



## ECLIPSE AVIATION'S ECLIPSE 500

it's small, fast, cheap—  
and finally flying by Mark Huber

THE CHALLENGE faced by Eclipse Aviation reminds me of the old joke: “How can you wind up with a million dollars by investing in aviation? Start with two million.”

Over the last two decades, only one U.S. aircraft manufacturer that began from scratch has made a real go of it: Cirrus Design. Cirrus builds four-seat propeller airplanes. In its early days, it survived by borrowing money from the principals' friends and relatives; pooling the executives' credit cards to make payroll; and, finally, attracting offshore investment after practically every American bank and investment house told the company to, well, “go fly a kite.” Today Cirrus is profitable and the deficiencies in its early aircraft have been remedied, but it took almost a decade after the FAA certified its first airplane to achieve these successes. Aviation investments require as much patience



as money, and we live in impatient times.

Now imagine how much harder it is to start a jet airplane company from scratch—one that relies on new aircraft, new manufacturing technology and mass production to make a profit; and one with a flamboyant CEO whose bold pronouncements turn the faces of his PR people purple and attract critics' disdain and media skepticism.

That's the case with Eclipse Aviation, which began in 1998. The Eclipse 500 twinjet VLJ gained "provisional" certification from the FAA in July 2006 and not-quite full certification in 2007 (flight into known icing conditions was approved just in June, for example). The company has spent the last two years ironing the bugs out of the design and finishing up the avionics software and functionality, well after customer deliveries commenced. Some of these mistakes were of Eclipse's own making and some were the fault of suppliers. But basically Eclipse illustrates the business-school version of Murphy's Law (what can go wrong, will), sort of the story of Job perfumed with jet-A fuel.

The miracle is that the company still exists at all, and that, for the money—a little more than \$2 million, fully loaded—the twin-engine Eclipse 500 is a pretty decent airplane. It's small and relatively fast for a VLJ. And it is even less expensive than most single-engine turboprops.

With full fuel (251 gallons), the Eclipse cruises at 370 knots and has a range of 1,125 nautical miles. But full tanks knock the available payload (pilots, passengers and bags) down to 700 pounds. You can get the airplane with six seats, but you'd be hard-pressed to fill them on a trip lasting more than an hour.

Not that you'd want to. The Eclipse's cabin is cramped: four feet two inches tall, four and a half feet wide and just over 12 feet long. It's OK with two adult passengers, maybe even three. But four? No way. You



## AT A GLANCE

Price (typically equipped)	\$2.15 million
Passengers	4
Crew	2
Range (4 pax, 2 crew)	1,125 nm
Maximum cruising speed	370 kt
Maximum takeoff weight	5,995 lb
Fuel capacity	251 gal
Cabin	
Width	4.8 ft
Height	4.2 ft
Length	12.4 ft

Source: Eclipse Aviation

can also forget about bringing a lot of stuff, unless you pile it in the passenger area. The baggage compartment is only 16 cubic feet.

The environmental control system (ECS) features independent zones for cabin and cockpit but the pilots, not the passengers, control the cabin zone. Most people I've talked to who have ridden in the back claim the ventilation blows very cold, especially at higher altitudes. Whether this is a fault of the system or the pilots is unknown. Eclipse claims there is no

### FAA EMERGENCY DIRECTIVE TARGETS ECLIPSE 500

During an encounter with wind shear at Chicago Midway Airport on June 5, the pilot of an Eclipse 500 pushed the thrust levers (throttles) forward with enough force to cause a software error that locked both engines at full power. Unable to slow the airplane for landing, the pilot elected to shut down one engine for the subsequent landing attempt. When he did, the thrust on the working engine dropped to idle and became unresponsive to thrust-lever inputs, resulting in a hard landing that blew out both of the airplane's main tires. No one aboard the airplane was hurt, but the incident prompted an FAA emergency airworthiness directive on June 12 requiring inspections of the thrust levers in more than 200 in-service airplanes. Nearly all of them had completed the checks at press time, with similar anomalies uncovered in two aircraft, according to Eclipse Aviation. The company is working on a software update to prevent a similar incident from occurring in the future. —Stephen Pope

THE CRAMPED, 12-FOOT-LONG CABIN IS OK WITH TWO PASSENGERS AND MAYBE THREE. BUT FOUR? NO WAY.



THE ECLIPSE 500'S COCKPIT EQUIPMENT ALLOWS FOR "HANDS-OFF" COUPLED APPROACHES USING THE AUTOPILOT TO EVEN THE SMALLEST AIRPORTS.

problem with the ECS. Cabin pressure altitude is 8,000 feet at 41,000 feet.

You can order options that make the cabin more stylish and comfortable, and the company's excellent Web site, [www.eclipseaviation.com](http://www.eclipseaviation.com), lets you use a menu to "build" and fully visualize your airplane with the interior color scheme and exterior striping. You can also add an entertainment package that features XM radio and an MP3 player (\$15,000), a refreshment center (a glorified ice drawer for \$6,000), an electric-flushing toilet with privacy curtain (\$10,000) and metal plating (\$10,000). The quality of the fit and finish is acceptable for an airplane at this price point, but nobody is going to confuse it with what you'd find in a Gulfstream.

Power comes from a pair of Pratt & Whitney Canada PW610F turboprops that produce 900 pounds of thrust each and enable the airplane to take off and land in well under 3,000 feet—paved or not. The engines are more powerful—and suck more fuel—than the Williams EJ-22s that Eclipse initially planned to use. Those engines failed during flight test and caused the switch to Pratt and a rather long delay in bringing the airplane to market. They also caused the 500 to grow wing-tip fuel tanks. Tip tanks were common on early Learjets and on 1950s vintage jet fighters. They are a sure sign that some engineer, somewhere, somehow, has screwed up because the airplane needs more fuel but there's no place else to put it. Fortunately, thanks to modern aerodynamics, the tip tanks on the 500 blend well into the wings and give the airplane a more "muscular" look.

The cockpit features a three-screen Avio NG glass panel system torturously developed by Eclipse and var-

ious unindicted coconspirators. Earlier this year, Eclipse announced that it was adding the Garmin GPS 400W unit to the system and would retrofit it to the 160 airplanes produced through March 2008 and make it standard on future production. In my opinion, this hybrid system isn't quite as good or as clean as the integrated Garmin G1000 avionics system on the Citation Mustang and Embraer Phenom, but it will get the job done and allows for instrument approaches with the autopilot engaged—a "coupled approach" in pilot jargon—to even the smallest airports.

Pilots who fly the 500, and the mechanics who work on it, generally like the airplane. They do, however, recognize that it remains a work in progress and mention a few things to watch out for:

**THE TIRES.** Eclipse designed the 500's tires to land on grass and pavement, so they're soft. Soft tires wear out faster—in the case of the 500, sometimes as soon as after 60 cycles. (A cycle is a landing and a takeoff.) So with average use, you're looking at tire changes two to three times a year. That is a lot more than with other jets. Eclipse is working on getting a more durable tire compound but until then expect to burn some rubber.

**THE BRAKES.** They are small and you have to baby them, but they are the primary way to slow the airplane down on the ground. The 500 doesn't have anti-skid brakes, unlike most automobiles and some other small jets, such as the Citation Mustang. The good news is that the Eclipse lands slowly and its trailing-link landing gear smoothes out even the most inept landings. "It is a very forgiving aircraft," said pilot Jeff Hultquist.

**PARKING.** The 500 is a small airplane, but it doesn't have nosewheel steering, so in some circumstances you need lots of space on the ground to maneuver.

**MAINTENANCE.** Fixing a 500 is computer-intensive. Mechanics do most of the troubleshooting and a lot of the calibrating via a laptop that plugs into the instrument panel. Your mechanic will have to be trained on the airplane and a lot of his course may be new territory.

Most of the operators I spoke with claimed Eclipse provided good product support. "Parts availability has been very, very good," said Dave Hintzke, a line mechanic with Florida-based air-taxi company DayJet.

Other early problems associated with the aircraft, most notably cracking windshields, have been resolved. The few Eclipses that have come onto the used market seem to be holding their value well. Granted, the airplane had a rocky start, but the market seems to be growing more confident and comfortable with it as time progresses. ■

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## THE 500'S SMALLER SIBLING

Last summer, Eclipse shocked aviation watchers by displaying a single-engine variant of its Model 500 twinjet VLJ. The Eclipse "concept jet," or ECJ, featured seating for four (including the pilot) and borrowed key elements from the 500, including the nose, wing, avionics and engine. Even more unusual, the ECJ was developed and built by an outside engineering firm and in secret at a NASA test facility.

Cynics branded the ECJ a publicity stunt designed to deflect attention from development problems—most now resolved—on the twin-engine Model 500. But those of us with a sense of VLJ history couldn't help but notice the similarities between the ECJ and the demonstration aircraft that started the modern VLJ craze—the Williams V-JETII. So, as prices of both fuel and the 500 continued to rise, it came as no surprise when Eclipse announced in late May that it would proceed with the ECJ, now re-badged the Model 400. Eclipse says the \$1.35 million Model 400 should be ready for customers by late 2011. It will cruise at 330 knots and have a ceiling of 41,000 feet and an unrefueled range of 1,250 nautical miles.

Several other companies—including Cirrus, Diamond and Piper—are betting on the emergence of the single-engine "personal" jet market. Prototypes of all three of those airplanes should be flying by the time you read this. The Diamond D-JET, while not



certified, already has been flying for several years. However, although those other companies are experienced airplane manufacturers, Eclipse has its jet production line up and running now. And despite the program delays it has had with the 500, by using many components from its twinjet, Eclipse should be able to fast-track development, certification and manufacturing of the 400. In time, its sales could actually surpass those of the 500. "People just love this [Model 400] airplane," said Eclipse CEO Vern Raburn. —M.H.