

Taking Diamond Aircraft's new four-place IFR airplane on a long cross-country

Aircraft reviews normally involve only two flights, one for air-to-air photos and one for a performance evaluation. This review of Diamond Aircraft's IFR-certified DA40-180 Diamond Star involved five, including a long cross-country. That provided the opportunity to test the composite aircraft as the average owner might use it, and in a variety of conditions—from smooth air to whipping crosswinds.

BY ALTON K. MARSH

Our first article on the Diamond Star was published in *AOPA Pilot* two years ago, but our writer had to go to Austria for the evaluation ("Diamond Star: Katana Plus Two," January 2000 *Pilot*). Now the DA40 has come to North America—production has begun at Diamond's plant in London, Ontario. The Austrian-built Diamond has been certified in the United States for IFR operations since August 2001, and there are 20 flying in the United States. So what's different about this one?



DA40-180 Diamond Star

Star over

PHOTOGRAPHY BY MICHAEL P. COLLINS

The panel has been redesigned to provide more legroom for the larger pilots found in Canada and the United States. There has been some other tweaking as well: There is more headroom and the interior has been upgraded with leather. Smaller main tires are used in combination with more streamlined wheelpants, and the glareshield has been angled upward to allow the pilot to see under it better. The Garmin GNS 530 and 430 GPS/coms are a new option in the North American DA40.

The DA40 I evaluated, C-GDFC, was a production test aircraft; full certification was waiting on a Canadian produc-



er Canada

tion certificate that was expected by the time you read this. That meant the aircraft was approved only for day VFR operations. It had been sold to a flight school at the London airport—thus, the registration number. Although company officials were mum about the number of Diamond Stars on order, a safe estimate is 30 to 40, with another 40 on order from the company's dealers. There were eight on the production line.

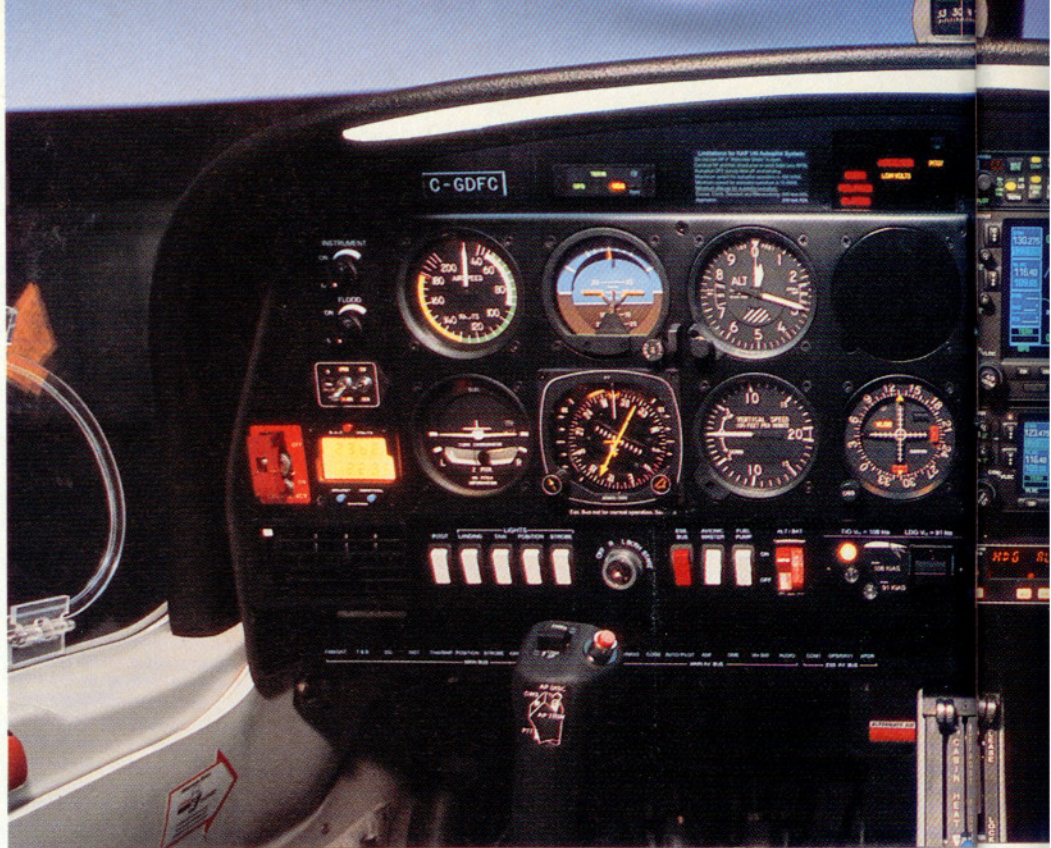
The bottom line

If you have to leave the article at this point to go to the kids' ball game or just head out for the evening, here's the bottom line: I loved the Diamond Star. As I first sat in the cockpit my impression was that of a lightweight trainer, but initial impressions can be deceiving. Was it a *real* airplane? It was. And quite a performer on only 180 horsepower. Actually, it weighs nearly as much as a Cessna 172SP, but flies 15 kt faster. It was easy to fly, a solid IFR platform, and well mannered in crosswinds.

The first flight was for the air-to-air photo on the previous page. Formation flying requires precise positioning of the airplane, similar to that required during an ILS approach. At one point during the shoot, I decided I needed a break from staring into the sun and placed the Diamond Star in the five-foot shadow from the lead airplane's fuselage. I was able to hold that position well. The aircraft's stability was further proven when I removed my hand from the stick and watched the airplane move in formation without banking, climbing, or descending. (And yes, the Honeywell Bendix/King KAP 140 two-axis autopilot was off.)

The aircraft has a stick, rather than a yoke or side-stick such as that found in Cirrus aircraft, yet even with my limited experience with stick controls I had no adjustment problems. The DA40 also has a castering nosewheel, meaning that steering on the ground is accomplished by differential braking. Yet I could have sworn the aircraft had a steerable nosewheel. Company officials attribute that to the location of the strut-attach point to the wheel, one that got the balance just right: Small amounts of airflow from the propeller over the rudder are sufficient to turn the aircraft.

The aircraft does not have a vacuum system, and the attitude indicator and heading indicator are electrically powered. If there is an alternator failure, the





The canopy (below) is hinged at the front, making it easy to open and close. Switches on the stick (left) include a throttle control, electric trim, push-to-talk, and autopilot disconnect. An angled glareshield makes the panel (top) easier to see.



battery will power all avionics for an hour, Diamond Vice President John Gauch said. After that, the pilot can throw a guarded switch on the left side of the panel to tap power from a pack of 28 AA-size batteries that can run the attitude gyro and a floodlight for 1.5 hours. If the battery pack is used, or if two years have elapsed, the batteries must be replaced. The pack is easily reached beneath the bottom of the panel.

The aircraft has carbon-fiber wings and a fiberglass fuselage. Lightning protection is provided by embedded metal strips that direct the energy away from vital aircraft systems.

The visibility, especially critical in formation flying, was the best of any aircraft I have flown. I mentioned to Gauch that I felt I was on the bridge of the *Starship Enterprise*—only the “on-screen” view wraps around the pilot for more than 180 degrees, an unobstructed picture window on the world. The top of the bubble canopy is painted to provide a sun shield, although the low sun angles of the winter season kept the sun in my eyes during most of the flight. Company test pilot Rob Salton said a movable sun shield such as those found in auto supply stores would solve the problem.

Landing was easy. However, until I adjusted to the different perspective, I tended to flare high. Salton diplomatically said most pilots new to the Diamond Star initially have that problem.

Off to Canada

Fortunately for me, there wasn't time for my evaluation flight because of weather moving toward the route back to Canada. Instead I would fly Gauch and Salton back to the Diamond Aircraft factory and then fly the airplane again for the usual evaluation maneuvers, such as stalls, steep turns, slow flight, and several landings, including short-field performance.

Headwinds between AOPA's headquarters in Frederick, Maryland, and the factory in London, Ontario, were 35 kt at lower altitudes and 45 at higher ones. The aircraft's promised true airspeed of 145 kt would be well appreciated.

The aircraft was loaded, calculations showed, without a pound to spare—three big guys and lots of bags. (To show off the airplane's cargo capabilities, Gauch brought a pair of skis along.) Yet we leapt off the ground and climbed out at more than 1,000 fpm, just as the company brochure pro-

mised. However, to make headway against the wind, I lowered the nose to pick up speed, losing climb performance. Our average climb rate to 6,500 feet was then about 620 fpm. Once at altitude, we used the capabilities of the Garmin 430 to determine true airspeed. Salton calculated that our power setting was 65 percent, and we were making 140 KTAS. (Other calculations showed 144 KTAS at 4,500 ft and 75-percent power and a later reading of 142 KTAS at 6,500 ft and 65-percent power.) The aircraft is also offered with a Bendix/King avionics package that

includes a KLN 94 GPS. The base price of the aircraft with the King package is \$179,900, or \$2,000 less than with the Garmin package. Included in each package are nav/coms, an intercom, transponder, audio panel, and ILS receiver.

Cabin roominess was excellent. The noise level was low. Not until I had been in the aircraft nearly 2.5 hours and we were approaching New Philadelphia, Ohio, for our first stop did I notice that the seat seemed a little hard. A sheepskin covering might do the trick.



Speaking of New Philadelphia, that stop gave me a chance to experience the aircraft's crosswind capability. Winds were reported as 18 gusting to 21 at 90-degrees to the runway: The Diamond Star pilot operating handbook says it can take 20-kt direct crosswinds. I knew this would be an interesting challenge.

My first approach was foiled by the wind and was high. I decided to continue above the runway to better judge what the winds were doing before going around. My second approach used a speed of 80 kt; that's 10 to 15 kt faster than recommended, that I chose because of the turbulence and crosswinds. Descending to within 10 feet of the runway, I discovered the DA40's motorglider heritage: We floated the length of the runway and went around again to make a final approach closer to the suggested airspeed of 65 to 70 kt.

Approaching touchdown, I was ready for a fight, but the Diamond Star barely seemed to notice the crosswind. I found

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Access to the avionics is simple and quick. The red panel switch taps a AA battery pack that provides an hour and a half of emergency power to the attitude indicator.

that was the case on subsequent landings in crosswinds at London and at Toronto's City Centre Airport.

North to London

The winds were no friendlier as we left New Philadelphia for a 1.5-hour flight to London, Ontario. Our route, as planned by Salton and Gauch, took us over the islands of Lake Erie, rather than along a direct path across the wider part of the lake. First came Kelleys Island, then the Bass Islands, and finally Pelee Island where Diamond Aircraft owner Christian Dries operates a winery. (The wine is served at the Katana Kafe in London, a high-quality restaurant operated by Diamond Aircraft.)

Crossing the Canadian border, we joked about the misconceptions some Americans have about Canada. I can report that there were no polar bears in sight, no igloos, and no fishermen spearing whales. *Darn.*

As the route curved back eastward, the groundspeed picked up to 170 kt,

and then, as though the wind had discovered our luck, it slowed to 155 kt. Once on the ramp at London and not far from the Katana Kafe, a Canadian Customs official came by on schedule, asked a few polite questions, and let us go within minutes. It didn't hurt that there were two Diamond Aircraft officials on board and only one suspicious Yank.

On the factory floor were the DA40's ancestors: the Evolution, the Eclipse, and the HK36 Xtreme motorglider. Also present was Diamond Aircraft's entrant in the current competition for a U.S. Air Force trainer, a two-place

airplane with the PIC position on the right, so that cadets can have the aircraft's center-mounted throttle in their left hand as it would be in a fighter jet. I later flew it for a series of seven-turn, stomach-churning, but safe spins.

The two-seat Evolution is the trainer model, while the Eclipse is that model with upgrades, including a nicer interior, a larger cockpit, a different sweep to the wings, a rear window, and improved avionics. There were 14 unsold trainers on the factory floor awaiting customers. Just to clarify, yes, Diamond Aircraft once made

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I flew a wary approach, ready for wind shenanigans, but other than a crab, little action was needed.

Katana trainers, but those were Rotax-powered, and Diamond no longer offers the Rotax in new airframes. It still supports the Rotax-powered aircraft that are out there, and will even upgrade a Katana from the field with a larger Rotax 912S engine to improve performance. The upgraded model is called a Katana

100. But the Evolution and Eclipse are now Continental-powered. The Diamond Star has a Lycoming engine. There are no more Katanas coming from the factory, just aircraft based on the Katana design.

All the aircraft made by Diamond Aircraft evolved from the motorglider

design that was the company's main product before it was acquired by Dries.

"We now have a two-seat trainer and a four-seat aircraft that you can transition to easily for rental and traveling," Gauch said. "Piper and Cessna have worked hard to convince people that training in a four-seat aircraft is the way to go, but that was predicated on the fact that they had four-place airplanes to sell, rather than what was best for the flight schools and FBOs."

The test flight

A test evaluation flight is meant to determine, among other things, whether the aircraft does anything scary. All attempts to make the Diamond Star do something scary failed. In fact, Salton held the stick

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SPECSHEET

DA40-180 Diamond Star

Base price: \$189,900

Price as tested: \$227,190

Specifications

Powerplant	.180-hp Lycoming IO-360 M1-A
Recommended TBO	2,200 hr
Propeller	three-blade MT-Propeller MTV-12-B/180-7
Length	26 ft 3 in
Height	6 ft 6 in
Wingspan	39 ft 2 in
Wing area	145.7 sq ft
Wing loading	17.4 lb/sq ft
Power loading	14.1 lb/hp
Seats	4
Cabin length	8 ft 6 in
Cabin width	3 ft 9 in
Cabin height	3 ft 8 in
Standard empty weight	1,620 lb
Empty weight, as tested	1,711 lb
Max gross weight	2,535 lb
Max useful load	915 lb
Max useful load, as tested	824 lb
Max payload w/full fuel	660 lb
Max payload w/full fuel, as tested	584 lb
Max takeoff weight	2,535 lb
Fuel capacity, std	41 gal (40 gal usable)
	246 lb (240 lb usable)
Baggage capacity	77 lb, 13 cu ft

Performance

Takeoff distance, ground roll	800 ft
Takeoff distance over 50-ft obstacle	1,150 ft
Maximum demonstrated crosswind component	20 kt
Rate of climb, sea level	1,070 fpm

full back in a stall and made controlled turns to change his heading 90 degrees and back again.

Steep turns again proved the safety of the DA40. At 60 degrees of bank, I could maintain altitude without adding power.

Landings were as easy as those in the simplest trainer. Short-field takeoffs used an estimated takeoff roll of 250 feet, and a landing to a full stop soaked up only 300 feet. We were light, of course, with two people, less than full fuel, and no baggage on board.

On to Toronto

The test-flying wasn't over yet. Gauch needed to visit Airline Training International (ATI) located at Toronto's City Centre Airport—directly in front of the city's spectacular skyline. By a fortunate coincidence, I needed transportation to Toronto to catch a flight home. Upon arrival at City Centre I was greeted with a 15-kt crosswind, but this time it was only 30 degrees off the runway heading.

As in New Philadelphia, I flew a wary approach, ready for wind

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

aligning the aircraft with the runway centerline at about 50 feet, only the slightest slip was needed to track it.

Robert Gilson, president and CEO of ATI, gave a tour of his new flight school while several of his flight instructors

shenanigans, but other than a crab, little action was needed. I did not repeat the mistake of carrying excessive speed on final and made a good landing. After

examined the DA40 and ATI mechanics popped the engine cowling to judge ease of maintenance. Gilson said his flight school is the only one in the world to be traded on the stock exchange. The end result of the visit was that ATI will add the DA40 to its flight school. It already operates two Evolution aircraft in addition to a fleet of new Cessna Skyhawks and a twin trainer. Chances are that more flight schools will come to the same conclusion: This is a *real* airplane. **AOPA**

E-mail the author at alton.marsh@aopa.org

Cruise speed/endurance w/45-min rsv, std fuel @ 75% power, best economy (fuel consumption), 4,000 ft.....
145 kt/3.1 hr
 (63 pph/10.5 gph)
 @ 50% power, best economy (fuel consumption), 10,000 ft.....
120 kt/5.4 hr
 (40.2 pph/6.7 gph)
 Service ceiling.....14,000 ft
 Landing distance over 50-ft obstacle
2,093 ft
 Landing distance, ground roll1,155 ft

Limiting and Recommended Airspeeds

V_X (best angle of climb).....66 KIAS
 V_Y (best rate of climb).....73 KIAS
 V_A (design maneuvering).....108 KIAS
 V_{FE} (max flap extended).....91 KIAS
 V_{NO} (max structural cruising).....129 KIAS
 V_{NE} (never exceed).....178 KIAS
 V_R (rotation).....59 KIAS
 V_{S1} (stall, clean).....52 KIAS
 V_{S0} (stall, in landing configuration).....
49 KIAS

For more information, contact Diamond Aircraft, 1560 Crumlin Sideroad, London, Ontario N5V 1S2; telephone 888/359-3220 or 519/457-4000; fax 519/457-4021; or visit the Web site (www.diamondair.com).

All specifications are based on manufacturer's calculations. All performance figures are based on standard day, standard atmosphere, sea level, gross weight conditions unless otherwise noted.



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