

Avro RJX and paper planes

BAe Regional Aircraft has selected an engine for the RJX that should give it the economic performance too long missed by the BAe 146 and Avro RJ. Meanwhile, up to four other manufacturers are still proposing or deciding which aircraft to offer in the 70- to 110-seat market.

BAe RJX a reality

British Aerospace Regional Aircraft has announced that it has conditional authority from the BAe board to offer the Avro RJX.

As expected, a version of the Allied Signal AS 900 engine, the AS 977-1A, has been selected to power the aircraft. Although short of a full launch, this puts the RJX ahead of all the other offerings in this category. The Avro RJX is basically a re-engined Avro RJ. Most importantly the remaining LF 507-powered RJs being built still have to be placed with customers. A final decision to launch will be taken by the third quarter of 1999.

BAe Regional Aircraft is taking a conservative view on the market. It feels the potential of 2,500 aircraft over 20 years does not warrant the development of a new aircraft. The market could be made smaller by the retirement of Fokker 100s and other similar sized aircraft into the market.

BAe Regional Aircraft says it expects to maintain market leadership, despite the bullish comments being made by a host of other manufacturers. Many of the Avro RJ's customers are airlines that are members of major alliances.

The generally conservative view of the market is explained by the existence of US major airline scope clauses. This has led to a peculiar situation in which there is a gap between a maximum of 50 seats operated by regional affiliates and an economic minimum of 120 seats operated by the majors. It is in this gap that the RJX and others could potentially have a huge market. For the present,

however, such a market is out of reach.

This will only change if scope clauses are extended by US majors to allow larger aircraft into the regionals, or if 70- to 100-seat aircraft become economical enough for majors to operate. A key factor in this is list price and consequent finance charges. This is where one competitor, Embraer, may at least have an advantage.

The market for now is left mainly to Europe and Australasia. Unofficial reports speculate that the choice of the Australian Air Show as the place to launch the programme may not be a coincidence. In fact, a launch order is being negotiated from an existing BAe 146 operator in the region. This could be for up to 30 aircraft.

Assuming a full launch takes place as scheduled, entry into service will occur in May 2001. List price for the RJX will be approximately \$1.5 million more than the current Avro RJs. This would give the RJX-85 a price of \$27.4 million and the RJX-100 a price of \$29.9 million.

The key to the RJX is the improvement in economics it offers over the Avro RJ. The targets set by BAe Regional Aircraft were for a reduction of 2,000lbs in hull weight, 15% lower fuel burn and a decrease of 20% in direct engine maintenance cost (see *Upgrade for Avro RJ*, page 37, *Aircraft Commerce*, September/October 1998). The onus to achieve this is on the engine selected for

the Avro RJX.

The BAe 146 suffered enormous problems with engine reliability and its image, because of the ALF 502 engine. The Avro RJ is powered by a derivative, the LF 507. These reliability problems translated into unexpectedly high engine maintenance and spare engine inventory charges for the BAe 146. The LF 507 offered some improvements, but BAe Regional Aircraft still aims for further reductions to make the aircraft more acceptable against two-engined aircraft with more reliable powerplants.

The onus is on the AS 977 to achieve these reductions. The engine has a higher flat rating and lower specific fuel consumption than the LF 507. It also has a much higher turbine entry temperature (TET) margin. All of these improvements are a result of the AS 977 engine having much higher aerodynamic power than the LF 507.

BAe Regional Aircraft says the engine has delivered enough improvements for it to meet the fuel burn and maintenance cost reduction targets. The AS 977 is a derivative of the AS 907. It will have life limited parts (LLPs) with 25,000 cycle lives and, initially, will be thrust rated at 7,000lbs. This could later rise to 9,500lbs as development progresses. The AS 907 is optimised for high-speed and high-altitude operations. The AS 977 has been slowed down and, as a result, has gained TET margin and longer LLP lives.

Allied Signal says the 20% reduction in direct engine maintenance costs will come from on-wing lives of 12,000 engine flight hours (EFH). This compares to about 6,000EFH for the Avro RJ. The firm is confident it will achieve lower maintenance costs since the AS 977 has a TET of 370°F during cruise and 160°F at take-off.

BAe Regional Aircraft is counting on the AS 977 to deliver the 15% fuel burn and 20% direct engine maintenance cost reduction that the Avro RJ has been missing. The AS 977 is expected to have on-wing times of 12,000EFH, a TET margin of 370°F in cruise and 50% fewer parts than the LF 507. The engine has also contributed a 500lbs lower hull weight.





The AS 977 will include several other improvements, including greater accessibility to engine line replaceable units and wide chord fan blades. The aerodynamic efficiency of the engine will allow it to have 66 turbine blades, compared to 97 in a competitor's engine. The AS 977 will also have about a 50% parts count compared to the LF 507.

The wide chord fan blades will contribute to lower fuel burn. Despite the engine having a smaller fan and bypass ratio than the LF 507, the AS 977 has a similar weight and 29% greater net thrust. The higher flat rating will improve payload-range performance from hot-and-high airfields. The engine has also delivered a 500lb reduction in hull weight.

The combination of a 15% reduction in fuel consumption and a 20% reduction in engine maintenance costs result in about a 4% reduction in overall direct operating costs compared to the Avro RJ. The RJX's increased list price reduces the overall improvement in DOCs to about 1%.

The RJX was described by British Aerospace Regional Aircraft's vice president for marketing, Nick Godwin, as "The common sense derivative that achieves the same basic economic goals of the brand new 'paper aircraft' proposed by other manufacturers."

But this does not stand up to scrutiny. Based on the limited amount of information that has been released to date, and by making some very broad assumptions, it is estimated that its closest competitor, the ERJ-190, could offer up to 20% lower seat-mile costs than the RJX-85. This assumes Embraer will be able to deliver an aircraft to the

market for \$24 million, \$3.4 million less than the RJX-85.

If the market size is what Embraer has predicted (2,500 units) then there should be no problem amortising the development costs over a large number of aircraft. This should take place over about 20 years and so will equal only about 120 aircraft per year.

In reality nothing like this market size has existed previously for aircraft, such as the F.28/Fokker 100 and BAe 146/Avro RJ.

ERJ-170 & ERJ-190

In an amazing turnaround, Embraer has announced the pre-launch of a new regional jet family comprising the 70-seat ERJ-170 and the 90-seat ERJ-190.

Pending a final go-ahead decision, which is planned for the second quarter of 1999, initial ERJ-170 deliveries should take place in 2002, with the larger model following in 2004. A target price of \$21 million for the ERJ-170 and \$24 million for the ERJ-190 has been set.

Previously, Embraer had been very cool to the idea of a 70-seat jet. At the ERA General Assembly in September 1998 it had said the launch of a 70-seat aircraft would have to wait until the US market was less bound by scope clauses. Considering Embraer's historical market share, which has been almost entirely in the US, this seemed an appropriately cautious response. However, Embraer has now gone ahead, if only with a pre-launch.

Few details have been released, but

Embraer has said it will launch the ERJ-170 and ERJ-190 in the same way that it has always launched new aircraft; it will spend an amount similar to that by other manufacturers to develop a derivative and to put it on the market at a lower list price than the competition. Considering the difficulty that scope clauses present for Embraer in the US, the company will need to sell outside its traditional market.

one of the decisions that has been taken is to use a four abreast cabin cross-section. Considering the ERJ-190 will accommodate 90 seats, it will have a narrow fuselage of 23 seat rows.

Embraer says that it has the resources to develop the aircraft without partnering with another manufacturer. Investment will total about \$750 million for the project. One-third will come from Embraer and the remainder from risk-sharing partners and investors.

Fairchild & ATR?

While Embraer and British Aerospace have moved forward, what is the position of Fairchild Aerospace? After a period of frantic activity between May and October 1998 the company has been quiet.

The only rumours are that Crossair has pulled out of its programme. Fairchild's inactivity echoes earlier German experience with several aircraft types.

Further progress now appears to depend on the successful conclusion of a partnership with ATR, a company which until recently had been linked with Embraer.

A partnership between Fairchild and ATR is hardly a match made in heaven. There is a distinct difference in ideology between the private enterprise of Fairchild Aerospace and the state ownership that characterises ATR partners Aerospatiale and Alenia.

ATR appears to have conceded design leadership to Fairchild Aerospace. Nevertheless, arguments continue on final assembly location and shareholdings.

One motivation behind all the paper aircraft projects is that no one wants to be seen to be doing nothing. In the words of Embraer's vice-president Satoshi Yokota at the announcement of the ERJ-170/190 "We need to show we're in the game."

British Aerospace's announcement is therefore a breath of fresh air for real airlines that operate in real markets. **AC**