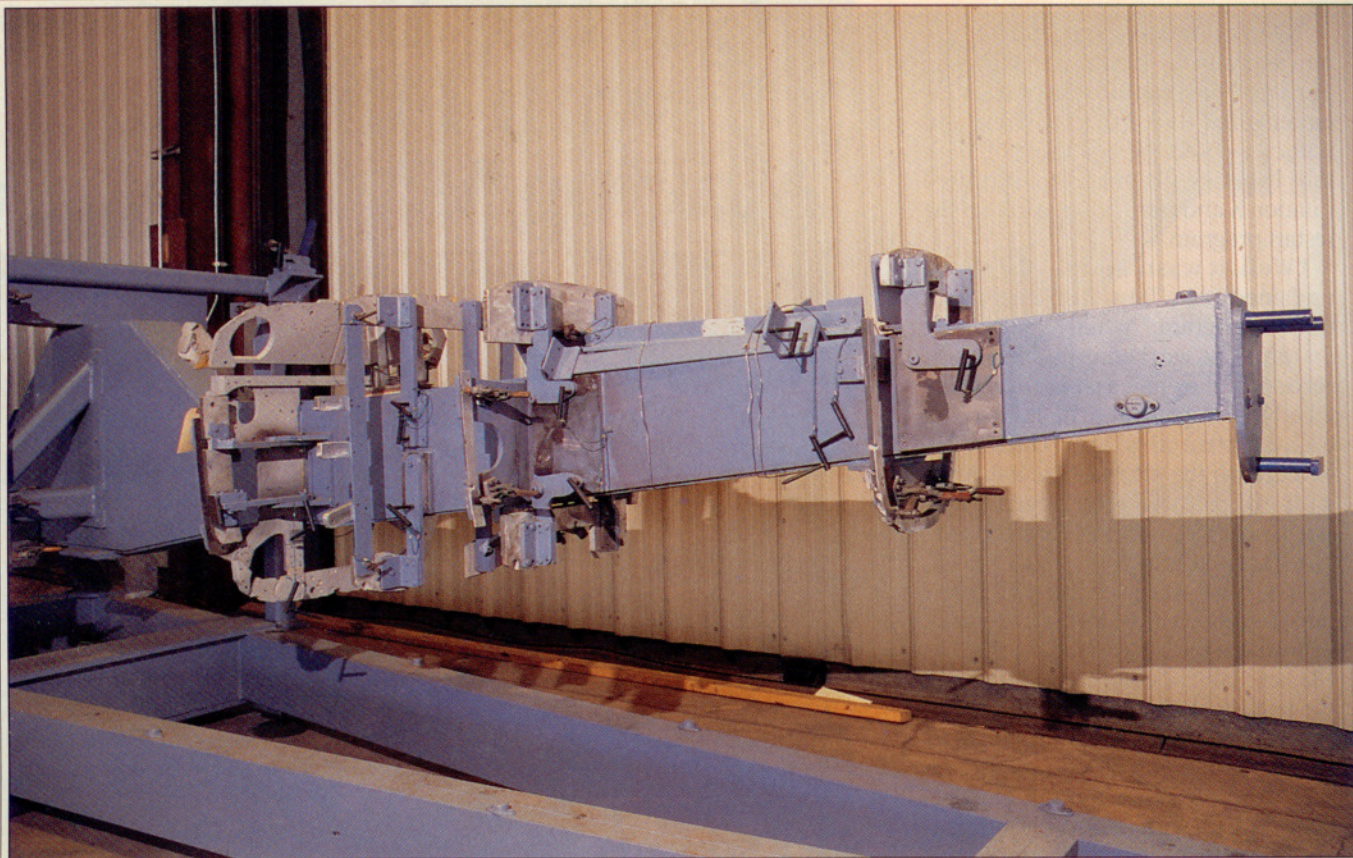
"We were slow to start, but we are now in a sort of frenzy in making the preparations," said Dale of his new endeavor with the singles. Dale and four co-workers were plucked off their jobs building the yet-to-be-certified Citation X and were put to work on the restart program.

"Well, it wasn't quite like that," explained Dale. "Most *asked* to be put on this program." When Dale worked on the X, he worked on a small subsection of the wing that is covered by a belly fairing. Today, he is working on an entire airplane. Dale is no stranger to the singles—he has been with the company for 24 years and was working on them when production halted in 1986.

"The most visible change will be the new panel," said Dale of the new instrument panel destined for the 172, 182, and 206 models. Steve Copeland, the project engineering group leader, showed us one of the panel layouts that is being considered for the 172. This example was a flat metal panel painted gray, with removable subpanels for easier maintenance and replacement of instruments. To remove an altimeter in a Skyhawk currently requires a good deal of time spent on your back, removing the instruments below it (usually the tach and vertical-speed indicator). In the new panel, the flight instrument group, mounted on an individual subpanel, can be taken out or simply tilted forward to gain access to the faulty indicator. Even the screws used to hold the subpanels will be of a plastic-coated type to minimize unsightly scratching of the panel during maintenance.

Interestingly, the flight instruments will not reside on a shock-mounted subpanel as they are in most airplanes. "Our experience with gyros revealed that there were more gyro failures in shock-mounted instrument panels," said Copeland.

To the right of the flight instruments, a removable subpanel will contain the avionics instrument heads; and at the far left of the panel is a removable engine instrument group. Although the brand and style of the engine instruments have yet to be determined, they will likely be two-inch "turbine-style" analog gauges. No oil or fuel lines will be routed into the cockpit to run these instruments, either—further enhancing the airplane's safety.



Although none of the instrument vendors has been officially named at this time, the panel mock-up has some new and clever faces on it. The attitude indicator has a flag to indicate that its vacuum source has gone belly-up. This will alert the pilot to activate the standby vacuum system that the airplane will likely have. Print on the altimeter, heading indicator (no HSI in this mockup), and VSI has a new typeface that is different but easy to read. The symbolic airplanes depicted on the HI and turn coordinator are Cessna singles instead of the low-wing jets we've been looking at for years.

All of the instruments in this mock-up were internally lighted, although Copeland stressed that these may or may not be the final choices. Upper management may decide to go with a lower-cost alternative. He also stated that there will not be post lighting. For those well versed in instruments, some of those installed in this mockup are easily recognizable, but no brand names have been released yet.

The panel mock-up showed a graphical representation of a stack of Bendix/King avionics, including a pair of nav/coms with digital CDIs, a GPS, and an autopilot that will at least keep the wings level. Cessna would not confirm the actual models of the boxes

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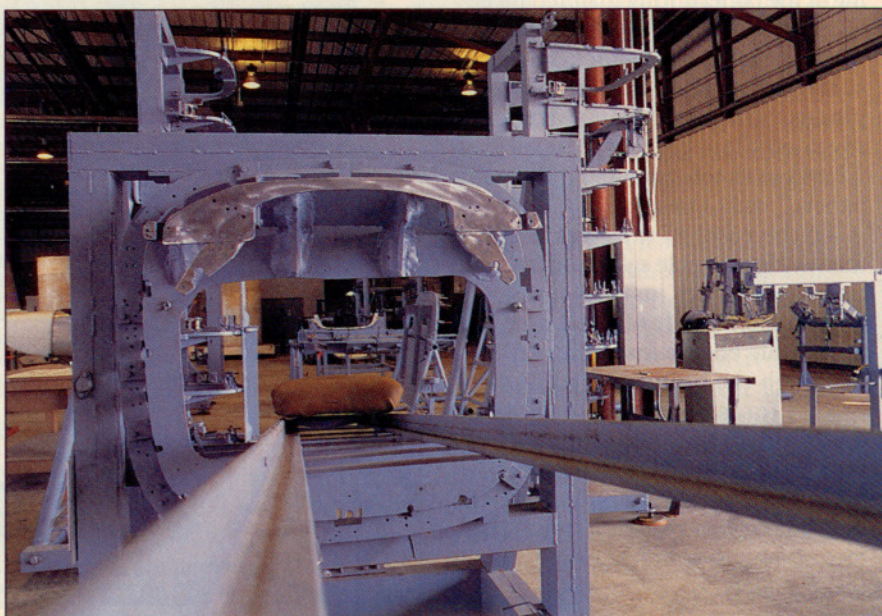
***Refurbished tooling
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before it is sent to the
new production plant.***

Tailcone jigs for the 172 (above) and for the 182 (below) were resurrected from storage. Some tooling was stored outside.

because the final choices have yet to be made.

Atop the panel is a new glareshield, the design of which was influenced by the example in AOPA's Better than New 172 1994 sweepstakes airplane. Providing a large hood over the panel, the glareshield incorporates a band of floodlights on its underside. The panel and all related structures will be designed by CATIA.

CATIA will also be used to redesign the inner wing and fuel areas. The last



172s were available with usable fuel capacities of 40, 50, or 62 gallons in either a wet wing or tank form of containment. The new wet wing will hold 50 gallons of usable fuel—less capacity than what left the factory with the optional wet wing in 1986. Cessna wanted to reduce the total fuel capacity to allow for a greater full-fuel payload.

Using CATIA, the engineers were able to design two wing ribs that would displace exactly six gallons in each wing in order to meet the 50-gallon goal without having to resort to labor-intensive trial and error. Additionally, CATIA will be used to design a further refined engine cowl and new crashworthy seats.

What will cover those new crashworthy seats? "There will be quite a lot of carry-over from the jets on the interiors," said Dale. Cynthia Halsey, the director of interior designs for the Citation series, will put her talents to work on the new singles, said Dale. When questioned whether or not the interior will look like that of the interior in the Better Than New 172, Dale held up a videotape that contains footage of the BTN 172 as well as many other aircraft on display at AOPA Expo '94 in Palm Springs, California, last October. Various overhaulers and specialty shops displayed customized Cessnas at Expo, providing a number of ideas to Cessna.

Most decisions are still under review, however. "Everything's been kept quiet because no final decisions have been made," said Dale, referring to names of vendors; performance figures; and, of course, price. Understandably, Cessna wants everything to be just right. The exterior will look more or less the same as the venerable Skyhawk, save for the new cowl and graphics. Yet from what we've seen, the new Cessnas will be quite different on the inside, providing a more pleasant and safer cabin and cockpit.

The two prototypes that will be made in Wichita for approval of the tooling may be ready as soon as February. If all goes well, the tooling will then head to the Independence plant, where the foundations are currently being poured. A July 4 opening of the Independence plant is still planned. The First New 172 will likely debut in October at AOPA Expo '96 in San Jose, California. At that time, some lucky winner will be awarded the keys to the first new 172. □