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BY THOMAS B. HAINES

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MIKE FIZER

A new horse in the jet race

As a VLJ alternative, the Sierra Stallion gives old Citations more kick

BY THOMAS B. HAINES

The dark desert floor dropped away with breathtaking speed as the 32-year-old Cessna Citation's vertical speed indicator pegged at 6,000 feet per minute. Banking the jet around to the northeast after our departure from Scottsdale, Arizona's Runway 21, I couldn't help but think what a lot of spunk the old airplane had sporting its new Williams International FJ44-2A engines.

Within minutes Phoenix was a distant glow as we sprinted northeastward toward the Winslow VOR. After just 16 minutes in the climb, we leveled at Flight Level 400 and quickly accelerated to 387 knots while burning about 109 gallons per hour.

To put that into perspective, you need to understand what this airplane, N1DA, a Citation 500, might have done under similar circumstances in 1975 when it left the factory in Wichita. Then, powered by Pratt & Whitney engines, it would have taken closer to an hour and 20 minutes to reach FL400, where the cruise speed would work out to 320 to 325 knots, according to Mark Huffstutler, chief executive officer of Sierra Industries. Re-engining old Citations with new-generation Williams engines is just one of scores of modifications Sierra Industries, of Uvalde, Texas, is authorized to perform.

With the Williams engines quietly humming in the background, Huffstutler reminded me that from FL400 we

PHOTOGRAPHY BY MIKE FIZER

N1DA benefits from another Sierra Industries modification, **the 47-inch wing extensions similar to the wings** that Cessna debuted on the Citation 501 SP in 1977.

could still travel about 1,300 nm, putting his favorite fishing spot near Cabo San Lucas on Mexico's Baja California peninsula well within range. I know a place there too, and the temptation was great to head south, but instead I shoved the thrust levers forward and climbed to FL430, something the factory-new airplane wasn't authorized to do. At that lofty altitude, the cruise speed settled in at about 380 knots while fuel burn declined to 94 gph. Our range from top of the climb then stretched to 1,480 nm, making places like Chicago, Pittsburgh, and Tampa realistic destinations.

Given the three decades of engine technology advances between the original Pratts and the newer Williams designs, the performance differences shouldn't come as a complete surprise. The original Pratts were rated at 2,200 pounds static thrust (lbst) at sea level

The Sierra Stallion engine mod includes new cowlings to house the Williams International FJ44-2A engines, which weigh less and have a smaller diameter than the original Pratts.

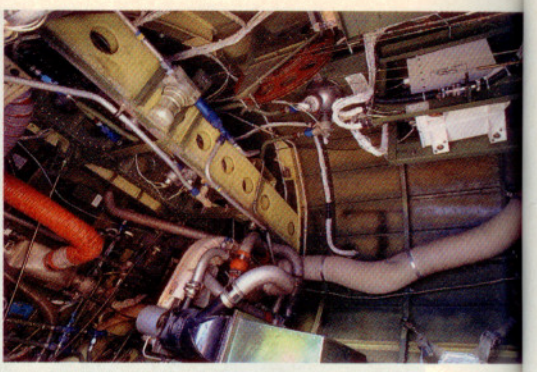
under standard conditions and not installed. The on-aircraft performance was obviously less as you introduced such systems as pressurization and bleed air.

The Williams engines, meanwhile, are rated at 2,300 lbst installed. So in the real-world application, the Williams start out with about 400 lbst more than the Pratts. In addition, the original engines lost thrust dramatically as the airplane climbed.

Design enhancements allow the Williams engines to retain much more thrust at altitude, meaning that at cruise altitudes they provide about 50 percent more thrust than do the stock engines. "Basically, you can go the same speed on 20 to 25 percent less fuel or you can burn the same fuel and go 50 knots faster," says Huffstutler. After the engine upgrade, there is no combination of weight, field elevation, and temperature where you can't take off at maximum takeoff weight and not climb directly to maximum altitude. "Even from Aspen [Colorado] on a hot day, IFR," he notes.

N1DA benefits from another Sierra Industries modification, the 47-inch wing extensions similar to the wings that Cessna debuted on the Citation 501 SP in 1977. Any Citation coming to Sierra for the engine upgrades requires the long wing. The later models come that way from the factory. Otherwise, they undergo the Sierra wing mod first, which costs $75,700. An alternative is the Sierra FJ44 Eagle II mod, which includes a thicker inboard wing section with a greater chord, allowing for about 100 gallons more fuel capacity and an increase in takeoff weight compared with the early airplanes. The Eagle II airplanes will be slower than the Stallions, though, because of the thicker wing. The Sierra

With its mostly stock panel, N1DA races into the night sky (top). Although N1DA's owner kept the original interior, Sierra Industries provides a host of services for Citation owners, including new interiors that feature all of the amenities you might expect from a more modern airplane (right).



The Stallion mod includes new structure to support the Williams engines (dark-green spar, upper left) and dual digital engine control units housed in the tail cone (black boxes, upper right).

Citation mods come in almost a dizzying array of flavors; they are outlined in the company's 84-page catalog.

The newest mod, certified last fall, is the FJ44 Stallion, which allows airplanes with the "classic" thin Citation wing to receive the Williams engines. With one mod or another that he owns, Huffstutler says he can take any Citation delivered between serial number one in 1972 and serial number 689 delivered in 1984 and make it like any other, with each powered by the Williams engines.

In addition to the performance enhancements, owners benefit from reduced maintenance costs, the option of guaranteed maintenance costs through Williams' Total Assurance Program, an increase in resale value, and a move away from the aging Pratt & Whitney engines, which are becoming increasingly difficult and expensive to overhaul. Turbine operators considering an engine upgrade typically wait until their engines are at TBO before investing in new powerplants. Huffstutler, who, of course, would like your business today, notes that because of the change in the market for the older Pratts, Citation owners should not wait until TBO to upgrade their engines because by then the engines may not be worth overhauling. Trading sooner allows the owner to receive about $50 per flight hour remaining before TBO and also to benefit sooner from the lower fuel burn and greater performance of the Williams engines.

What you get

Bring your Citation 501 to Sierra and about nine weeks later and $1.53 million lighter (minus the remaining time on your Pratts), you'll fly away with a set of new FJ44-2A engines. Citation 500s also will require the wing mod. Engine data will be shown on new round gauges. An optional Meggitt dual flat-panel engine display system runs another $27,500. If you don't have a Citation, Sierra can supply the airplane with the mods for about $2.85 million, which includes the Meggitt system, new paint and interior, and a host of improvements to the panel, including a pair of Garmin GMX200 multifunction displays, two Garmin GNS 430s, and two Garmin transponders. The MFDs include JeppView electronic charting, L-3 Communications Avionics Systems Stormscope WX-500, terrain awareness warning system, datalink weather, and XM radio for entertainment. These special-order airplanes typically take about six months to complete.

For those who think the price is high for a potentially 30-year-old airplane, Huffstutler reminds that overhauling one original Pratt engine costs at least $300,000, with some costing as much as $500,000 each depending on condition.

From an operational standpoint, one of the nicest features with the Williams upgrade is dual engine control units (ECUs). No more jockeying the levers during takeoff so that you don't over-boost the engines. Instead, the ECUs, which are black boxes stuffed in the tail, use hydromechanical systems to control the engines until near 100-percent power. At that point, the electronics kick in to finesse the settings. From a pilot standpoint, you just bring the thrust levers forward and sit back and watch as the computers take into account ambient conditions to keep the engines happy.

Weight on a squat switch causes the ECUs to dial the idle thrust down low so that thrust attenuators, such as those found on the original Williams-powered CitationJets, are not necessary. A switch in the cockpit allows the pilot to select how quickly the engines roll down to ground idle. Typically, the ECUs command the roll back after three seconds on the squat switch, allowing for maximum deceleration upon touchdown. But if the pilot is doing touch and goes or expects to have to go around, he can set the switch to the eight-second position. There, the engines will stay at flight idle thrust for eight seconds, reducing engine response delays in the case of a need for takeoff right after touchdown.

Structural changes to accommodate the new powerplants are relatively minor. Sierra modifies the empennage by adding a new beam between the fore

Huffstutler sees the Stallion as an alternative to the emerging very light jets.

and aft beams supporting the Pratts. The Williams engines rest on the original aft beam and the new midbeam. The cowlings are all new because the Williams engines are about 3 inches smaller in diameter than the Pratts. The Williams engines also weigh about 40 pounds less each and have about 50-percent fewer parts, according to Huffstutler. The new cowling is mounted to the Williams engines, which makes for a quieter cabin than the old system. Originally, the cowlings were mounted to the engine pylons with the Pratts sitting inside attached to isolators.

A VLJ alternative?

Huffstutler sees the Stallion as an alternative to the emerging very light jets. With his modified Citation, you pay about $500,000 less than you would for a new Cessna Mustang VLJ, but you get a bigger cabin, more payload, more range, and more altitude options, and you can have it now or within a few months. Many customers now placing orders for VLJs from various companies will wait years to get their airplanes, he notes.

Of course, new is new. Not even extensive modifications can reverse the aging effect on airframes. And the new airplanes come with complete warranties and much more sophisticated cockpits that can be easier to manage than cockpits designed in the 1960s and 1970s. But for anyone with a VLJ on order looking to benefit now from jet transportation and to build time for when their new airplane is ready, the Stallion is an interesting airplane to consider. For those who already own and love their old Citations, the Sierra modifications offer plenty of ways to improve performance and efficiency. AOPA

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Links to additional information about Sierra Industries may be found on AOPA Online (www.aopa.org/pilot/links.shtml).