

Raytheon's first

Raytheon Aircraft is claiming a breakthrough in business-jet design with the launch of its Premier I.

GRAHAM WARWICK/WICHITA

RAYTHEON AIRCRAFT'S new Premier I light business-jet is not a Beech, nor a Hawker. It is the first all-new aircraft to carry the Raytheon name and, for the year-old company, it represents both the launch of a new light-jet family and the first step in a revamp of its entire product line.

The Raytheon Model 390 Premier I is a six-passenger aircraft with a composite fuselage, swept wing, Williams-Rolls FJ44-2A turboprops and Rockwell-Collins Pro Line 21 flat-panel avionics. Its first flight is planned for the third quarter of 1997, and the first deliveries for the fourth quarter of 1998.

At \$3.9 million, the Premier I is priced between Cessna's CitationJet and Citation Bravo, but offers a larger cabin, higher performance and lower cost of operation than either aircraft, says Raytheon. "The Premier I is a light jet with a mid-jet cabin, high speed and a price well below that of any other light jet," says president Roy Norris.

Raytheon's first all-new business jet was conceived in secret at the company's Andover, Kansas, plant, where designers were given a challenge: "We did not want another 'me-too' aircraft," Norris says. "There had to be an undeniable, dramatic, improvement over the CitationJet" — which he describes as a "microjet". The result, he believes, "...is the most significant new-aircraft entry into the market in the last 25 years.

"The Premier I offers a mid-jet cabin at a microjet price. It will reduce the microjet to a toy," Norris argues. "The Premier I is a real, practical, business aircraft" which will appeal equally to entrepreneurs and corporate flight-departments, he believes.

According to Norris, the Premier I "...is the first light jet to take advantage of new developments in aerodynamics and construction". The aircraft has a high aspect-ratio swept wing, whereas Citation light jets have straight wings. "Straight wings are inefficient," he argues. "You go to a jet to improve speed and efficiency.

Why take half of it away with a straight wing?"

The second major innovation is the cabin, Norris says. "With previous aircraft, you had to compromise on cabin size when moving from a turboprop to a light jet. The jet needed a small [fuselage] cross-section to achieve its speed. The Premier I uses advanced aerodynamics, combined with a composite fuselage giving a substantially increased internal size while maintaining an external cross-section similar to that of other aircraft," he adds.

WIDER INSIDE

Carbonfibre/honeycomb-sandwich construction eliminates all internal fuselage frames and increases the available cabin volume by 13% over conventional construction, says Model 390 chief engineer David Bernstorf. Fuselage skins are 20mm thick, reducing the inside diameter by just 40mm, compared to 150mm for a conventional fuselage.

Fuselage outside diameter is 1.8m. The cabin interior is 1.7m wide and 1.6m high, with a flat floor, dropped aisle, and a full-width private lavatory aft. "The cabin cross-section is embarrassingly close to that of the Hawker 800," Norris admits. "A customer can step up from a [Beech] King Air 90 or 200 and not feel that the cabin is compromised," he says.

Raytheon talked to more than 100 customers and worked with an advisory group of more than 20, representing operators of the King Air 90 and 200, CitationJet, Citation V, Learjet 31, and Hawker 800, in defining the aircraft. Premier I marketing manager Ken Mikolajchak says that surveys showed that a six-passenger



Premier I: first step in product-line revamp

interior was "highly desirable" for comfort. The aircraft carries six passengers in individual seats, the centre seats swivelling through 180° to berth with the forward seats, he says.

Fuselages will be produced using automated fibre, or tow, placement (*see box*). Compared with hand lay-up, used to produce Beech Starship fuselages, tow placement is "extremely cost-efficient", says Norris. Numerical-control (NC) machines will be used to produce the fuselage. "This reduces the cost of growing the aircraft. We can change the length, the diameter, the number of windows, even the loft lines, by changing the NC tape," he says, acknowledging that Raytheon plans a Premier II and III.

Bernstorf says that the composite fuselage offers several advantages, including lower cost and weight, a quieter cabin, resistance to fatigue and corrosion, reduced manufacturing variability, and a smoother finish. Over 100 fuselages, the production cost will average \$300,000, compared to \$416,000 for a conventional aluminium unit, Raytheon estimates.

SWEPT FOR SPEED

With a 20° leading-edge sweep, high aspect-ratio, and a supercritical aerofoil section "with some degree of laminar flow", the wing is designed to give the Premier I a 460kt (850km/h) cruise speed. Flaps extend out to 75% chord, to achieve a 3,000ft (900m) take-off field-length. As a result, the ailerons are small, and roll-control augmentation is provided by the outer of three spoiler panels on each side. Flight controls are manual.

Passing the wing under the fuselage avoids penetrating the pressure vessel and provides for a flat cabin floor. There are composite fairings forward of and under the wing, but the aft

HOW THEY COMPARE

	Cessna Model 525 CitationJet	Raytheon Model 390 Premier I	Cessna Model 550 Citation Bravo
Equipped price (\$m)	3.15	3.9	4.395
High-speed cruise (kt)	382	461	392
NBAA IFR range (km)	2,360	2,775	2,845
Cabin — length (m)	3.4	4.1	7.5
Height (m)	1.4	1.6	1.4
Width (m)	1.4	1.7	1.4
Volume (m ³)	7.1	11.3	10.6
Payload, full fuel (kg)	263	363	406
TO field length (ft)	3,080	3,000	3,400

Source: Raytheon Aircraft