Pilot Report: Bell's New Jet Ranger X

Aviation Week

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Tony Osborne/AW&ST

Bell Helicopter has returned to the five-seat light-turbine market once dominated by its 206B Jet Ranger, of which some 8,500 civil and military variants were delivered. But since production of that model ended in 2010, other marques and models — notably the Robinson R66 — have come to the fore. Now, with the new Model 505 Jet Ranger X, a more powerful and sophisticated successor to the 206, with new propulsion, avionics, systems and airframe but the same transmission and rotors, the Textron subsidiary hopes to reclaim its crown.

The 505 was certified in December 2016 and deliveries began in March. A former U.S. Army aviator — my training at Fort Rucker began in the TH-67, the service's version of the Jet Ranger — and an MD 520N pilot for the Prince George's County, Maryland, Police Department, I traveled to Dallas to evaluate Bell's latest.

Evaluation pilot Aaron Smith (left) finds integration of the helicopter's systems with the Garmin G1000 displays to be seamless. Randall Parent, Bell's senior demonstration pilot, is in the right seat. Credit: Tony Osborne/AW&ST

According to Chuck Evans, Bell's director of marketing and sales, the company's targets for the new aircraft included equipping it with a powerful turboshaft with full-authority digital engine controls (FADEC), a modern digital cockpit, a true five-place cabin and marketing it for about $1 million.

Our evaluation flight was to depart from the Vertiport, Dallas's downtown elevated heliport, hard by the city's convention center. There I met Randall Parent, Bell's senior demonstration pilot. As we walked on to the deck after our preflight briefing, the winds were out of the south at 25 kt., with gusts to over 33 kt. Some maneuvers would not be advisable in sustained winds with such a gust spread. Parent and I discussed the flight maneuvers I felt would best give an idea of the Jet Ranger X's abilities. We were flying a demonstration aircraft that was not equipped with skid shoes for touchdown autorotations or run-on landings. We would have to terminate all autorotations with power.

During the walk-around, I found that everything I needed to check — sight gauges, engine inlets, avionics bay — was easy to access. Dzus fasteners secure all access doors, making them easy to manipulate. Climbing on the aircraft to inspect the rotor head and engine also was relatively easy; however, it would have been helpful to have a right-side handhold, like the one on the left, to aid the ascent.

Up top, the dual-spool hydraulic actuators constitute a slight change from the 206. The major difference between the predecessor aircraft and its descendant, however, is the latter's Turbomeca Arrius 2R engine, rated at 504 shp for takeoff and 457 shp continuous. That represents a major increase from the 206B's 420-shp Rolls-Royce 250-C20B. However, Bell's main reason for choosing the French engine was its FADEC.

Behind the cabin is a luggage compartment big enough for four sets of golf clubs or 250 lb. of gear. Meanwhile, the electronic power supply unit contains everything needed to manage the generator, battery monitoring and charging, and power distribution to the aircraft's various systems. Notably, there are no cockpit circuit-breakers within reach of the pilot since Bell wants to wean pilots from using them as switches or resetting those indicating a problem — a position I endorse.

The tail boom remains a classic monocoque design, and the tail rotor and its gearbox are legacies of the 206. The main rotor and transmission are also proven components from the 206, with minor design changes for installation. All the lighting is LED, and a night-vision-goggle-compliant version of all lighting and displays will be available.

Credit: Sheldon Cohen / Cohen Pictures

The main windscreen descends level to the floor with no obstructions. Doors and seats were easy to manipulate. No doors-off configurations have been specified but should be soon — likely with a speed restriction of 90 kt., as with the 206.

Behind the left cockpit door is a smaller reverse-opening door to help access the rear cabin. The area in the rear is remarkably spacious and can easily accommodate three adults.

Entering the aircraft, it would have been helpful to have a strap to grab to assist with front-seat boarding. The forward seats are comfortable but not adjustable; they must be locked forward in the "fly" position. To adjust for pilot height, anti-torque pedals must be moved to one of eight positions, a somewhat cumbersome task.

The checklist is a simple, single sheet taken directly from the pilot operating handbook (POH). Parent turned on the switch to the small lithium-ion battery in the avionics bay. At that point the Garmin G1000 displays and standby indicators came alive. Integration of engine, transmission and systems with the G1000 appeared seamless. Warning, caution and advisory lights are all displayed clearly. The limiting engine or transmission indication is enlarged, with information presented in dial format so pilots can readily monitor trends. For startup, Turbomeca's limiting indication is measured gas temperature (MGT).

Parent switched to a nifty weight-and-balance display page that is clearly laid out as a top-down view of the aircraft. He entered our weights and that of the fuel and instantly the display showed our weight of 3,150 lb., or 530 lb. below maximum gross, along with our longitudinal and lateral center of gravity.

There's a two-position switch labeled IDLE and FLY on the collective-lever head, easily manipulated by thumb. After confirming both switches were set to IDLE, I reached to the center instrument panel controls, pushed the selector to START/RUN and that was it. We watched as MGT, Nr (rotor speed) and Np (power turbine speed) came alive, and Ng (gas turbine speed) was at about 63%. I have thousands of hours in FADEC-equipped aircraft, but none in a single-engine rotorcraft in the 505's price range.

After setting up the G1000's PFD and MFD, Parent placed his throttle (switch) to FLY and we were ready to go. We taxied out, lifted off and headed to Dallas Executive Airport (RBD, the former Redbird), about 8 nm to the southwest, to conduct maneuvers. Parent had me switch my throttle to FLY, and the aircraft let us know we were in "dual-FLY" mode. The 505 was remarkably smooth given the winds. I had no problems finding a straight and level attitude at 100 kt. The collective control was also staying right where I put it, and so it continued throughout the flight.

Bell's 505 Jet Ranger X retains the Model 206B's proven main and tail rotors and gearboxes. Credit: Tony Osborne / AW&ST

I set up a 70-kt. base leg then reduced to 60 kt. indicated airspeed on final and shot my approach to the departure end of Runway 17. Into the wind it was difficult to detect the 25-35-kt. wind. On the way to RBD I did notice that, similar to the 206, you have to make a conscious effort to maintain coordinated flight and keep the aircraft in trim. I have flown a number of aircraft without automated flight controls that do not require as much footwork, but it was no different from the 206. On short final, a voice alert told me I was at 50 ft.

At the departure end of Runway 17 we sidestepped to the large sod area where Parent let me conduct a number of hovering maneuvers, including sideward and rearward flight. I was easily able to get the aircraft to move in either direction smoothly, with relatively little pedal input to keep the tail behind the aircraft. I was easily able to reach 17-18 kt. Parent demonstrated speeds closer to the 25-kt. sideward and rearward limits with no issues. Turns around the mast were smooth, and the aircraft required less torque than I thought to get the tail through the 30-kt. wind while maintaining a relatively constant rate of turn.

After in-ground-effect hovering maneuvers, I asked Parent to get to an out-of-ground-effect (OGE) altitude of about 100 ft. AGL to demonstrate pedal turns — a maneuver I would not have been as comfortable doing in the 206 given the winds. I noted about 78% as the highest torque value — good power remaining considering winds and weight.

Credit: Tony Osborne / AW&ST

As previously mentioned the aircraft was not equipped with skid shoes for touchdown autorotations or run-on landings. Consequently, we had to terminate all autorotations with power. After the OGE hover work, I asked Parent to demonstrate a hovering autorotation. He went with the published zero-ground-speed bottom side of the height-velocity diagram limit of 5 ft., switched to IDLE and the 505 settled much like the 206, with about 2-3 in. of right pedal input. Then it was my turn. I took the controls, placed the throttle to FLY and the FADEC smartly brought rotor rpm back to flight speed. Once again, for my hovering rotation the aircraft was exactly like a 206.

Next, when Parent demonstrated a minimum-rate autorotation, 50 kt. gave us 1,400 fpm, and a max glide speed of 70 kt. gave us 1,850 fpm. He used the middle of the green arc for Nr, or 100% — at the center of the 90-111% range. Descent rates were as expected for the high inertia of the relatively large and lengthy blades of Bell’s semi-rigid underslung rotor design. It feels like you have lots of time. Compared to some aircraft, you do — just don’t let Nr go below the green. Getting rpm back on a decayed high-inertia rotor system is not fun, if not impossible.

On one autorotation, Parent went as far as the flare before cushioning (where energy in the rotor system is used to soften the landing) and then switched the throttle back to FLY. He slowed the descent to 5 ft. AGL and then placed the throttle switch back to FLY and almost simultaneously pulled collective, asking for power. The Arrius 2R responded rapidly with little yaw to the right as power increased.

It was my turn to fly with the hydraulics off. This requires some effort, but the rates and movements are predictable. In the 206 with hydraulics off to simulate a failure, it is standard to search for a suitable landing area such as a runway to execute a run-on landing. Parent told me to perform a normal landing from a hover. My experience flying the CH-47D with the automatic flight control system off helped, but any pilot with good stick-and-rudder skills would do well.

At this point, it made sense to demonstrate run-on landings, but because of the winds we chose to put the hydraulics back on. Even though the aircraft lacked skid shoes, we were able to conduct a run-on landing to a grass area. Touching down above effective translational lift speed (16-24 kt. — where the rotor system is more efficient and drag from downwash starts to reduce), I was easily transitioned and maintained control to a complete stop.

Then it was Parent's turn to demonstrate a max-performance takeoff using about 95% of continuous power available, or about 85% torque. The result was about 1,750 fpm as we climbed to 2,000 ft. At the top we planned to reduce collective to enter a vortex ring state, but with zero ground speed and a 35-kt. wind across the nose, we were not going to be able to enter a settling-with-power condition.

Next, I began a series of standard airborne law-enforcement maneuvers. I used a highway on downwind so I could look across where my tactical flight officer would sit. The windscreen and doors provide good visibility. But the location where an operator would mount a computer or video monitor could hinder the spot I use to view a fleeing vehicle. This is where a chin window can make a difference.

When conducting steep, 360-deg. turns in both directions — as when pursuing a fleeing car — the aircraft was smooth, and I was able to roll the 505 to a 60-deg. bank without any adverse yaw and little additional vibration from the rotor system. Next, I focused on a tennis court to serve as a simulated target location. I initially flew 1,000-ft. AGL orbits at 60 kt., a typical infrared-camera search altitude and speed. I then reduced altitude to 600 ft. AGL and airspeed to 40 kt., a common visual search combination. In both cases the aircraft was predictable and did not display any unusual characteristics. The 600-ft. AGL orbit was high enough above the Dead Man's curve to gain the airspeed required to make a successful autorotation to landing. By this time, the sustained winds and gust spread was so high, neither Parent nor I felt it prudent to demonstrate autorotation from a hover at the top of the height-velocity diagram. At that point, we headed back to the Vertiport.

The 505 holds about 550 lb. of fuel and, at a consumption of about 200 lb./hr., you can expect about 2.5 hr. of flight, and with a cruise speed of 105-110 kt., you can plan a range of about 250 nm. Bell predicts DOCs of about $420 per hour. Some components are life-limited to 500 hr. pending fatigue testing. The goal is for all major components to have at least a 3,000-hr. time between overhauls.

The 505 Jet Ranger X meets Bell's targets and is an able successor to the iconic Model 206. While I would prefer it being fitted with a fully articulated rotor, that would have caused it to exceed its target price. And with a base of about $1.2 million, the 505 should prove to be a popular competitor in the entry-level, light-turbine helicopter market — a market its predecessor helped create.