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Diamond's DA40

They provide the airframe—you choose the rest.

TEXT AND PHOTOS BY KARA DODGE

The DA40-180 Diamond Star is a true travelling machine. Economy cruise speed at 10,000 feet is 120 knots on 6.7 gph. With 45-minute reserves, range is reported as 600 nautical miles.

FOR SOME FOLKS, change is a scary thing. But when change is literally in the air (in an airplane either with you in it or directly over your head), the fear factor is upped significantly. There's perhaps good reason for that fear—it comes from technology and equipment that is yet unknown for most people, pilots and non-pilots alike. A pilot walks up to a glass panel on display at an airshow and starts pushing buttons. Some of the features look vaguely familiar (especially the radios), but others are downright foreign. And up until now, it's been impossible to know how training would be handled for the pilots who were eager to get their fingertips on the soft keys and their eyeballs on the gorgeous glass panels. And training is the only way to make the scary unknown less of a threat and more of the promise the makers say it will be. We recently tried out some of this training, and we're happy to report that there's every indication that pilots flying behind the G1000 in the DA40 are going to be thoroughly prepared to take full advantage of the functions and information offered by the panel in front of them. Not to mention that they're going to be thrilled with the performance, handling and safety of the aircraft in which they're flying.

It was mid-September, and the colors on the leaves were just beginning to lose their green and give way to reds and yellows, when *PRIVATE PILOT* headed north to visit the Diamond Aircraft Company's London, Ontario, Canada factory and North American Headquarters. To check out the DA40 Diamond Star's biggest change since our last report—a brand-new avionics option, the Garmin G1000 all-glass cockpit—we took the aircraft up for a test flight. We already knew the DA40 to be a capable, dependable and fun aircraft. (For a complete review of the DA40's flight characteristics, see Steve Whitson's article in our April 2000 issue.) It's time to add a few more adjectives: sleek, modern and just downright cool. But more on that later.

There's a unique philosophy held by the creators and promoters of Diamond Aircraft International airplanes: "We're in the business of selling airframes." We heard that statement twice on just the first morning of our recent trip over the border. The proof in the pudding is the choices offered to their buyers: carbureted or fuel-injected engine; avgas or diesel; Garmin G1000 all-glass cockpit, Avidyne FlightMax Entegra Integrated Flight Deck, or steam gauges with Bendix/King radios. And of course the paint scheme and the type of material used for the interior. Diamond's focus is to make the best airframe possible and in the most efficient manner. While most of the DA40s are built in Canada (only the ones with the diesel engine are built in Austria), and they're all finished and assembled there, the company has just opened a new composite facility at their Austrian plant to allow for increased production of all Diamond models. A typical week's output of the London facility is four DA40s and one DA20-C1. The low line item parts count in each aircraft and fiberglass construction is very evident when strolling through the London facility. There's not much noise (other than in one area of fiberglass cutting) and only one two-level cart that travels its way throughout the construction process, which contains all of the parts and accessories that will be installed on the aircraft.

Sky Blazing

Glass cockpits were all the rage at last summer's AirVenture Oshkosh, and as FAA-certified aircraft with such equipment actually go on the market and enter fleets, the excitement continues to build. Diamond Aircraft had long ago agreed to wait for Garmin's G1000 release—even though they also offer the Avidyne Entegra FlightMax system as an option (in addition to standard steam gauges if you're so inclined—to date, they've had one request for that configuration). And patiently they waited as (an)other aircraft blasted into the future with glass panels. What they were waiting for, though, was not Garmin's version of glass panels, but instead, an all-glass cockpit.

Two separate units: one to serve as the Primary Flight Display (PFD) showing the flight instruments (airspeed, vertical speed, attitude and slip/skid indicators, HSI, altimeter and turn coordinator), and the other as the Multi-Function Display (MFD) with the navigation and flight-planning capabilities and engine readouts. Of note is that these units are plug-and-play—place them in the slot in the DA40

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PHOTO BY KARA DODGE

and a chip knows the unit is in a Diamond Star. Take that same box out and put it in a Cessna Mustang, and this time the box knows it's in that aircraft. Go ahead and put it back in the DA40—no problem. A nice feature, should you need to repair or replace the box itself. And between the boxes sits the audio panel.

Training—Designed from the Ground Up

Empire Aviation and the Diamond Aircraft facility at London airport have a close working relationship, and we're not just talking location on the ramp. True, there are only about five hangars separating the Diamond Flight Centre from the Empire Aviation building, however it's the number of Diamonds on Empire's ramp and the fact that Empire was tapped to develop and administer the transition training course for Diamond Aircraft owners that makes the relationship so close, so mutually beneficial and so important. Owned and operated by Tom Lawson, Empire has a total of 14 aircraft in its fleet; nine of them are DA20-C1 Eclipses and one a DA40 (with steam gauges—they're still waiting for the Canadian authorities to certify the DA40 with Garmin glass). The others are Cessna 172s and a Piper Seminole for multi-engine training. But that Diamond TwinStar will be looking for homes soon... We don't know for sure, but all signs point to TwinStar training being available at Empire Aviation in the near future.

Lead by CFIs Brent Eddington and John Kellner, transition training for the DA40 is a two-day intensive course that combines classroom training, simulator training and actual flight time for a complete understanding of the aircraft's systems. New DA40 owners are sent some pre-training homework (collected on the first day of class) intended to familiarize them with the features of the Garmin G1000 all-glass cockpit. The DA40 Checkout Exam also sent ahead of training ensures that new owners have good basic knowledge of their aircraft, while referencing the Flight Information Manual (also included in the training package). A training DVD gives the new owners an overview of the systems to be discussed in training, as well as a brief discussion of how they work together. We found the DVD useful in both its brevity and comprehensiveness. Walking into class cold leaves a much steeper learning curve to climb in just two days. But by designing pre-training homework into the course, Eddington and Kellner assure themselves transition trainees who are prepared to review and learn the avionics' features, applications and functions.

We were fortunate to sit in on a morning's classroom training session lead by Eddington and an afternoon's training flight with Kellner during our time at the Diamond Aircraft factory. Following the slide presentation and the discussion lead by Eddington in the four hours before lunch, we went into the training flight with a thorough background of the Primary Flight Display (PFD)—the Multi-Function Display (MFD) was covered in the afternoon, as was the KAP 140 autopilot. A Systems Overview was the first order of business, which explained how the two glass panels, one audio panel, two integrated hubs and five other system components work together to give the pilot

Even with its tall tail, the DA40 measures only 6.6 feet high. A tailskid sits below just in case a landing flare goes awry, though it seemed to us that it's only necessary for moving the aircraft in and out of the hangar tail first.

N61LH was awaiting pick up by its new owner, Larry Hornsby, when we photographed it in London, Ontario.

With seats for four, the maximum takeoff weight is 2,535 pounds, and the useable load with fuel is 600 pounds. Plenty for a weekend trip with friends!

flight instrumentation, location, navigation, communication and identification data on two large high-resolution displays.

To experienced pilots, the components are going to sound similar to steam gauges of old, however which information each component gives, and how it gives it, will be new. A side note here—it will be very interesting to see how first-time student pilots might respond to initial flight training behind an all-glass panel such as this one. Not only will they learn the components and how they work together, but they will also be learning for the first time exactly what information comes from the instruments and how to use that information to make decisions in flight. It's likely that future student pilots, by and large more computer-savvy at the onset of their training than student pilots of yesteryear, will have no trouble whatsoever adapting to these glass-panels, and would more likely struggle to interpret the data given by steam gauges than the kind offered by digital readouts and displays. That remains to be seen, of course, but we learned that Middle Tennessee State University has already launched a study that will follow two control groups of student pilots, one that will learn solely on steam gauges and the other that will learn from the beginning in aircraft with all-glass panels. After gaining private pilot certificates and instrument ratings, the control groups will then transition to the other kind of avionics. How well the transition goes and what challenges are faced by each group will be evaluated in effort to understand how transition training should be conducted, how initial learning on steam gauges does or does not impact how easy it is to transition to glass and vice versa. It will be some time before the results are known, but the entire industry will anxiously await them.

Back to the here and now. This transition training is not designed to teach you about aircraft instruments, but to take your previous knowledge and apply it to the new equipment. For example, what "pitot static" functions are and what information you get from the pitot static instruments isn't discussed, but you'll learn which of the new components offers that information. There's an assumption you already know. For example, the GDC 74A Air Data Computer calculates and digitizes pitot, static and temperature inputs. As a result, it gives a constant indication of true airspeed (TAS), indicated airspeed (IAS) up to 430 knots, Outside Air Temperature (OAT) and pressure altitude and

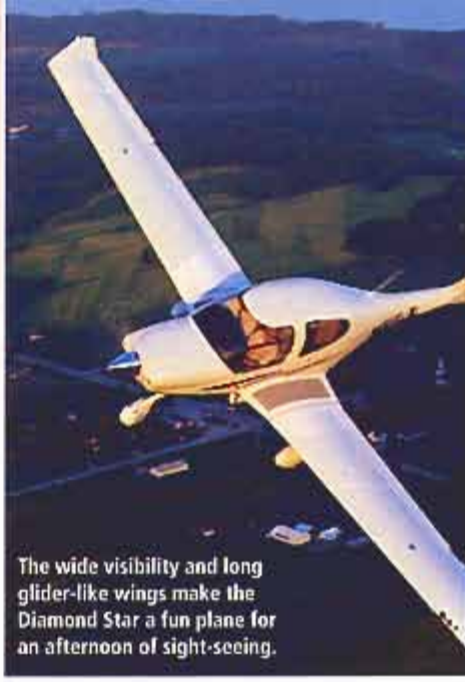
The rudder pedals come to you. Because the seats were crash tested to -26Gs as set, designers had to build the rest of the pilot's position around them.

density altitude (pressure altitude is sent to the transponder for Mode C capability). As to what information Mode C is required for, of what relevance pressure and density altitudes are and how TAS and IAS are different, well, you'd have to go back to a primary instructor for that information. (At the same time, Eddington and Kellner were both very eager to answer any and all questions.) Before the morning session is complete, in addition to knowing what each component contributes to the system, you'll be familiar with the layout of the PFD and audio panel.

All knobs and buttons are on the panels themselves—no radios in a center console. That's just for the power controls and fuel selection. At first that may take some getting used to, but we found the panels fell comfortably within reach, and actually allowed us to keep our eyes focused outward above the panel, or just barely below that, throughout the flight. Kellner, who spent the entire second half of the summer preparing the course, and since then teaching it inside the aircraft, assures us that after a time, the novelty of the panels wears off and the impulse to stare at the beautiful panels and not outside the aircraft fades. Anyway, both panels have the same knobs and buttons on each side of the screen. However, it's recommended that the pilot use the co-pilot's navigation knobs (on the left-hand side of each screen) so that her left hand remain free for flying. So really, instead of reaching left and then right, then farther right, to access all of the necessary knobs and buttons, the pilot just uses the three right next to each other in the middle of the aircraft's panel—communication, then the audio panel, then navigation.

The fact that only a fraction of the soft keys are currently assigned a function cannot be missed. For as advanced and exciting as the release of the G1000 has been, it's as yet only a glimpse into what the future holds for avionics in general and for this piece of equipment specifically. XM Satellite Weather, a built-in autopilot and aircraft checklists are only a few of the features that might be added in the future. Fortunately, the hardware doesn't change—it's just a matter of a software upgrade via a card, and the latest and greatest will be there. We look forward to what's to come from Garmin.

Comfort and safety were joined in equal parts in the design of this cockpit. Crash tests on the seats to -26Gs were successful, not to mention how the fuselage serves as the "cage" the aircraft designers wanted around DA40 pilots and passengers at all times.



The wide visibility and long glider-like wings make the Diamond Star a fun plane for an afternoon of sight-seeing.

Flight Test

But what's it like to actually fly the DA40 with this all-glass cockpit? Incredible! The airplane's heritage of gliders was evident, as all it wanted to do was climb at any given chance. One interesting experience was the desire to chase a very specific airspeed and altitude. When you're looking at an exact (and perhaps constantly changing) digital number—say, 143 knots—as opposed to a vague one—anywhere between 135 and 145 will do—it's hard to fight the urge to keep the numbers right on the money. Kellner said that's been something all transitioning pilots have had to get used to, and reports that in time you

LEFT: Pick your prop. This aircraft has the Hartzell two-blade constant speed propeller, but the three-blade MT composite prop is still an option. RIGHT: The wing section is a modified WORTMAN FX 63-137/20 laminar airfoil specifically designed for this aircraft. The wing design, with upturned wingtips, provides for benign stall characteristics.

LEFT: Entry is easy for both pilots and passengers alike. RIGHT: The inside of the plane looks as modern as the outside—the Garmin G1000 panel is now one of three options for avionics that Diamond buyers have.

learn to relax and understand what's a normal range for the numbers to move. We liked the lightness of the controls, especially for the aircraft's size. For an aircraft with a constant-speed prop and seats for four, it's docile in all configurations. Steep turns were downright fun with the 180-degree view afforded by the wrap-around windshield—see straight down, out or up. The only complaint about the windshield might be when you're traveling directly into the sun at sunrise or set—a small visor would have done well for our visibility. And though seemingly every pilot report states that an aircraft's "stall characteristics were benign," we have to report that they really were. Just a shudder and some burble lets you know a stall is impending, and then present. Aileron control remains throughout, thanks to the wing's long design and wingtips, and of course rudder control remains as well. Perhaps not something you want to emphasize to anyone training in this aircraft—why make potentially bad habits of using ailerons in a stall situation—but certainly this is just one of the examples of built-in safety of which the company is so proud. Another is the built-in protection of the fuel tanks—they sit in both wings fully contained between two spars—making fires after crash landings far less of a threat. Maybe now's the time to say that as of press time, there have been no Airworthiness Directives issued for this aircraft. Pretty impressive.

It's not one single feature that will make this plane a hot seller. It's that it would score a 9 out of 10 across the board—as opposed to a 10 in one category, a 9 in another, and maybe a 7 and a 6 to round out the score. This aircraft boasts a series of features that combine to make a fun, safe, affordable, comfortable and capable airplane, that looks awfully good besides.

BELOW: Delivery of new aircraft takes place at the Diamond Flight Centre, as does consumption of tasty meals at the Katana Kafe on the right side of the building.

LEFT: Brent Eddington of Empire Aviation leads the classroom portion of the Garmin G1000 transition training course.

DA40-180 Diamond Star

Price

w/ Garmin G1000 Flight Deck	$229,500
w/ conv. Garmin avionics	$196,600
w/ Bendix King	$194,600
w/ Avidyne	$196,600

Specifications

Length	26.3 ft.
Height	6.6 ft.
Wing span	39.4 ft.
Wing area	145 sq. ft.
Seats	4
Max. T/O weight	2,535 lb.
Fuel capacity	41 gal.
Fuel specification	100LL
Useable load with fuel	660 lb.

Engine

Lycoming IO-60-M1A 180hp @ 2700 rpm

Performance

Takeoff dist. over 50-ft. obst.	1,150 ft.
Rate of climb, sea level	1,070 ft./min.
Rate of climb, 10,000 ft	550 ft./min.
Cruise speed, 75% in 4,000 ft./fuel flow	145 kts/10.5 gal./hr.
Economy cruise speed (50%) in 10,000 ft./fuel flow	120 kts/6.7 gal./hr.
Stall speed	49 kts
Range (45 min. reserves)	600 n.m.