

Catching the 605



A SPECIAL SECT

A short hop
newest Cha

BY THOMAS A.





TURBINEPILOT

A SPECIAL SECTION FOR THE TURBINE OWNER-PILOT



A short hop in the
newest Challenger

BY THOMAS A. HORNE

Large business jets are plenty alluring—their sheer size, plush cabins, ocean-hopping range, and stately ramp presence transmit an air of exclusivity that's hard to ignore. But what's it like to experience Bombardier's Challenger 605, one of the biggest of the big bizjets? In short, it's a mixture of great performance, high-tech treats, and decadent luxury.

Step into the cockpit, and it's easy to be impressed and overwhelmed by the vast array of displays, buttons, and switch panels. Lower yourself into a pilot's seat—both of which are very comfortable, and adjustable 10 ways to Sunday—and you'll soon feel quite small looking out of the huge wraparound windshield. From this lofty perch, you can't help but be drawn to the ship's four-tube Rockwell Collins Pro Line 21 display screens. Measuring 10 by 12 inches, these big screens aren't only flight and navigation instruments, they're literally windows into the guts of the 605's systems. You can call up schematic views of the engine, fuel, hydraulic, electrical, and flight control

systems, and see details regarding quantities, pressures, and valve, switch, and control surface positions. Oh, and they give real-time info on the airplane's weight.

It's a semi-paperless cockpit, too. Jeppesen charts for instrument approaches, departures, airport diagrams, and taxiing play on the Pro Line 21's multifunction displays, so you only need to carry paper en route charts. The airplane's position is geo-referenced, so you can watch as you progress down an instrument approach, or navigate an unfamiliar airport's runways, taxiways, or ramps. Datalink weather from XM WX Satellite Weather provides U.S. coverage, with Universal Weather available for global weather services. In spite of the Pro Line 21's bigger screens (a 55-percent increase over the predecessor avionics suite, the Pro Line 4 used in the Challenger 604) the new system yields a 120-pound weight savings over the 604 cockpit.

PHOTOGRAPH COURTESY BOMBARDIER

One new addition to the 605's avionics is the primary flight display (PFD) flight path vector symbology. This indicates where the airplane is actually going—not heading or track—which is helpful during approaches and landings. A head-up display (HUD) is optional, as is an infrared-sensing system Bombardier calls the BEVS (Bombardier enhanced vision system). Combine all this with the standard terrain- and traffic-avoidance systems, and you've got tremendous situational awareness, day or night.

I flew with Bombardier demonstration pilots Yves Tellier and David Ure, out of Windsor Locks, Connecticut's Bradley Field, home to one of Bombardier's service centers. After a walk-around and preflight—aided by a review of the systems using the MFDs—it was time to light the fires and taxi. Starting is a matter of a couple button-pushes.

Taxiing is something else. That's the time you begin coming to terms with the size of this 48,300-pound aircraft (that's maximum ramp weight; our actual ramp weight was 36,190 pounds). The nosewheel tiller steers 65 degrees either direction, and together with the very effective brakes, it takes a while to taxi smoothly. I tried to minimize lurching by being very gentle with my inputs. By the time we reached the active runway I pretty much had the hang of it. Which was a good thing, because I

had Ure as a second pilot, watching my performance, plus another aviation writer, and our photographer, Mike Fizer, ensconced in the cabin.

The 605 has autothrottles, which are a novelty for me. Tellier suggested an autothrottle takeoff—something I never imagined before. I lined up for takeoff, pushed the "ATS" button on the glareshield autopilot panel, and like magic the thrust levers advanced on their own to the proper levels for takeoff. "You don't need the tiller during the takeoff run," Tellier says. And I soon found out why. The immense shove from those dual General Electric CF34-B turbofans (8,729 pounds apiece) launches you down the runway in a flash, and rudder steering was perfectly adequate for maintaining the centerline. Did I mention we had a crosswind gusting to 40 knots?

V_1 (takeoff decision speed) was 114 knots, V_R (rotation speed) was 121 knots, and our speed for a return with one engine out (V_T) was 154 knots. Those first two speeds came and went in flash, and by midfield I'd say we were well past pattern altitude (Bradley's elevation is 173 feet msl). Had we lost an engine during climbout, the CF34's automatic power reserve (APR) feature would have sensed an imbalance in fan speeds and bumped up the good engine's thrust to 9,220 pounds—without the pilot doing a thing.

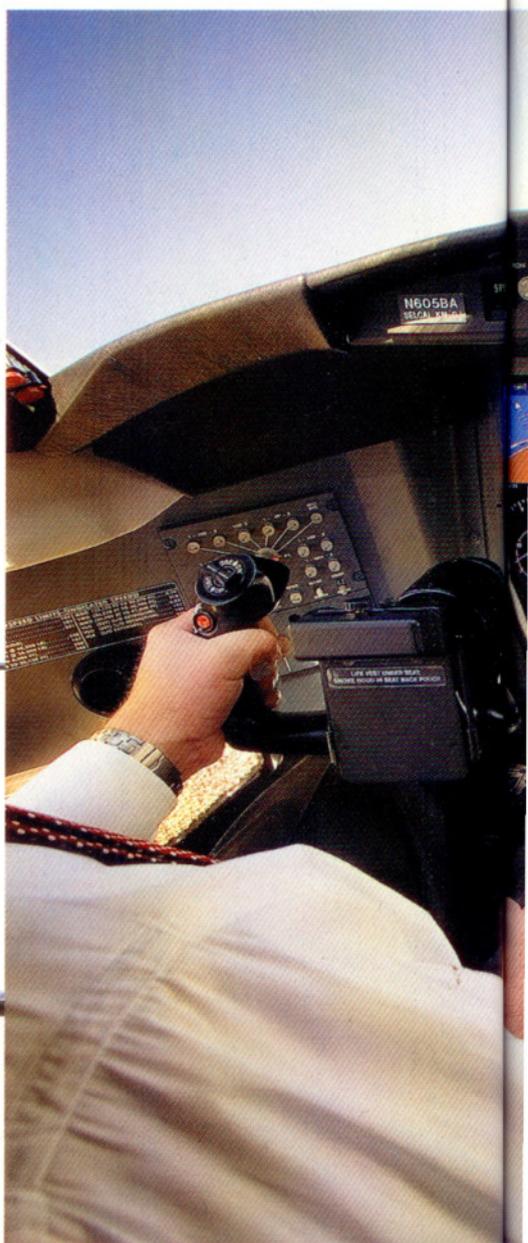
Our flight profile kept us to 17,000 feet, where I sampled steep turns, slow flight, configuration changes, and spoiler deployment. All was uneventful, although I noticed a slight pitch-up tendency with spoiler deployment. Normal cruise altitudes, of course, are in the high-30,000-foot range, where true airspeeds top out at 470 knots. Bombardier says that customers' average trip durations are two to three hours.

All of the airwork was in preparation for the ultimate challenge to come: landing. I was determined to do well, but had heard from numerous Challenger pilots that the deck angle is low on approach, so you have to fight the illusion that you are too nose-low on final. Personally, I think the nose-low impression is created by the steep slope of that massive windshield. I'd

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taken notes during the preflight briefing, one big goal of which was to prepare me for the airplane's landing behavior. "It'll look like a windshield full of dirt," said Tellier. "But don't worry, that's the normal approach picture." Here are the notes regarding final: N_1 at 65 to 70 percent; airspeed at 125 knots for this day, weight, and winds; at 50 feet, go to flight idle; begin a "pre-flare" at the 30-foot agl callout from the enhanced ground proximity warning system (EGPWS), hold the nose right there; you'll look like you're nose low, but AI will show 5 degrees nose up. After touchdown, I am to pop the thrust reversers and steer, while Tellier extends the spoilers. Finally, get out of reverse by 80 knots, lest the engines ingest debris.

Tellier asks for an autothrottle landing—still another oddity in my book—

but, I figure, why not see how good the system is in these strong, gusty winds?

Down we went on the ILS to Runway 33. The autopilot and autothrottles were doing the work, and it was unusual to see the thrust levers sawing away, back and forth. But make no mistake, the airspeed stayed glued at 125 knots.

As the runway neared, I belatedly punched off the autopilot (my excuse is that I was fixated on the autothrottles), waited for the autothrottles to automatically kick offline at 50 feet, then made that pre-flare at 30 feet.

"It's more of a roundout than a flare," Ure said. Whatever it was, it worked out fairly well. The arrival was firm but not jarring. Another manually flown trip around the pattern produced an even better landing. The control feel is somewhat heavy, but re-

sponsive commensurate with an airplane of this size. Flight controls are activated via cables and pulleys, but inputs are boosted hydraulically. There's also an artificial-feel system that uses spring-loaded rollers riding along cams. Bottom line: If there's any trick to landing a Challenger, it's a pretty easy one to learn.

Then it was time for me to swap seats and sample the cabin amenities. At seven feet, two inches wide (at floor level) and six feet, one inch high, the 605 has the widest cabin in its class, I

The 605's front office is spacious, well organized, and uncluttered. The main reason is the four-tube Rockwell Collins Pro Line 21 avionics suite. Red T-handles on the center pedestal are used to disconnect jammed flight control surfaces.



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was told. The cabin windows have been enlarged over those of the 604. They're now mounted two inches higher on the fuselage, and are themselves two inches taller. This lets in 30 percent more natural light, I was informed, and "standing passengers can look outside without bending over." Minutiae like this are the stuff of customer complaints, and manufacturers who ignore them do so at their peril.

Maybe that's why the 605 lavatory has a bigger sink, and its toilet seat has its height adjusted downward to 18 inches high. "So it's just like the toilet seat in your house," I was told. Go ahead and laugh. Bombardier has sold some 35-plus Challenger 605s, they go for upwards of \$30 million a pop, and if you bought one today you'd have to wait for a 2010 delivery date.

This success is understandable. After all, the cabin and galley are exemplary, the airplane's speed and range (at 0.80 Mach, you can fly five passengers 3,732 nm with NBAA IFR fuel reserves) favor far-ranging corporations, and the airplane comes with a Rockwell Collins Airshow 21 entertainment system with satellite television capability, plug-in monitors can be fitted out at each seat station, and Internet access and satphones can be installed as options. There are three basic floor plans, with seating for between nine and 11 passengers.

Pilots, of course, will enjoy the airplane as much as the passengers. If there's a hitch in the deal, it's the airplane's fuel burn. Although modest as long-range, big-cabin bizjets go, the rule of thumb is that the 605 will burn 3,000 pounds of fuel (about 448 gallons) in the first hour of flight, 2,000 pounds (298 gallons) in the second, 2,000 pounds in the third, and 1,800 pounds (267 gallons) in subsequent hours. That's part of the price of doing long-range business these days. But another part is that the kind of executive transportation offered by the 605 is becoming more and more essential. Ditto the company's Global series of ultra-long range airplanes, the Global 5000 (Mach 0.89, 4,800 nm) and Global Express XRS (Mach 0.89, 6,150 nm).

Bombardier is staying ahead of the game in the green movement as well. Eyeing a growing trend begun in Europe, and anticipating its expansion,



the company has wasted no time in establishing an optional carbon-offset program for its customers. Under this program, owners of Bombardier airplanes can contribute to an effort managed by Climate Care, a United Kingdom firm that invests in projects such as renewable energy, energy efficient technologies, and reforestation. Contributions are linked to an airplane's yearly fuel burn, based on 400 flight hours annually.

For an airplane like the Challenger

A wide, flat floor is a signature feature of all Challengers. For the 605, the window area was increased, which lets in 30 percent more light and allows standing passengers to see outside without bending down. A nine-seat interior is the most popular configuration, but customers can select from three different executive floor plans, with seating for up to 11 passengers. A cabin electronic system comes with two 18-inch cabin monitors, a CD/DVD player, and touch-screen controls. An airborne office suite is optional, as is a satcom system.

TURBINE TALK

Critical Mach number

BY BARRY SCHIFF

Every pilot is familiar with Bernoulli's Principle. It partially explains the mystery of lift and states, in part, that when air flows over a curved surface, the speed of that flow increases.

Assume that a wing is slicing through the air at Mach 0.80 (80 percent of the speed of sound). Because of Daniel Bernoulli's discovery and camber, we understand why airspeed above the wing is faster, Mach 0.95, for example. If the airplane were to accelerate to say, Mach 0.85, the airspeed over the most highly curved portion of the wing might reach Mach 1.0, the speed of sound.

In this case, the critical Mach number (colloquially referred to as Mach "crit," or MMC) is Mach 0.85, the airspeed at which local airflow over some portion of the wing (or airframe) becomes sonic. It marks the beginning of the transonic airspeed range.

When the wing reaches its critical Mach number, a shock wave forms over that portion of the wing that has reached Mach 1.0 and is accompanied by a drag rise. (A shock wave can be seen over the thickest part of the wing when atmospheric conditions and a low sun angle are just right.)

It is obvious that efficient cruise flight ends at Mach crit. A relatively large increase in power is required to overcome shock drag and specific range declines dramatically.

Flight beyond MMC can result in Mach buffet and/or airflow separation but is limited by MMO, the maximum-allowable Mach number.

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605, the investment would amount to \$13,600 per year. Participation in this program counters charges that general aviation is insensitive to environmental concerns.

A few years ago, when Challenger marketing used the "Wide Body Leader-Ship" slogan, the saying around the office (full disclosure: I once worked for Bombardier) was "It's not how big you are, it's how you're big." We used that to counter the competition's digs, and it sums up the Challenger philosophy, which is built on the notion that cabin width is the most important factor in creating a sense of cabin spaciousness, and that a big, flat floor was equally essential. (OK, the cabin windows were too small, but that's been fixed.)

With the Challenger 605, Bombardier adheres to this tried-and-true strategy, and adds to it by making huge advances in cockpit and cabin technology. As the big three large bizjet manufacturers—Gulfstream, Dassault Falcon Jet, and Bombardier, with Embraer and Cessna sneaking up—continue to jostle for market share, it's a safe bet that Challengers will always find their share of devotees.

ACPA

E-mail the author at tom.horne@aopa.org



Bombardier's Challenger 605 on the ramp at Hartford service center (top). The wing and tail both begin flying at the same time during the takeoff run, so liftoffs are smooth. The 605's anti-skid brakes have been beefed up with an additional rotor (above). The landing gear is hydraulically actuated, but free-falls for emergency extension. But that's not likely—the 605's hydraulic system has six hydraulic pumps for redundancy.

SPECSHEET

Bombardier Challenger 605

Base price: \$29.8 million

Specifications

Powerplants	Two GE CF34-3B, 8,729 lbst ea; with APR: 9,220 lbst ea
TBO/HSI	On condition
Length	68 ft 6 in
Height	20 ft 10 in
Wingspan	64 ft 5 in
Wing area	492 sq ft
Seats	2 + 9/11
Cabin length	28 ft 3 in
Cabin width	8 ft 2 in
Cabin height	6 ft 1 in
Max ramp weight	48,300 lb
Max takeoff weight	48,200 lb
Max zero fuel weight	32,000 lb
Basic operating weight	26,985 lb
Payload w/full fuel	1,315 lb
Max payload	5,015 lb
Max landing weight	38,000 lb
Fuel capacity	2,985 gal (20,000 lb)
Baggage compartment volume	115 cu ft

Single-engine ROC	1,144 fpm
Normal cruise speed/range w/NBAA fuel rsv	471 KTAS (Mach 0.82)/3,732 nm
Max operating altitude	41,000 ft
Landing distance	2,775 ft

Limiting and Recommended Airspeeds

V _R (rotation)	140 KIAS
V ₂ (takeoff safety speed)	147 KIAS
V _{REF} (reference speed, final approach)	132 KIAS
M _{MO} (max Mach number)	0.85 Mach

For more information, contact Bombardier Business Aircraft, 400 Cote Vertu Road West, Dorval, Quebec Canada H4S 1Y9; 800-268-0030; 514-855-7698; www.businessaircraft.bombardier.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.

MIKE FIZER