



# The twinjet is as fun to fly *in* as it is to fly

by Matt Thurber

The best way to experience a business jet's capabilities is to spend some time not only flying it but also sitting in the cabin during a cross-country trip to get the full passenger flavor. A trip and demo flight in Bombardier's best-selling super-midsize Challenger 350 afforded an opportunity for both experiences, starting with a flight from Las Vegas to Hartford, Connecticut, followed by a local flight out of Bradley International Airport where Bombardier's demo team is headquartered and also the site of one of Bombardier's largest factory service centers.

The Challenger 350 started as the 300, first taking flight on Aug. 14, 2001 and entering service in January 2004. A clean-sheet design, the 300 extended Bombardier's wide-cabin philosophy in a super-midsize design that could span the continental U.S. in one hop, and hence the model's original name, Continental Business Jet. This was later changed to Challenger 300. The upgraded 350 entered service in mid-2014, and it has been selling well since, averaging 62 per year from 2015 through 2017, roughly twice as many as the Gulfstream G280



and about three times as many as the Embraer Legacy 450 and 500. The CL350 is popular with fleet operators, and the first one was delivered to NetJets. Through the first quarter of 2018, Bombardier delivered 12 CL350s.

With a 3,200-nm range, the CL350 is a step more capable than the CL300, thanks to modern avionics, more powerful engines, cabin improvements, slightly longer wingspan, and a higher maximum takeoff weight (mtow). The performance improvements come with no change in the maximum fuel capacity of 14,150 pounds. The CL350 with its greater 40,600-pound mtow is able to take full advantage of the airframe's fuel capacity, while the CL300 was limited by its lower 38,850-pound mtow to less than max fuel in most cases.

Honeywell boosted the 6,826 pound thrust HTF7000-series engine on the CL300 to 7,323 pounds to create the CL350's HTF7350, without changing the ISA +15 deg C flat-rating. New canted winglets extend the wingspan to 69 feet from just under 64 feet, increasing the wing's aspect ratio by 6 percent and helping improve climb capability and high-altitude efficiency. The CL350 can climb directly to an initial altitude of FL430, 2,000 feet higher than the CL300.

While the cabin is the same size in both models, Bombardier designers have updated the CL350 interior, borrowing some elements from the cabins of the Global 6000 Premier design as well as the Challenger 650.

## Las Vegas to Hartford

The first leg of this trip included the two pilots—Dennis Yount and Kenneth Giuffre—flight attendant Griffin Bruehl, and three passengers. With full fuel, the Challenger 350 would have enough for us to fly to Bradley International Airport in Connecticut as well as the next day's demo flight and the short leg to drop me off at Teterboro. Flexibility is a hallmark of the CL350, which pays off in being able to tanker fuel bought inexpensively and make multiple hops or fill the seats and still be able fly maximum range from a hot and high airport.

A member of Bombardier's demo fleet, N207BZ opens into a club-four seating area, aft of which is the optional three-place divan opposite two club seats. The base interior option is fitted with two double-club seating areas. An extra belted seat is available in the lavatory.

Overhead is where the Challenger CL350 shows the application of modern design principles. Gone are the bulky extrusions, replaced by streamlined sidewalls and overhead island-style housings that replace passenger service units. "It gives a more airy feel," said senior sales engineer Joelle Nakhle, "and you feel more volume."

"Each seat is an optimized environment," she explained, with the Lufthansa Technik nice HD cabin-management system (CMS) and in-flight entertainment system (IFE)



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controls under a touchscreen electronic display that defaults to a moving-map information screen. The display is mounted in the sidewall rail “in the most natural position” for viewing, she said. A scroll wheel is used to select a function, then pushed to activate the selection. One seat is assigned as the master, but this can be moved to any seat position. The master has some additional control, including plus or minus 3 deg C adjustment based on the pilot-selected cabin temperature. Quick-access buttons simplify the selection of often-used items.

Cupholders at each seat are mounted behind the CMS display, which can also show movies, and when a drink is nestled in the 6.5-mm deep holder, it doesn't interfere with viewing the display, another example of the ergonomic care taken by Bombardier's interior design team.

Attention to detail was also evident when flight attendant Bruehl showed me how to open the table between the club seats. The table tilts outward with the push of a button, then pushing down on the top pops the table up so then it pulls up and outward, then the top half folds out.



The clever part is the cover where the table attaches to the sidewall. Instead of leaving a smartphone-chomping gap, a hinged cover folds down and fills the gap, and it also matches the table end to make a smooth flat surface from the sidewall to the outboard end.

A wood veneer side ledge lid opens to reveal power outlets and USB slots, and this panel is placed so it is never blocked by a seat.

Larger windows—20 percent taller than the CL300's—at each seat position flood the cabin with natural light and ensure that passengers never need to bend over to see outside.

Seats are all berthable, and in this divan-equipped cabin, the six club seats can be made into three beds. Seating capacity in this configuration (called Globetrotter) is 10, including the lavatory seat. The divan can also be made into a bed by pulling the three divan seats out flat. Each divan seat section can also be pulled flat individually, making a cozy way to put a child to bed while the parent sits on an adjacent unextended divan section.

The other baseline configuration (called Executive) is two double-club seating areas and the belted lavatory seat, for a total of nine passengers.

Occupants can access the 106-cu-ft baggage compartment with no restrictions up to the FL450 maximum altitude. The pocket door between the galley and cabin is standard on the CL350 and when closed along with deployment of the door curtain, turns the cabin into a quiet cocoon where it's possible to have a conversation without raising voices.

Fore and aft bulkheads carry 22-inch monitors for playing DRM content from the nice HD CMS or from occupants' own media collections via a USB drive or HDMI connection or using the Blu-ray player mounted near the galley. Each monitor can display content separately. The cabin sound system runs on transducers built into the sidewalls and delivers an enveloping crisp sensory experience.

Passengers can connect their own smart devices wirelessly to the CMS-IFE and by plugging in an IP address, control the lights, environment, and entertainment selections and view the moving map.

The galley and lavatory can be fitted with stone, marble, or wood flooring. Bruehl appreciates the voluminous storage in the galley and small touches like the gasper outlet blowing cool air in the back of one of the deep drawers. His favorite drawer is the large cold-storage bin, which is below the drinks drawer and helps keep drinks cool. He also appreciates the optional sink installed in this CL350.

All Challenger 350 completions are done at Bombardier's facility in Montreal, and buyers are encouraged to travel there to meet with the design team and see the assembly line and customer response center. Customers are welcome to bring their own designers, and Bombardier's experts will help explain weight and flammability constraints.



## Performance

All aircraft designs require some compromise, generally balancing fuel against passenger and baggage loads, but the Challenger 350 can carry a full payload and still fly a maximum-range trip of 3,200 nm at its long-range cruise speed of Mach .80 (eight passengers, two crew, NBAA IFR range with 200-nm alternate).

The CL350's takeoff distance at mtow on a standard day at sea level is 4,835 feet, and landing distance 2,364 feet. Adding higher conditions at 5,000 feet on a standard day shows a takeoff distance of just over 5,500 feet at mtow. An unrestricted climb to the maximum altitude of FL450 should take 16 minutes from sea level.



MARK WAGNER

**Price:**

(typically completed and equipped)  
\$26.67 million

**Engines (2):**

Honeywell HTF7350, 7,323 lbs

**Avionics:**

Rockwell Collins Pro Line 21 Advanced

**Passengers (typical):**

2/3 crew + 8/9 pax

**Range:**

(w/NBAA reserves, 200-nm alternate)  
3,200 nm at Mach 0.80

**High-speed cruise:**

470 ktas/Mach 0.82

**Long-range cruise speed:**

Mach 0.80

**Fuel capacity:**

14,150 lbs

**Max payload w/full fuel:**

1,800 lbs

**Ceiling (certified):**

45,000 ft

**Cabin altitude at ceiling:**

7,848 ft

**Max takeoff weight:**

40,600 lbs

**Takeoff distance at mtow:**

(sea level, standard)  
4,835 ft

**Landing distance:**

2,364 ft

**Length:**

68.7 ft

**Wingspan:**

69.0 ft

**Height:**

20.0 ft

**Cabin:**

Volume: 930 cu ft

Width: 7.2 ft

Height: 6.0 ft

Length: (seating area) 25.2 ft

**Baggage capacity:**

106 cu ft

**FAA certification:**

FAR Part 25



At maximum cruise thrust and after a max-weight takeoff, the CL350 flies faster—474 kias—at FL290, but at the expense of an extra 750 or so pounds of fuel per hour. At FL410, fuel consumption drops to 1,880 pph while speed tops out at 459 kias, so clearly it's worth flying higher.

The CL350's primary competitors are the Citation Longitude (not certified at the time of this writing), Embraer Legacy 500, Falcon 2000S, and Gulfstream G280.

The CL350's 6-ft high and 7-ft, 2-in wide flat-floor cabin, with a volume of 930 cu ft, is wider and larger than the Legacy 500's 6-ft, 10-inch wide, 823-cu-ft cabin but the same height. The G280's 935-cu-ft cabin, although a dropped aisle, is taller by three inches and the same width as the 350. The Falcon 2000S cabin, also has a flat floor and at 7 ft 8 in wide, it is six inches wider than the CL350, and two inches taller. The flat-floor Longitude cabin measures 6 ft high and 6 ft 5 in wide, but Textron Aviation hasn't published a volume number.

In terms of speed, these jets are fairly close, although the 2000S tops out at Mach 0.86, the G280 at Mach 0.85, Longitude at Mach 0.84, and the Legacy 500 and Challenger 350 at Mach 0.83. Published NBAA IFR range figures are: CL350 (8 pax): 3,200 nm; Longitude (4 pax): 3,500 nm; Legacy 500 (4 pax): 3,125 nm; 2000S (6 pax): 3,350 nm; and G280 (4 pax): 3,600 nm.

## Operating Costs

Bombardier continues to help operators by lowering direct operating costs of the Challenger 350. One significant change was by boosting maintenance intervals to 600 from 400 hours under the jet's MSG-3-based maintenance program, which constantly reviews maintenance requirements.

The base price of \$26.67 million includes features that Bombardier says are typically optional on other jets, such as the pocket door, microwave oven, coffeemaker, bulkhead monitors, and CMS-IFE displays at each seat. ADS-B Out is standard, and connectivity and avionics options include FANS 1/A+ and RNP AR 0.3, SwiftBroadband satcom, and Gogo Business Aviation 4G air-to-ground system.

Other options are available, such as the divan floorplan, SmartRunway and SmartLanding system, SiriusXM Weather, stone flooring, jumpseat, and additional galley enhancements.

## Flight Deck and Systems

The Challenger 350's flight deck is logically laid out and features the latest implementation of the Rockwell Collins Pro Line 21 avionics suite—Pro Line 21 Advanced—with four large displays in portrait orientation.

The primary flight display (PFD) fills the full width with the attitude directional indicator (ADI) symbology and synthetic vision system (SVS) imagery. Unlike its competitors, the



Challenger 350 does not offer a head-up display as an option, but like most modern jets, it displays the HUD-like flight path vector (FPV) on the PFD, and it's easy to fly with the FPV pointed right on the touchdown zone for a perfectly aimed landing.

In addition, the SVS includes the Rockwell Collins airport dome that highlights the destination airport and an extended runway centerline, both helpful situational awareness tools in the terminal environment.

Dual Rockwell Collins FMSs with SBAS/WAAS GPS, LPV, and RNP approach capability are mounted in the center console. Radar is Rockwell Collins's digital MultiScan system with ground-clutter suppression and auto-tilt and -gain. Dual inertial reference systems are also installed.

Glareshield control panels are duplicated for each pilot so no one has to reach across the cockpit to adjust the controls.

While the CL350 fuselage is wide, the center console extends outward at the front to accommodate the FMSs, and this ends up taking up some potential legroom. I didn't find the cockpit at all uncomfortable because of this, and it's a consequence of Bombardier



**Bombardier designers' attention to detail is evident throughout the cabin, which feels large and is laid out intuitively for today's users.**



designers keeping the overhead free of switches and buttons. What does end up taking space on the console, between the FMSs, are the electrical system switches, which are delightfully simple in keeping with the primarily DC-based system's architecture. The upper console also hosts switches for the anti-ice and air-conditioning/bleed air systems.

One simple but excellent design feature is the placement of the altimeter setting knob next to the audio panel on the left and right side tilt panels, well away from other frequently used glareshield knobs. It's easy to mix up which knob to turn when setting the altimeter when the baro setting knob is placed next to course and heading knobs, and I'm sure I'm not the only pilot who has done this more than once.

Nosewheel steering is via a tiller, which is only for taxiing and provides 70 degrees turning authority right or left. The rudder pedals are good for seven degrees either way, and this is plenty of control during takeoff and landing.

The CL350 doesn't have autobrakes, but with the ground spoilers deployed once the weight-on-wheels switches activate after landing and the wheels spin up, stopping the jet is not a problem. The carbon-fiber anti-skid brakes provide more than enough stopping power, but it's rare to have to really step hard on the brakes, according to Bombardier demo pilot Yount, who flew with me during my evaluation of the CL350. Final approach speed ranges from 111 knots at low weights to 125 knots at mtow, thanks to Fowler-type flaps that move backward for the first 4 degrees of flaps then down to the 30-deg maximum setting. After the ground spoilers deploy, landing in less than 2,000 feet is typical, he said.

Flight controls are all cables and pulleys, with no hydraulic controls except for the spoilers. The outboard spoileron on each wing is fly-by-wire controlled. A gust lock system physically covers the power levers when actuated, and the levers can't be moved when the gust lock bar is installed.

During the flight from Las Vegas to Bradley, I spent a few minutes up front getting familiar with the flight deck. At FL450, the CL350 cruised at Mach 0.80 long-range cruise speed. True airspeed was 462 knots and fuel burn lower than book at 1,600 pounds per hour total. The CL350 isn't equipped with autothrottles, but its Fadec does include a Mach hold feature that makes maintaining power easier.

## Local Flight

For the flight evaluation, Yount and I planned a lower-level flight to around 15,000 feet for some handling maneuvers followed by takeoffs and landings back at Bradley. I had already experienced the high altitude capabilities during the previous day's flight. Demo pilot Etienne Côté flew jump seat. Takeoff weight was about 10,000 pounds below mtow.



As usual, I had to remind myself to grab the tiller before launching off the blocks; flying different airplanes can be confusing, and it's important to remember the protocol before stepping on the gas.

The tiller steered smoothly and predictably and we were soon ready to take off on Runway 6. Yount had briefed me on what to expect on the takeoff: not to rotate into the flight director but fairly soon after liftoff pull power back to the climb detent and hold the nose at 5 to 7 degrees above the horizon, then press the sync button on the yoke to drop the flight director bars down to the selected attitude.

I pushed the power levers all the way forward, and the HTF7350 engines spooled up quickly and poured on the acceleration. It was quickly time to rotate. I pulled the yoke aft but kept the nose relatively low to avoid too steep a climb, then pushed the sync button on the yoke and nestled the nose into the flight director bars while we blasted through the 3,500-foot broken ceiling on the way to 15,000 feet.

ATC gave us a block between 15,000 and 20,000 feet, and I took advantage of the freedom to get used to the CL350's handling with some shallow turns then steep 180-deg turns at 250 kias. I didn't use the trim during the steep turns, but of course put the FPV on the horizon to keep from climbing or descending. I added about half a knob of power keep the speed on target, and the speed trend vector on the PFD helpfully showed me whether I needed to "drive back" the power when the vector climbed up or "drive forward" with the power levers when the vector trended downward.

I experimented with the spoilers to see if they affected the pitch attitude, which they didn't. When deployed, the spoilers caused a slight rumble, but that was it. With gear and flaps down and at slower speeds, the CL350's handling lightened up a bit, and I could feel it would be easy to fly in the traffic pattern and not at all truck-like. I made some rapid turns and could see the spoilerons actuate to help facilitate the turn. Comparing higher speeds with lower, the same amount of control input delivered the same results in pitch and bank.

I wanted to feel how the CL350 handled with one engine out, so I pulled power on one engine and stepped on the opposite rudder to straighten out the nose. I could see the speed trend vector showing that power needed to be added on the "good" engine and the slip/skid indicator on the ADI. It didn't take much rudder to straighten the nose, and Yount confirmed, "There's no need to slam it." He likes to teach pilots to follow the forward-moving power lever with the corresponding rudder. "If the throttle is going forward [to add power on the good engine]," he said, "the same foot goes forward."

We set up for the return to Bradley Airport for some touch and goes. VREF was 113 kias, and I flew at ref +10 while maneuvering to set up the final approach. Local winds were calm.



Yount had briefed me to bring the power back at 100 feet, then to idle at 50 feet. At 30 feet, I pulled the nose up a small amount, but even that was too much and caused a slight bit of floating before a smooth touchdown on the trailing-link main landing gear. We used up about 2,200 feet of runway before lifting off and climbing out for a right downwind.

The second landing was firmer with no float, just a tiny nose up movement to flare; this time it felt like I was driving the Challenger right onto the runway, but the touchdown was smooth and we had plenty of runway remaining. We took off again, then I turned onto left downwind for the final approach and landing.

For the last landing, I deployed the thrust reversers to the first detent after touchdown and stepped on the brakes as needed to make the optimum taxiway. The brakes worked smoothly, without grabbing, and as the CL350 slowed down, I moved my left hand back to the tiller steering and taxied back to the Bombardier hangar. ■