

Besides modern standard operating costs, regional manufacturers have operational flexibility, passenger comfort and list price to generate the high sales volumes. Has Fairchild-Dornier come up with a product line which excels in all aspects?

# Do 328Jet: a cut above the rest?

**F**airchild and Dornier won only a small percentage of regional aircraft sales in the 1980s and early 1990s. Fairchild bought Dornier and the two have developed a family of five regional jets, which on paper at least look impressive. Does Fairchild-Dornier now have the product range to make it a market leader?

The success of regional aircraft is determined by a combination of operating performance and economics together with passenger and market appeal. The same techniques to reduce operating costs are available to all regional manufacturers. This leaves list price, an advantage in operating performance and flexibility, and superior passenger comfort as opportunities to win market share. The problem regional aircraft manufacturers face when developing products is that regional airlines serve a variety of markets which have different requirements. Regional jets have stimulated the development of even more markets for the manufacturers to serve. This puts pressure on them to develop multi-purpose aircraft.

Fairchild-Dornier has waited for most other manufacturers to lay their cards on the table. This delay has given Fairchild-Dornier the opportunity to gain an advantage wherever it can with its regional jet products, but has meant it lost some sales in the meantime.

## Do 328Jet

The Do 328 high-speed turboprop enjoyed only mediocre success. A few other high-speed turboprops were

developed but these also failed to sell in large numbers. The basic reason is that high-speed turboprops had higher operating costs but showed no significant operating advantage over regular-speed turboprops. One reputation the Do 328 established is the generous seat and aisle widths of its three-abreast cabin.

The regional market began to show a preference for jets after the launch of the Canadair RJ. Others have been successful since. Regional jets are increasing in popularity because their greater attractiveness to passengers generates more traffic and higher yields. Jets also stimulate demand and open new route network possibilities.

The Do 328 turboprop's generously sized passenger cabins made it feasible to develop into a jet. Regulations in the US were changed so that aircraft as small as 19 seats were required to roster a flight attendant, making the smallest turboprops uneconomical to operate. This has spurred the requirement for larger aircraft so it made sense to develop the Do 328 turboprop into a jet.

As Fairchild-Dornier explains, the Do 328Jet is aimed at capturing the replacement market for 19-seat turboprops and stimulate traffic growth on the lowest density regional routes with a jet service. With 38 seats, it is also placed to compete with 30-seat turboprops such as the Emb-120 and Dash 8-200.

Despite having the operating costs of a jet aircraft, Fairchild-Dornier is confident the Do 328Jet will be more attractive to operators because it can offer greater comfort as well as

conveniently shorter block times on traditional turboprop markets.

The Do 328Jet will also face direct competition from other regional jet families. The ERJ-135 is a 37-seat regional jet and the Do 328Jet's closest rival. The ERJ-135 also has its larger sister, the 50-seat ERJ-145. This was one factor that forced the requirement for more than one variant, and the decision was taken to stretch the Do 328Jet to a 44-seat aircraft: the Do 428Jet. This aircraft is similar to the Do 328Jet although the 428Jet will have higher thrust engines, a larger wing and faster cruise speed.

## Do 528/728/928Jet

With the obvious success and fast development of the BRAD CRJ/CRJ-700 and ERJ-135/145 programme, potential development of small jet families by IPTN, AI(R), Boeing and Airbus, and requirement from airlines for families of jets from 55 up to 115 seats, Fairchild-Dornier realised the opportunity in having its own programme.

Initial concepts revolved around further stretches of the 328Jet but the bold decision was taken to develop an all new aircraft. This would offer even higher comfort levels, better operating performance and leapfrog all other small jet families already developed or conceptualised.

The market for aircraft in this category stems from a need to replace the ageing F28 and the smallest DC-9 and BAe 146, and to provide superior alternatives to the ERJ-145, Avro RJ,





*The Do 328Jet has take-off and climb performance standards comparable to the turboprop from which it is derived.*

CRJ/CRJ-700. It was important to continue to exploit the explosion in regional jet operations and the untapped potential of new routes they offer.

### Do 328/428Jet

The Do 328Jet has the same fuselage as the 328 turboprop but is powered by two PW306B turboprops rated at 6,050lb of thrust that give it a cruising speed of more than 400 knots. The aircraft's design also provides it with a time to climb capability of just over 14 minutes to 31,000 feet and a take-off field and landing performance similar to turboprops.

The aircraft has Cat II/IIIa landing capability and 18-inch seat width. It therefore has the operating characteristics of a jet as well as the ability to operate from the same airfields as turboprops. It also has a list price of \$11.6 million, which should keep the total operating cost on a comfortable level with turboprops in its class. This compares with list prices of \$9.7 million for the 37-seat Dash 8-200 and \$7.8 million for the 30-seat Emb-120.

To date the 328Jet has secured 43 firm orders and 18 options and will enter service in March 1999, which is a few months ahead of the ERJ-135. The ERJ-135 has firm orders for 73 aircraft and options for 122.

The Do 428Jet has also been formally launched, but so far has not won any firm orders. Fairchild-Dornier still expects to certify the aircraft in December 2000 with entry into service in the following month. This will be three years after the

ERJ-145 entered service and eight years after the CRJ started operations. The ERJ-145 has won 182 firm orders and 245 options. The CRJ has won 286 firm orders. The 428Jet will be a basic stretch of the 328Jet and will be powered by PW308B engines rated at 7,900lb thrust. The Do 428Jet's biggest problem is that it arrived on the market when most potential 40 to 50-seat regional jet customers had opted for the CRJ or ERJ-145.

The Do 428Jet has a faster cruising speed than the 328Jet but Fairchild-Dornier has not said what the exact speed will be. The Do 428Jet's list price is \$13.1 million meaning it has a lower acquisition cost per seat than the 328Jet.

The 428Jet's price compares well to the \$15 million list price for the 50-seat ERJ-145 and \$19.5 million list price for the 50-seat CRJ. Its advantage is lengthened by a wider cabin than the similarly configured ERJ-145 and wider seats than the four abreast CRJ. The 428Jet's disadvantage is fewer seat numbers but this is taken care of by the 528Jet.

The 428Jet is a similar size to the ATR 42 and Dash 8-300, and so will compete with the ERJ-145 and CRJ for orders to replace 35 to 50-seat turboprops and open new jet markets.

As with other regional jet families, the 328Jet and 428Jet will have a high number of common features. The aircraft will have the same pilot type rating and share the same auxiliary power unit (APU), landing gear, complete engines and line replaceable units (LRUs). Engine overhaul and spare engine provisioning

will also be provided by Pratt & Whitney Canada, simplifying maintenance overheads for operators.

As well as high speed and greater reach from hubs, the two aircraft have been conceptualised to achieve similar turn times which will allow both to fit into existing hub and spoke feeder networks and achieve high enough annual utilisation to efficiently amortise ownership costs.

### Do 328/428Jet operation

Fairchild-Dornier concedes the Do 328Jet is slightly slower than its closest rival, the ERJ-135. Fairchild-Dornier claims, however, that the 328Jet will in fact be faster than the ERJ-135 on shorter routes because the 328Jet has a faster climb speed. The ERJ-135 has a climb time to 35,000 feet of 23 minutes, while the Do 328Jet has a climb time to 31,000 feet of 14 minutes. Otherwise, Fairchild-Dornier says the ERJ-135 will not make any noticeable impact on block times on the shorter sector lengths the two aircraft are likely to operate. The ERJ-135 has a maximum cruise speed of Mach 0.78 (460 knots at 30,000 feet).

Fairchild-Dornier further expects the 328Jet's operating economics will be superior to the ERJ-135's, meaning the 328Jet is able to offer lower seat-mile costs than turboprops on a shorter sector length than the ERJ-135 is capable. This would then widen the 328Jet's potential market.

The ERJ-145's low list price and ownership costs means it is able to match or out-compete many turboprops on



short sectors, and the ERJ-135 is not too dissimilar. This will present a challenge for the Do 328Jet, especially because it has a similar list price to the ERJ-135.

Fairchild-Dornier also claims the 328Jet's superior take-off performance will allow it to operate routes that are not possible with the ERJ-135. The dilemma regional jet manufacturers have is that field performance is sacrificed by the use of wings that provide cruise speeds close to larger aircraft. The Do 328Jet has retained much of its field performance with its overhead wing. The Do 328Jet will have take-off and landing field lengths of 4,070 and 3,890 feet. This compares to 5,410 and 4,460 feet for the

ERJ-135 which has a jetliner type configuration.

The Do 328Jet has therefore been designed to make a compromise between field performance and speed, while not sacrificing too much jet appeal. Many of the hub feeding markets in the US are from small remote and inaccessible airports and aircraft operating performance is a prime issue in fleet planning.

The Do 328Jet and 428Jet will therefore present direct competition for the ERJ-135 and 145 family. The Do 328/428Jets will have the advantage of lower list prices, greater operating flexibility through shorter field lengths and wider seats and cabins.

The operating cost performance of the ERJ-135 and 145 have been examined in several ways against turboprops. The conclusion usually made is that the Embraer aircraft have superior economic performance over most turboprops of similar sizes. In this respect, the Do 328Jet and 428Jet should have little difficulty in providing sufficient competition to turboprops

*The BAe146 is one of several aircraft replacement markets the Do 728Jet and 928Jet will be tackling. The Do 528/728/928Jet will have the highest passenger comfort standards of any regional jet family so far conceptualised.*

when their list prices, revenue earning potential and probable lease and ownership costs are taken into consideration.

### Do 528/728/928Jet family

The Do 528/728/928Jet family is based on a five abreast cabin, low wing and twin-engined design which will give the aircraft an airliner type configuration and performance. Like the Do 328, Fairchild-Dornier has given the 528/728/928 family aisle and seat widths greater than virtually all their contemporaries with the exception of the BAe 146/Avro RJ in a five abreast configuration.

The Do 528/728/928 have seat widths of 18.1 inches except for the centre triple seat which is 19.1 inches. The seats and the 23-inch aisle are all wider than the A320. The aircraft could conceivably be configured with six seats abreast.

The Do 528Jet has a standard seat configuration of 55 seats, the 728Jet 70

#### DO 328JET AND DO 428JET

Aircraft type	Do 328Jet	Do 428Jet
Seats	34	44
List price	\$11.6m	\$13.1m
Service entry	March 1999	January 2000
Cruise speed (knots)	400	400+
Take-off field length (feet)	4,070	Unknown
Landing field length (feet)	3,890	Unknown
Seat width (inches)	18	18
Aisle width (inches)	18	18

## DO 528JET, DO 728JET &amp; DO 928JET

Aircraft type	Do 528Jet	Do 728Jet	Do 928Jet
Seats	55	70	90
Service entry	Second quarter 2002	Mid 2001	Mid 2003
Cruise speed	Mach 0.81	Mach 0.81	Mach 0.81
Take-off field length (feet)	4,000	5,000	6,000
Landing field length (feet)	4,000	4,500	5,500
Seat width (inches)	18/19	18/19	18/19
Aisle width (inches)	23	23	23

seats and 928Jet 90 seats. Seat numbers could therefore be increased by 11 to 18 if an operator took the decision to have a six abreast configuration.

The General Electric CF34-8D was recently selected to power the three aircraft which will be rated at 8,730lb, 12,650lb and 13,800lb thrust.

The aircraft will have a cruise speed of more than Mach 0.81 (460 knots). Minimum range will be 1,200nm. Take-off field length targets in standard conditions are 4,000 feet for the 528Jet, 5,000 feet for the 728Jet and 6,000 feet for the 928Jet. These performances are impressive, considering the size and configuration of the aircraft.

The 728Jet will be the first to achieve certification and service entry, targeted for mid 2001. The 528Jet will be the next to follow in second quarter 2002 and the 928Jet in mid 2003. This compares with service entry dates of 1999 for the 717, and third-quarter 2000 for the CRJ-700. The 717 has won 55 firm orders. The CRJ-700 has 67 firm orders. The 528/728/928Jet family has already been launched with firm orders for an impressive 165 aircraft and a further 120 options.

The family has been launched by orders from Lufthansa Cityline and Crossair. The rationale behind the aircraft family is to provide airlines with aircraft of between 55 and 115-seats. This will provide replacement candidates for the F28, BAe 146, DC-9, 737-200 and ATR 72, as well as alternatives to the CRJ and CRJ-700, Dash 8-400, Avro RJ and ERJ-145.

The appeal of the family is split since the seat numbers of the 528Jet and 728Jet fall below the scope-clause seat and size limits of most US major airline regional affiliates, while the 928Jet does not. The market appeal and applicability is different in other parts of the world however. Like all other regional jets the 528/728/928 family will open up new route and market opportunities.

There is also the possibility of the family being stretched further to provide a 115-seat aircraft. A 108-seat aircraft would be possible if the 928Jet had a six abreast configuration. The galley layout and space may be only enough for

regional-style operations and a six abreast configuration would probably necessitate the removal of a seat row to allow larger galleys. Seat pitch is generous so no other changes would be required.

These options should be kept in mind since the 928Jet and a possible stretch would compete head-on with the 717, 737-500/600 and A319M5. The Do 528/728/928Jet family is the widest in its class.

In terms of operating efficiency the family has the usual features of modern aircraft. The three aircraft will have common LRU, APU, avionic suite, engine core, landing gear and mechanic training as well as a common pilot type rating. Fairchild-Dornier acknowledges there will inevitably be differences in engine thrusts and specification weights but will attempt to maximise similarity at both the training and provisioning level.

Although little is known about the CF34-8D engine, Fairchild-Dornier says it expects to have a guaranteed on-wing time of 10,000 engine flight hours. If this is the case, it will go a long way to simplifying and minimising engine maintenance and spare provisioning costs.

The Do 528/728/928Jet's cruise speeds of Mach 0.81 will allow it to blend into the jet environment while also being

configured to operate economically as regional aircraft. Fuel burn and maintenance costs should be at the same standards as other modern aircraft, while list prices have not yet been determined. Considering aircraft ownership costs are the largest of all operating costs, the list prices will be crucial to determining the aircraft's competitiveness.

Like the Do 328/428Jet, the 528/728/928Jet family appears to have many of the key ingredients in place to be a success. The aircraft offer unprecedented levels of cabin comfort, are expected to meet formidable take-off and landing performance goals and have speeds that will mean they operate as true jets. The three aircraft are also the first full regional jet family with 55 to more than 100 seats. This head start and the right balance of features will be all that Fairchild-Dornier needs to make the programme successful. AC

*The Do 928Jet can also be stretched to provide 115-seat aircraft that could replace older Stage 2 types like the 737-200 and DC-9-30.*