

While it still not clear where the market for 70-100 seat RJs will come from, there are indications of how the market will develop. Some US majors have managed to relax their pilot union scope clauses and others that do not have them have placed large orders. Considering the replacement market potential, total sales could reach the 2,000 level.

Can the market absorb 2,000 70-100 seat RJs?

Despite recent orders from US Airways and JetBlue for 165 Bombardier CRJ700s and Embraer 170/190s, the eventual size of the market for the new generation of 70-100 seat regional jets (RJs) is still difficult to predict. Any discussion of the potential market usually returns to comparisons with the 'regional jet revolution of the mid-1990s'.

Commentators often forget that in the early 1990s the future of the Canadair RJ was anything but secure, with early orders being cancelled and the whole concept being questioned. Subsequent sales of over 1,000 aircraft proved the sceptics wrong. The latest generation of larger RJs is at a similar stage in its commercial development, but how realistic is the assumption that it will ultimately be as successful as the 50-seat generation?

Existing orders

Current sales of Bombardier and Embraer 70-100 seat RJs are given (*see table, page 39*). Bombardier and Embraer have sold over 450 aircraft in this category.

The CRJ700 is the market leader with 192 ordered and 95 delivered as of 30th May 2003. Its success is to some extent due to its early development, as it entered service in January 2001 with launch customer, Brit Air of France.

Bombardier launched the further stretched CRJ900 in July 2000 in response to the larger capacity offered by the Embraer ERJ-190/195. Bombardier announced firm orders for four aircraft with eight options from Brit Air, and Letters of Agreement with Air Nostrum and Tyrolean for eight and 12 aircraft respectively.

In the event none of these launch commitments have been confirmed. The only firm customer for the type is Mesa

Airlines with orders for 25 aircraft, the first of which was delivered in February 2003.

Embraer launched the all-new ERJ-170 family in June 1999 with launch customer Crossair ordering 30 ERJ-170s and 30 ERJ-195s, with options on a further 100. Given such a prestigious launch customer, Embraer must have been disappointed with the subsequent slow build-up of sales.

Until recently it was only able to add orders from two other operators; Air Caraibes and Alitalia, and it saw Crossair, now Swiss, reduce its order to only 30 plus 20 options.

Fortunately the second quarter of 2003 has seen a dramatic increase in the order book. In April LOT Polish Airlines committed to 10 ERJ-170s, in May US Airways committed to 85 ERJ-170s, and in June JetBlue Airways committed to 100 ERJ-190s.

Embraer has expanded the market away from the traditional regional operators with JetBlue's order. Even more significant than the scale of the order, is the fact that JetBlue is not a full-service airline but a low-cost carrier. JetBlue also gave up the commonality that the A318, an alternative to the ERJ-190, would have with its fleet of 41 A320s (with a further 111 on order). JetBlue emphasised the efficiency of the Embraer over the Airbus.

GECAS entered the RJ leasing business when it committed to 50 aircraft from each of the three manufacturers in June 2000. This appeared to herald a move back to operating leasing, but GECAS' enthusiasm has diminished considerably, since it has struggled to place these aircraft. Ten of the 15 CRJ200s, all 25 CRJ700s and the 10 CRJ900s have been passed on to operators, leaving only five CRJ200s as true operating leases from GECAS. Of the 50 firm ERJ-170 orders, 30 have been

earmarked for US Airways and four to LOT, while a further 15 have been converted into ERJ-190 commitments for JetBlue. Finally the 50 Fairchild Dornier 728s were cancelled following the bankruptcy of the manufacturer. By offloading almost all of its Bombardier commitments and leasing the Embraers, GECAS may now be content to exit the market gracefully.

Market assessment

The future market potential is analysed in the following broad categories:

- 1 Replacement market
- 2 Growth market
- 3 Mainline market

Replacement market

An obvious opportunity for the new generation of 70-100 seat RJs is to replace the existing BAE 146/Avro RJs and Fokker 70/100s. The current fleets of these aircraft in passenger airline operation are given (*see table, page 40*). VIP/corporate aircraft, freighters and aircraft currently inactive are not included.

Clearly the US is a very limited replacement market. The only operators are Air Wisconsin and Mesaba, with fleets of BAE 146s and Avro RJs, and American Airlines with Fokker 100s.

Mesaba's fleet of Avro RJ85s are on long-term lease from Northwest, for whom they are operated, and American has previously announced that the Fokker 100s will be phased out during 2005.

This only leaves Air Wisconsin's fleet of BAE 146s, which are grandfathered into the United Airlines' scope clause by individual tail number. Good airfield performance is a requirement for the

important tourist destination of Aspen, and if United continues jet service there, the only obvious replacement is the ERJ-170.

The replacement market is largely European, since there are more than 40 operators flying in excess of 300 aircraft. The biggest obstacles for new aircraft are:

- The poor financial condition of the airlines.
- The relative youth of the existing fleet and the availability of large numbers of used aircraft.
- The poorer cabin comfort provided by the CRJ700/900's narrow cross-section.

The financial weakness of Europe's major carriers and a gloomy economic outlook have caused many to postpone re-equipment plans.

The experience of Crossair with the Embraer 170/195 is a good demonstration. Crossair's circumstances have changed dramatically following its launch order for 60 aircraft and 100 options in June 1999. In March this year the order was reduced to 30 orders with 20 options.

Although the oldest BAE 146 are now 20 years old, the majority of these older aircraft are already on their second and subsequent operators. The fleets that are likely to be replaced with new production aircraft are far younger. The Avro RJs are no more than 10 years old and the average is nearer five years.

Lufthansa Cityline's recent agreement with BAE Systems demonstrates of how the youth of the existing fleet is postponing their replacement. Lufthansa has exercised its residual value guarantee with BAE on 10 of these aircraft and sold them back to BAE. Rather than simply taking the opportunity to return the aircraft, they are now the subject of a leaseback which will see the fleet of 18 aircraft operated into the 'second half of this decade'.

Europe is witnessing a lot of activity in the used aircraft market, but these operators are not necessarily likely to order new aircraft from the factory. A good example is Germania which is taking delivery of 19 ex-US Airways Fokker 100s for the development of new low-cost services in Germany. It is unlikely that this opportunity would have made commercial sense with new production aircraft.

The replacement market will see the four-abreast CRJ700/900 and ERJ-170 families replacing the five- and six-abreast BAE 146/Avro RJ and five-abreast Fokker 70/100. Embraer's optimised four-abreast cross-section will be an advantage as Bombardier struggles with the comfort standard provided by the 'historic' Challenger cross-section. Bombardier has

EXISTING SALE OF BOMBARDIER AND EMBRAER 70-100 SEAT REGIONAL JETS

Customer	CRJ700		ERJ-170/175	
	Ordered	Delivered	Ordered	Delivered
Air Caraibes			2	0
Alitalia			6	0
American Eagle	25	10		
Atlantic Southeast	12	12		
Brit Air	12	9		
Comair	20	10		
Delta Connection	26	5		
GECAS			50	0
Horizon Air	30	16		
LOT			6	0
Lufthansa Cityline	20	18		
Maersk	5	5		
Mesa	15	10		
Shandong Airlines	2	0		
Swiss			15	0
USAirways	25	0		
Total	192	95	79	0

Customer	CRJ900		ERJ-190/195	
	Ordered	Delivered	Ordered	Delivered
JetBlue			85	0
Mesa	25	3		
Swiss			15	0
Undisclosed			10	0
Total	25	3	110	0

developed the option of a three-abreast 'business' configuration to offset this disadvantage. Bombardier has matched this option with the basic CRJ900 airframe to arrive at a scope-clause-compliant 75-seater, designated the CRJ705, with nine 3-abreast seats and 66 4-abreast for US Airways. The use of this dual class configuration will also undoubtedly improve Bombardier's chances in the European market.

Growth market

There will be a natural growth market for larger aircraft where the 50-seat capacity of the earlier generation RJ is not sufficient. Bombardier and Embraer have approximately equal opportunities, with both having large fleets of CRJ100/200s and ERJ-135/140/145s to build upon.

Half the existing orders for 70-seaters have been for the US market (233 out of 461) and this trend is expected to continue.

Bombardier has an undisputed advantage with American Eagle and Delta Connection (Atlantic Southeast and Comair) together with smaller operators Horizon (Alaskan Airlines) and Mesa (America West) already operating the CRJ700/900.

Embraer has USAirways, but this operator split its order between CRJ705s and ERJ-170s. Among the US majors, and discounting Northwest and United which are discussed elsewhere in this article, this leaves only Continental which is a clear Embraer customer.

The biggest barriers to the widespread replacement of the 50-seat RJ generation with larger 70-100 seaters are:

- Pilot scope clauses
- The long-term financing of the existing fleet

Pilot scope clauses are a well documented subject, and one that will be reviewed in detail in a future issue of *Aircraft Commerce*. The most recent developments have been with United Airlines and USAirways. Both operators have been able to re-negotiate pilot agreements as part of their overall Chapter 11 re-organisations.

USAirways has completely revised its scope clause, and as a result has ordered 85 ERJ-170s for operation by wholly-owned subsidiary MidAtlantic Airways. As part of an agreement with its pilots that raised the scope clause limit to 75 seats, MidAtlantic will operate these aircraft exclusively with furloughed mainline crews. The 25 CRJ705s ordered

BAE 146, AVRO RJ & FOKKER 70/100 AIRCRAFT IN OPERATION

	BAE 146	Avro RJ	Fokker 70/100
Aer Lingus	6		
Aegean Cronus		6	
Air Baltic		2	
Air Berlin	4		
Air Botnia		5	
Air Botswana	1		
Air Canada Jazz	10		
Air Littoral			5
Air Wisconsin	17		
Airlink	16		
Alabian Airlines	2		
Alliance Airlines			2
Alpi Eagles			8
American Airlines			60
Atlantic Airways	2		
Axis Airways	2		
Austrian Airlines			4
Azzurra Airways		7	
BA Citiexpress	5		
Blue Line			2
BMI			6
Brit Air			8
British Airways		16	
Buzz	2		
CCM Airlines			3
China Northwest	10		
Cityjet	12		
Club Air	3		
Croatia Airlines	1		
Druk Air	2		
EU Airways			2
Eurowings	8		
Flightline	4		
Flybe	15		
Germania			4
Iran Air			5
Iran Aseman			3
KLM Cityhopper			35
Korean Air			7
Lufthansa Cityline		18	
Malev			6
Malmo Aviation	3	9	
Mandarin			2
Meridiana	4		
Mesaba Airlines		35	
Merpati			3
Mexicana			10
Montenegro Airlines			3
National Jet Systems	3	1	
Pelita Air Service		1	6
Portugalia Airlines			6
Regional Airlines			6
Skywest			1
SN Brussels Airlines	5	26	
Swiss		19	
TAM			35
Titan Airways	3		
Turkish		9	
Tyrolean			6
Uzbekistan		3	
Vietnam Airlines			2
WDL Aviation	1		
Total	141	157	240

at the same time will also be operated by wholly owned US Airways subsidiaries.

United Airways has signed memoranda with two of its three existing regional partners, Air Wisconsin and Skywest, together with new partner Mesa, for the operation of expanded fleets of RJs. These include the operation of 70-seaters for the first time.

Skywest's memorandum calls for the operation of 30 70-seat RJs by the summer of 2005, while Mesa's includes 20 70-seaters.

Only Atlantic Coast Airlines has yet to reach agreement with United, but negotiations are continuing.

Bombardier would appear to have the advantage with the United Express operators since Air Wisconsin, Atlantic Coast Airlines and Skywest are exclusively CRJ operators, and although Mesa operates both the CRJ and the ERJ-145, it has already selected both the CRJ700 and CRJ900 for its fleet.

RJs entered an industry in the 1990s that had expanded with a plentiful supply of manufacturers willing to offer their aircraft on short-term leases. The advent of RJs therefore came at a time when the decision to operate jets was not restricted by the disposal of the existing fleet. Even where operators were tied into long-term leases, for example Atlantic Coast Airlines with its fleet of 28 BAE Jetstream 32s, the profits being generated by RJs meant that airlines were able to bear the costs of early returns to their lessors.

The situation with the larger RJs will be more complicated. In order to minimise the financing costs of the 50-seat RJ generation most of these fleets, particularly in the US, have been financed over terms of 15 years or more.

Obviously having commitments to these aircraft for such a long period of time reduces the flexibility to take larger aircraft as required. Deliveries of 37-50 seat RJs peaked between 1999 and 2002. Assuming a typical 15-year financing term, the earliest opportunities for large-scale replacement will occur from around 2014 onwards.

A recent practical demonstration of the difficulties resulting from such long-term financing is UK operator Flybe's experience. The decision to dispose of its fleet of four CRJ200s was taken in July 2001, only six months after the last aircraft had been delivered. Attempts to place them were unsuccessful, and they are now being traded back to Bombardier as part of the order announced in April 2003 for 17 Q400 aircraft.

Mainline market

As well as the development of a market which will see 70-100 seaters replacing 50-seaters, it is also possible that the larger RJs may replace the

smaller narrowbodies in the fleets of the mainline airlines.

Despite Embraer's success at JetBlue, the mainline market is the most difficult to predict. Airbus and Boeing's current lack of success with the A318 and the 717, however, suggests that this market will be small. This is also supported by sales of the previous generation of 100-seaters, where BAE and Fokker tried to convince the mainline operators to select their BAE 146-300/Avro RJ100 and Fokker 100 aircraft as an alternative to the 737-500 and MD-87.

BAE was largely unsuccessful, but 115 Fokker 100s were sold to American Airlines and US Airways. Boeing meanwhile sold 389 Boeing 737-500s, and McDonnell Douglas 75 MD-87s.

USA

Since 1993 the smallest aircraft in the fleets of the major operators have changed. A large proportion 737-200 and DC-9 fleets have been retired. Continental, Southwest and United replaced these with the 737-500.

Significant numbers remain in service with particular operators. Most notable are the 51 737-200s with Delta and 121 DC9-10/-30s with Northwest.

Some of this demand will be met with the A318 and 717, provided that both programmes continue to be available. The lack of success with these aircraft suggests that all is not well with this market. While there is clearly a gap in the market, it will not be completely filled by the A318 and 717.

Airbus has only generated 84 sales for the A318 (only 34 of these to operators Air France 15, America West 15 and Frontier Airlines 5), with the balance to lessors CIT, GECAS and ILFC. Airbus has seen a gradual decrease in its order book as a result of cancellations. Boeing has fared little better, and although it has achieved sales of 155 aircraft, the backlog is down to 37 aircraft, 21 of which are for Midwest Airlines.

Europe

Compared with the US, Europe does not have large fleets of older generation aircraft. The only sizeable 737-200 fleets are 21 with Ryanair and 10 with European Aviation of the UK. The only sizeable European DC-9 operator is Finnair, but the last eight of these are scheduled to be phased out by 2005. With the bulk of Europe's flag carriers now operating fleets of A320 family aircraft, the chances for the larger ERJ-190/195 in Europe are greatly reduced by the continued availability of the A318.

In Europe weight is far more important than in the US, since en-route charges 'Eurocontrol' are a function of

CATEGORISATION OF NARROWBODY JETS ACCORDING TO SEAT CAPACITY

0-50 seats	51-100 seats	101-150 seats	151-200 seats
CRJ-100/200	146-100	A319	A320
ERJ-145	146-200	737-200	A321
	146-300	737-300	737-400
	RJ70	737-500	737-800
	RJ85	737-600	737-900
	RJ100	737-700	MD-80
	CRJ700	MD-87	MD-90
	CRJ900		
	Fokker 70		
	Fokker 100		

maximum take-off weight (MTOW) and airport charges are higher than those in the US. Hence the direct cost savings of the lightweight RJ designs need to be carefully balanced against the indirect commonality benefits of operating a single-type fleet. A further consideration is that Europe's airspace capacity shortage, although reduced by the events of recent years, is still an underlying limitation and tends to discriminate against the smaller aircraft.

The combination of Northwest's and Delta's DC-9 and 737-200 fleets, together with worldwide replacement potential of 737-500 and MD-87 fleets, suggests a global market for a maximum of 600 aircraft.

The market gap

A comparison of the commercial airliner fleets of Europe and the US suggests there is an opportunity for Bombardier and Embraer to place a sizeable number of 51- to 100-seat RJs. The narrowbody jets are listed according to seating capacity (*see table, this page*). The distribution by capacity of the various aircraft types in Europe and the US is such that there is a high proportion of 0 to 50-seat RJs in the US compared to Europe, but a low proportion of 51 to 100-seat aircraft in the US compared to Europe.

Arguably the Fokker 100 could be included in the 101- to 150-seat category, but including it in the preceding category places all the non-Airbus, Boeing or McDonnell Douglas aircraft in the categories for less than 101 seats.

Despite the US having two and a half times as many 50-seat RJs in service and twice as many 101- to 150-seat aircraft compared to Europe, European operators actually have nearly twice as many 51- to 100-seaters. This simple comparison suggests that if the US was not so artificially constrained by scope clauses there would be a demand for about 1,000

aircraft in the 51- to 100-seat category (800 additional aircraft). Europe is still constrained by similar limitations, but to a lesser extent.

Performance comparison

The technical differences between the two families of aircraft are obvious. Bombardier has opted for a stretched development of its 50-seat RJ, whereas Embraer has opted for an all-new design.

The biggest difference between the two aircraft families is in their seating capacity.

In single-class configurations at 31-inch seat pitch, the CRJ700 accommodates 70 seats and the CRJ900 86 seats, thereby broadly matching the ERJ-170 and -175 with 74 and 86 seats.

Bombardier offers nothing to match the larger capacity of the ERJ-190 and -195 with 102 and 112 seats.

A fundamental difference between the CRJ700/900 and the ERJ-170 is that the latter has been designed from the beginning with access to difficult airports in mind. Launch customer Crossair's insistence that the aircraft should be capable of operating from London City Airport and Lugano has resulted in a design with more flexible capabilities. Despite the addition of leading edge slots, the Canadair CRJ700/900 suffers more limited airfield performance.

Druk Air has selected the A319 to replace the two BAE 146-100s it operates into Paro Airport, which suffers from both high altitude and high temperature. Embraer was unable to meet the delivery schedule with the ERJ-190 and Bombardier simply could not perform out of Paro.

The ERJ-170's capabilities at difficult airports give it a clear advantage in the BAE 146/Avro RJ replacement market, but the market itself is quite small. For example, only six of the 40 European BAE 146/Avro RJ operators actually utilise the full performance capabilities of



the aircraft by accessing London City Airport.

Differences in operating costs between the CRJ700/CRJ900 and the ERJ-170/175 are going to be small. Both aircraft families are powered by variants of the CF34-8 engine and employ similar technology systems. The differences in MTOW, although significant in isolation, will not dramatically affect the overall cost level.

Of the CRJ700's nine airline customers, seven are CRJ100/200 operators. The two exceptions are American Eagle and Horizon Air. American Eagle selected the ERJ-145 in June 1997 for its 50-seat requirement and the CRJ700 for its 70-seat requirement, before Embraer had launched its 70-seater. Horizon skipped the 50-seat RJ generation completely, but then selected the CRJ700 to replace its F.28 fleet.

Although the ERJ-170 lacks any technical commonality with the ERJ-145, the importance of continuity of supplier is shown, since four of its airline customers are existing ERJ-145 operators and a fifth, US Airways, has a link through the use of the ERJ-145 at its feeder partners. Only JetBlue has not been a previous Embraer operator.

The ERJ-170's design is sometimes described as revolutionary, but in reality it appears to be a balanced one, which overcomes many of the criticisms of the derivative Canadair CRJ700/900.

The undeniable advantages of the CRJ700 and CRJ900 remain their commonality with the 1,026 Canadair CRJ100/200/440 aircraft already on order.

Summary

This article has attempted to quantify the size of the market for 70-100 seat RJs by examining the replacement, growth and mainline markets for the US and Europe.

It has concluded that the principal market is for 50-seater growth in the US. Unsatisfied demand for 51-100 seaters is estimated to be in the region of 800 aircraft.

The replacement market is smaller and more international, estimated at 500 aircraft with the majority in Europe.

The mainline market is the most difficult to predict, but even the complete replacement of the remaining mainline fleets of 737-200s and DC-9s, together with all 737-500s delivered, would only justify a forecast of about 600 aircraft.

Overall market demand is therefore estimated at 1,900 aircraft.

An accurate assessment of the overall timing of the demand for the 70- to 100-seat RJs is difficult, since it depends upon so many external factors, such as airlines' ability to negotiate terms with their pilots' unions and the readiness of financiers to return to the airliner market.

While there are three main markets for 70-100 seat RJs, the principal market comes from growth of the 50-seat RJ market in the US, where unsatisfied demand for 51-100 seat RJ aircraft is estimated at about 800 aircraft. Demand from Europe is for about another 500. Total market for 70-100 seat aircraft is estimated at about 1,900 aircraft.

Without limitations, the growth demand from the US market could, as for the 50-seaters before, be realised in a short space of time. However, the inability of airlines to finance additional aircraft, or to extricate themselves from existing long-term commitments on smaller RJs, means that limitations do exist.

The airlines themselves are generally in poor financial health and although GECAS is supporting USAirways, and most recently Air Canada, with post-bankruptcy financing for new RJs, this source is not likely to be available to all operators. Deliveries of future 70- to 100-seat aircraft are therefore likely to be spread out over a longer timescale than the 50-seat generation and production rates are therefore likely to be significantly lower.

There are two distinct market segments and the 70-seat market is likely to repeat the intense competition between the two manufacturers in the 50-seat market.

Both manufacturers have advantages and disadvantages, but neither offers an overwhelming benefit over the other, with the possible exception of the Embraer's superior airfield performance. Fortunately for Bombardier, the market which demands this level of performance is small.

It is therefore likely that other factors will be considered in the decision-making process.

The overwhelming advantages of the CRJ700 and CRJ900 are that they are perfect complements to an existing fleet of CRJ100/200s. Since the US growth market is probably the largest opportunity, the Canadair RJ's strong customer base in the US should give Bombardier a dominant position.

Embraer will undoubtedly fare better in the 100-seat market, since Bombardier has nothing to offer against the ERJ-190 and 195. Nevertheless, Embraer will not have the market to itself. It will face stiff competition from Airbus and Boeing for the replacement and mainline markets.

Bombardier has chosen to avoid a head-to-head clash with Airbus and Boeing, and only time will tell whether this decision was the correct one. **AC**