Hawker 200
Dual personality: sporty performance and commodious cabin

Analysis:

Operating costs for current and out-of-production aircraft

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By Fred George
fred.george@aviationweek.com

Hawker 200

Dual personality: sporty performance and commodious cabin

Push up the throttles in the Hawker 200 on takeoff and you might think you’re strapped in a Learjet 25, considering this aircraft’s rapid runway acceleration, excellent climb performance and near Mach 0.80 cruise speeds in the mid-forties. That’s to be expected. The Hawker 200 has the best thrust-to-weight ratio of any business aircraft in current production, even edging out the athletic Cessna Citation CJ4. Clearly, this aircraft runs away from its predecessor, the Beechcraft Premier IA. When the Hawker 200 enters service in late 2012, pilots will be able to plan flights using Learjet-like 440 KTAS block speeds and file for direct climbs to altitudes as high as FL 450. Trips between city pairs such as Seattle and Los Angeles, Houston and Chicago, or Toluca and Dallas will take little more than 2 hr. The only member of the Hawker family that can cruise faster is the $2.5 million super-midsize Hawker 4000 flagship.

The Hawker 200’s boost in performance mainly comes from its Williams International J34-IAAP turbofans. They provide almost one-third more thrust than the -2A engines that power the Premier IA and they give the aircraft much improved hot-and-high airport performance. Winglets also contribute by cutting lift-induced drag, thereby allowing to improve runway performance and enabling it to cruise higher, faster and more economically. Maximum operating altitude is increased by 4,000 ft., to 45,000 ft., further improving fuel efficiency and helping the aircraft top more weather buildups. Just as importantly, the Hawker 200 can climb directly to FL 450 in 26 min., or less, as we recorded when we flew it.

The empty weight of the new Hawker went up by 720 lb., compared to the Premier IA, but its maximum takeoff weight increased 1,300 lb. Thus it can lift almost three times the payload with full fuel. The Hawker 200 can carry four adults, one child and baggage with the tanks topped. A typically-equipped Premier IA has a 320-lb. tanks-full payload.

The Hawker 200 is built on the same factory tooling as its predecessor, and thus their interior shell dimensions are identical. These two aircraft have the largest cross section of any in the light jet class. Thought was given to stretching the aircraft and adding more fuel, but that would have required a costly investment in new factory tooling and a considerably more extensive recertification program. Keeping a tight rein on development costs enabled Hawker Beechcraft to hold down the price increase to less than $660,000 compared to the Premier IA.

The overall cabin volume is 315 cu. ft. and there is an 85-cu.-ft. cockpit. Its interior height and width actually rival that of some midsize aircraft, including legacy Hawkers. Capitalizing on that sizable asset, the aircraft, which was to be called the Premier II, was renamed the Hawker 200.

Reflecting the new name, the cabin was rearranged to improve passenger comfort and utility. Since most operators will carry no more than four passengers, the main four-seat club section has increased legroom and the two forward-facing seats in the aft cabin have been removed. For the occasional fifth passenger, engineers installed a single side-facing chair on the left rear side. The side-facing aft chair allows a vertical aft partition to be fitted to the cabin, thus opening up space in the aft lavatory and also providing room for an optional belted potty seat to carry an extra passenger.

Hawker Beechcraft officials counter that the new aircraft flies routine missions 15- to 20- kt. faster than the Premier IA, making it the fastest light jet outside of the diminutive SyberJet SJ10-2, which has the smallest cabin outside of the out-of-production Eclipse 500. Moreover, if most competitive light jets are flown at its 440- to 450-KTAS cruise speeds, the Hawker 200 has far more range because it flies considerably higher and thus gets better fuel economy.

Operators want to fly farther than 1,370 nm with four passengers, they need only slow down to Mach 0.72 to stretch the range to 1,590 nm, as shown on the accompanying Time and Fuel Versus Distance Chart. Slowing down further to typical straight-wing jet cruise speeds of Mach 0.68 to 0.70 extends the four-passenger range to 1,545 nm.

Performance statistics and cabin measurements alone do not tell the whole story. The Hawker 200, along with its predecessor Premier I, is the first business jet to have a composite fuselage. The carbon fiber and honeycomb structure is immune to corrosion and has excellent fatigue resistance. The aircraft has a mildly swept wing and complex aero contours that give it exceptional fuel efficiency, considering its relatively high cruise speed and class-leading cabin comfort.

Modified Airframe and Improved Systems

The Hawker 200’s elliptical winglets, developed in partnership with Wichita-based Winglet Technologies LLC, are the most obvious aerodynamic change to the aircraft from its predecessor. These quick-response blades are built into the fuselage and can be set to one of three angles in flight. The Hawker 200 still falls short in its 440- to 450-KTAS cruise speeds, the most competitive light jets are flown at 1,000 nm farther with four passengers at Mach 0.68. The price increase to less than $600,000 enabled Hawker Beechcraft to hold down the price increases to the Hawker 200 than they were on the Premier IA. To provide additional strength needed for the increased pressurization required for cruising 4,000 ft. higher.

The pressurized section of the fuselage shell, minus the unpressurized nose and tail sections, is fabricated as a single structure on the assembly line. After that, the carbon fiber/honeycomb sandwich structure is removed and cured in a high-pressure autoclave. The completed fuselage is placed on the pressurized section and the airframe is assembled. The aft fuselage has deep structural contours that are made using computer controlled “viper” fiber-placement machines that wind carbon fiber tape, impregnated with epoxy resin, around a mandrel. After the viper completes the inner skin, technicians attach the honeycomb core by hand and then the viper applies the outer skin.

The carbon fiber skins are thicker on the Hawker 200 than they were on the Premier IA/1A to provide additional strength needed for the increased pressurization required for cruising 4,000 ft. higher. The multifunction spoilers and vertical stabilizer spars are constructed from aluminum. The wing is all aluminum and it has 20 deg. of sweep back at quarter chord. That’s about 15 deg. more than in common with the wings of legacy Hawker jets. The Hawker 200’s airfoil is a high-speed, natural laminar flow design that maintains laminar flow on the upper surface of the wing from root to tip.

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The wing structure is complex, robust and reinforced for the Hawker 200 to handle the 1,100-lb. takeoff weight increase and increased aerodynamic loads imposed by the winglets. There are six single-piece, machined-milled spars, plus a seventh, aft sub-spar that provides the rear mounting point for the main landing gear. Intercostal ribs, attached to the wing spars, form an internal ladder structure. Single-piece, milled upper and lower wing skins are riveted onto the ladder structure forming semi-monocoque wing boxes.

Raising the maximum ramp weight to 13,800 lb. from 12,590 lb. resulted in a more restricted c.g. range, as on the case with derivative aircraft. The new model has a forward limit of 27.7% MAC at MTOW compared with a 24.0% forward limit for the Premier IA. The aft limit remains 32.5-38.5% depending upon aircraft weight. In everyday operations, the narrowed loading envelope should pose no problems.

Most of the Premier IA's systems are carried over, but some have been upgraded. The right side emergency exit is larger. Carbon/carbon brakes replace the steel discs and steel braces replace aluminum braces on the landing gear. The engine mounting system is strengthened to handle the additional thrust. Pressurization is increased and twin ventral strakes have been added underneath the tail to improve stability.

As with its predecessor, the Hawker 200 has mechanically actuated primary flight controls. Rudder travel has been increased to 29 deg. from 25 deg. to handle the larger winglets and increased tip-to-tip span by 1.1 ft. and reduce drag up to 3-4% in cruise. Larger winglets would have further reduced drag, but they also would have required more structural reinforcement to the wings, thus increasing empty weight.

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As with its predecessor, the Hawker 200 has mechanically actuated primary flight controls. Rudder travel has been increased to 29 deg. from 25 deg. to handle the greater thrust. A rudder boost system reduces pedal effort in proportion to thrust asymmetry. Digital fly-by-wire, hydraulically actuated multifunction spoilers augment roll control authority. The spoilers also have speed brake and lift dump functions. Electric trim is provided in the pitch, roll and yaw axes. The left aileron spoilers also have speed brake and lift dump functions. The landing gear has been beefed up to handle the added weight. The carbon brakes both increase stopping power and reduce empty weight. The brake pedals are connected directly to the brake control valves, providing crisp response. An emergency accumulator provides brake power in the event of a hydraulic system failure. Nosewheel steering is controlled by mechanical links to the rudder pedals.

Toss out those Prist cans. Fuel heaters eliminate the need for anti-icing inhibitor additives. The wet wings hold all 3,650 lb. of fuel, down 20 lb. from the Premier IA. Over-wing refueling ports are standard. The optional single-point pressure refueling system adds 33.6 lb. to empty weight. Jet pumps normally feed fuel to the engines. Boost pumps provide fuel pressure for engine start and transfer. They’re also backups for the jet pumps.

Left and right engine-driven hydraulic pumps supply 3,000 psi pressure to actuate the landing gear, multifunction spoilers and anti-skid wheel brakes. Conventional MIL-H-5606 red fluid fills the 1.7 gal. reservoir.

Each engine also has a 28-VDC, 325-amp starter generator that supplies the parallel bus electrical system that powers the wing flaps, air-conditioning system and lights along with the anti-ice heaters, and other equipment. A 24-volt, 42-amp-hour lead-acid battery provides primary emergency electrical power. There is a separate standby 3.5-amp-hour battery for the emergency standby instrument system and other essential gear.

Engine bleed air is used for cabin heating and pressurization. Pressurization is scheduled by a stand-alone automatic controller that isn’t linked to the FMS. Maximum cabin altitude is 8,000 ft. at FL 450. There is a 50-cu.-ft. emergency oxygen system. An electrically powered vapor cycle system provides air-conditioning. The cockpit and cabin have individual temperature controls.

The wing leading edges and engine nacelle lips also use engine bleed air for anti-icing. The horizontal tail uses an electrically heated parting strip to soften ice accretion and an electro-magnetic expulsive icing system that thumps the leading edge to shatter ice and allow it to be carried away by the slipstream.
Rockwell Collins Pro Line 21 Avionics

The Hawker 200’s Rockwell Collins Pro Line 21 cockpit looks a lot like that of the Premier IA, with its three 10-in.-by-8-in. AFD-3010E LCD screens, stand-alone annunciator light panel and dual multifunction CDUs in the center console. The most obvious difference is the Meggitt EPD-40002 integrated electronic standby instrument system that replaces the cluster of three standby instruments aboard the Premier IA.

Major changes were made to the remote boxes. Rockwell Collins’ RTA-4112 Multi-Scan weather radar replaces the WXR-800 and the TSS-4100 hybrid instrument system that replaces the cluster of three standby instruments aboard the Premier IA, with its three 10-in.-by-8-in. AFD-3010E LCD screens, stand-alone annunciator light panel and dual multifunction CDUs in the center console. The most obvious difference is the Meggitt EPD-40002 integrated electronic standby instrument system that replaces the cluster of three standby instruments aboard the Premier IA.

Options include XM satellite radio or worldwide ACARS data link with graphical analysis storage, cup holders and emergency steering. For international operations, an Inmarsat data link adds access. For international operations, an Inmarsat data link adds access. For international operations, an Inmarsat data link adds access. For international operations, an Inmarsat data link adds access. For international operations, an Inmarsat data link adds access. For international operations, an Inmarsat data link adds access.
is superior. That’s an important asset in an increasingly eco-conscious world.

Range performance isn’t this aircraft’s best feature, even though it can fly four passengers 1,500 nm. Range competition is tough in the light jet class. Some operators hope that an auxiliary fuel system will be developed for the aircraft that will enable them to trade payload for more miles.

Hawker Beechcraft officials have no immediate plans for such a modification. They point out that the aircraft can fly coast-to-coast, eastbound or westbound, in the U.S. with one refueling stop. All other light jet competitors, except for the compact SJ30-2, also have to stop for fuel on that mission. The difference is that four passengers aboard the Hawker 200 will climb above the weather faster and make the journey in less time, in a more comfortable cabin and while consuming less fuel than most aircraft in this class.

The Premier IA offered ample cabin comfort, but its girth outgrew its engines during development and performance suffered as a result. Hot-and-high takeoff performance was anemic. With stiff winter headwinds, it might have to stop twice for fuel en route from New York to San Diego.

The Hawker 200 remedies those performance shortcomings and it offers an even more comfortable cabin for four passengers. With this dual personality aircraft, light jet operators no longer have to choose between cabin comfort and strong performance.

Designers attempt to give exceptional capabilities in all areas, including price, but the laws of physics, thermodynamics and aerodynamics do not allow one aircraft to do all missions with equal efficiency. Tradeoffs are a reality of aircraft design. In order to obtain a feeling for the strengths and compromises of a particular aircraft, we compare the subject aircraft’s specifications and performance attributes to the composite characteristics of other aircraft in its class. We average parameters of interest for the aircraft that are most likely to be considered as competitive with the subject of our report, and then we compute the percentage differences between the parameters of the subject aircraft and the composite numbers for the competitive group as a whole. Those differences are presented in bar-graph form along with the absolute value of the specific parameter for the subject aircraft and its ranking relative to others in the composite group. For the Hawker 200 Comparison Profile, we compared it to a composite group of five aircraft including it, the Cessna Citation CJ2+ and CJ3, Embraer Phenom 300 and SyberJet SJ30-2. Please note that the Comparison Profile is meant to compare the relative strengths and compromises of the subject aircraft to a composite average, rather than being a means of comparing specific aircraft models to each other.