

The turboprop market has been overtaken by the jet. In the US anti-turboprop fever has reached an all-time high. Yet, orders are still being fulfilled and second-generation turboprops are coming onto a market eager to buy used aircraft. So is the turboprop really redundant?

What future for the turboprop?

The regional jet has revolutionised the airline business. And after six years of service the question mark hanging over it has now been removed. But what of the turboprop? What will be the demand in the future, and how much of it will be met by used aircraft?

There is no doubt that the current use of turboprops will continue for the immediate future. Even if deliveries of the present generation of 30- to 70-seat regional jets are maintained at levels proposed by their manufacturers, it will take at least ten years to replace all the 1980s and 1990s built turboprops. But what of new production?

New aircraft production

The only turboprops still in volume production are second-generation aircraft launched in the 1980s. These are the Jetstream 41, Dash 8-100/-200/-300, Emb-120, Saab 340, and ATR 42 and 72.

First-generation aircraft have now been overtaken by second-generation aircraft. However, age is not the only criteria for success, since two of the third-generation aircraft, the Do 328 and the Saab 2000, face a limited future. Saab 2000 production will cease on completion of the 64th aircraft, while future deliveries of the Do 328 are unlikely in the face of competition from the 328Jet.

Third-generation turboprops have proved to be a technological 'blind alley'. Although claiming jet speed at turboprop economy they have failed to match the appeal of the jet and their overall cost structure is only slightly lower, if at all, than that of the jet.

Second-generation turboprops are also experiencing a slowdown. Production of the Jetstream 41 in the 30-seat category has already ceased and the Saab 340 line will be closed during 1999. The Do 328 faces strong competition from the company's own 328Jet derivative. During 1997 and 1998 only eight Do 328s were sold compared to 39 of the 328Jets.

The Embraer Emb-120 is now only built to order for existing customers. Indeed, if it were not for single orders for 20 aircraft from Skywest in 1998 and for seven from Rio-Sul in 1997, the line would have already closed. But with Embraer's workload on the ERJ135/145 increasing daily, the temptation to close the turboprop line on completion of outstanding deliveries may be too strong to resist.

Bombardier has now largely fulfilled the outstanding Dash 8-200 order from Horizon. Despite the lack of a substantial backlog of orders, the outlook for the aircraft is a little more secure than for other 30-seaters.

The fortunes of the Dash 8 are helped by a number of factors not shared by its competitors. These include a global

market base, good airfield performance, a new generation cabin with active noise control system, family commonality and Bombardier's strength. Most importantly, the aircraft is built on a common assembly line with the larger Dash 8-300 and the two aircraft share a lot of production commonality.

Both of the 1980s-designed 50-seaters remain in production. The Dash 8-300's success has never matched that of the ATR42, with sales of 136 compared to 311. Over the last four years the balance has been more closely matched with sales split roughly 60% to ATR and 40% to Bombardier.

Similarly, the ATR72-500 continues to be available, having seen off competition from the British Aerospace ATP back in 1995. The latest challenger is the Dash 8-400, but it remains to be seen whether this aircraft will be any more successful than the earlier high-speed turboprops.

The 30-seat market

There are several successful markets for turboprops in different parts of the world: the 50- and 70-seat markets in various parts of Europe, and the 30-seat market in the US.

The US has dominated the 30-seat market in recent years, with typically three out of four 30-seat aircraft being ordered by US operators. This compares with a total of about 200 30-seaters





The 30- and 50-seat jets have impacted the 30-seat turboprop market, which is confined mainly to the US.

ordered in Europe and a further 200 spread around the rest of the world.

Both the Dash 8 and Saab 340 have widespread appeal. The Emb-120 had a more limited market penetration, with few sales in Europe and most of the remainder in South America.

The other two aircraft, the Jetstream 41 and the Do 328, arrived too late to penetrate what was already a mature turboprop market.

Nevertheless, in the past four years turboprop orders have fallen dramatically compared to their previous peak levels. And the 30-seat market has been hit the hardest. Between 1995 and 1998, sales of 30-seat turboprops plummeted and market share is already down to 15%.

The reason for this is the exclusivity of the 30-seat market to the US. This factor, combined with the continent's experience of 50-seat jets and its aversion to all propeller-driven aircraft, appears to have killed the 30-seat market altogether. And then, of course, there is the imminent arrival of 30-seat jets.

In the last couple of years many airlines have been reluctant to make large commitments to turboprops, preferring instead to hold out for jets. The resulting pent-up demand is illustrated by the contrast between orders for regional jets and turboprops. A total of 171 orders for the ERJ135 and 328 jet were placed during 1998 (142 and 29 respectively), compared to

only 26 orders for 30-seat turboprops.

The same thing happened to 50-seat turboprops following the introduction of the Canadair RJ and Embraer ERJ145 jets. Given that same scenario, demand for the 30-seat turboprop is unlikely to recover above the low demand experienced in 1998.

Total orders for 30-seat turboprops and jets over the past five years have averaged 120 aircraft per year. If the turboprop's market share continues at 15% future demand for 30-seat turboprops may only be for about 18 aircraft per year. Though such a hypothesis might seem staggering, the speed with which British Aerospace, DASA and then Saab left this market must say something about how they viewed the future of 30-seat turboprops.

50-seat market

The 50-seat turboprop market, while smaller overall than the 30-seat market, is dominated by European operators. There are more than 350 aircraft either in service or on order in Europe. This compares with only 100 or so in North America.

The ATR42 has dominated the 50-seat market, with total sales matching those of the Dash 8-300 and Fokker 50 combined. The Fokker 50 matched sales of the ATR42 outside the US, being particularly popular in Europe.

Sales of the Dash 8-300 have been

disappointing in North America; the only operators are in Canada and include Air BC, Air Ontario and Canadian Regional Airlines.

The market for larger 50-seat aircraft has never been large in North America. Over the past four years demand from the USA has accounted for less than 10% of 50-seat aircraft ordered. US carriers have now jumped directly from 30-seat turboprops to 50-seat jets.

Total orders for 50-seater jets and turboprops over the past four years have averaged 180 aircraft per annum. The current market share of 15% for turboprops suggests future demand for 50-seat turboprops could be for only about 27 aircraft per year.

70-seat market

Europe also dominates the 70-seat market, although this sector is even smaller than the 50-seat sector. Since the majority of orders for the 70-seater have come from airlines outside the US, it is assumed that demand will be little affected by the imminent arrival of regional jets in North America. If this is the case, then the 70-seater should continue to sell well. Indeed, total orders for 70-seat turboprops over the past four years have averaged 27 aircraft per annum.

What little market there has been in the US has gone to the ATR72, 60% of it to a single operator, American Eagle.

US MAJOR AND REGIONAL AIRLINE SCOPE CLAUSES

Major Airline	Scope clause	Seat limit	MTOW limit	No of	Comments aircraft
Alaska	No	n/a	n/a	n/a	Informal agreement limits Horizon Air to 69 seats.
American	No	70	n/a	67	Expansion beyond initial limit jets dependent upon mainline fleet growth. Average seating capacity of AMR Eagle limited to 50 seats.
America West	No	n/a	n/a	n/a	
Continental	Yes	60	n/a	n/a	Seat limit applies to turboprops only, there is no limit on turboprops.
Delta	Yes	70	n/a	n/a	ASA has 'grandfather' rights to operate up to 20 88-seat BAe 146/Avro RJs.
Northwest	Yes	69	n/a	36	Latest agreement caps RJ85 fleet to 36, with further expansion dependent upon mainline fleet growth.
	Yes	50	n/a	45	Initial 50-seat regional jet fleet limited to 45 units, expansion dependent upon mainline fleet growth.
Southwest	No	n/a	n/a	n/a	
TWA	Yes	60	60,000lbs	na	Maximum certificated cruise speed of 400 mph or less.
United	Yes	50	75,000lbs	30	Turboprops are limited to 75 seats. Another 33 regional jets are subject to mainline narrowbody fleet growth. Air Wisconsin has grandfather rights to operate up to 18 (tail number specific) 146s.
US Airways	Yes	50	n/a	30	Seat limit is the same for turboprops.

This particular aircraft offers a unique combination of capacity and cost which provides the lowest seat-mile costs of any modern regional aircraft.

The US pre-occupation with scope clauses (see table, this page) has limited the application of larger aircraft. However, scope clause restrictions on the large regional aircraft market should relax over time. This has already been the case with large orders for 30- to 70-seat regional jets.

Used aircraft

All forecasters agree that the regional airline business will continue to grow. Based on historical data, a 10% annual growth in passenger traffic is expected for the foreseeable future. On a macro scale, most of this extra capacity will come from regional jets entering the market. For individual operators, however, much of it will be met by the acquisition of used aircraft.

Manufacturers must now offer their aircraft on highly flexible terms, and the operating lease is the most popular method.

More recently, the remaining manufacturers have placed the emphasis on either finance leases or simple cash sales. This is expensive for smaller airlines. As a result they will be forced into the used aircraft market, where operating leases are still the norm. The majority of aircraft will continue to be leased from lessors.

The continued availability of aircraft on operating leases is a very important consideration for second-tier airlines. These organisations either do not have the same access to capital that the first tier have, or they wish to avoid making long-term commitments which limit the future flexibility of their fleet.

As well as the big fleets controlled by the manufacturers' own asset management organisations, there are a number of smaller and less widely known lessors in the market, such as Ages, Aircraft Financing and Trading, Debis AirFinance and GECAS.

Short-term leases

Although the industry opinion suggests the end of the turboprop is nigh, the truth is that turboprop availability is by no means plentiful. Ironically, this means there is a good balance between supply and demand for most types. So well-maintained aircraft, from a reputable source, will be snapped up. The few aircraft still on the market are not enough to cause a collapse in lease rates. There are enough, however, to ensure that used turboprop lease rates remain competitive with new aircraft.

These rates are intended to be indicative of a five-year operating lease. This is the kind of arrangement that appeals to many regional airlines: a low rate and a short commitment.

The economics of regional jets can be very attractive, although only under certain circumstances. The economics include low lease rates, which require long-term commitments. New regional jets suit the larger, typically US, regional carriers. These carriers also have higher unit yields and are aligned with large carriers.

It may be less appealing to the smaller independent carriers in the rest of the world. The latter airlines, serving local routes and with little or no direct competition, will provide a market for good-quality used turboprops.

Since most of the second-generation aircraft entered service in the mid-1980s many more are likely to enter the market in the near future as they come to the end of their leases or financing terms.

Acceptability of used aircraft

European operators in the past have been reluctant to acquire used aircraft. This is becoming more acceptable with turboprops.

There are recent examples. KLM Cityhopper added three ex-Rio-Sul Fokker 50s to its fleet of ten. This is an example of when production had closed and the carrier's only other option would have been to change types.

In another recent example Finnair had a requirement for three ATR72s to add to its fleet of six. The carrier had the option of new aircraft, but acquired some from Transasia Airways of Taiwan.

Other airlines have been established entirely with used aircraft. Air Nostrum of Spain has grown in less than five years from zero to a fleet of 21 Fokker 50s and four ATR72s. All the aircraft are pre-owned and, in the case of the Fokker 50s, were acquired from a variety of sources.

Another good example is Skyways of Sweden, which operates a similarly sized fleet of 11 Saab 340s and nine Fokker 50s, again all pre-owned.

These are just a few examples of the increasing acceptability of used aircraft to European carriers. With one or two exceptions, notably Lufthansa Cityline, the majority of Europe's airlines are making use of pre-owned aircraft to some extent.

Mesaba is the obvious US example of a carrier expanding with used equipment. In 1996 it ordered 30 new-production Saab 340Bplus aircraft, together with 23 used 340A models. These were all provided through the manufacturer. In 1997 it re-ordered a further 19 new aircraft, but is still taking delivery of used aircraft.

Unless new aircraft offer some real benefits over existing types, the only other justification for their replacement would be if dispatch reliability deteriorated with age, or if the older aircraft became increasingly expensive to maintain.

Data published by Bombardier in 1997 showed that, for the Dash 8 at least, dispatch reliability was independent of aircraft age. Discussions with one ATR operator, which operates both new and 12-year-old aircraft, suggests that age is not a major factor in overall maintenance cost.

Aircraft movement

A limiting factor on the placement of used aircraft is that moving aircraft from Europe to the USA, or vice versa, involves significant expense. At the very least TCAS is required for US operation and an FMS for a European operator. Installation costs for these two items

USED TURBOPROP LESSORS AND LEASE RATES

Aircraft type	Major owners and lessors	Monthly lease rate \$
BAe J41	BAe Asset Management	45,000
Dash 8-100	Bombardier, Ages & Gecas	50,000
Do 328	Fairchild, Millennium	65,000
Emb-120	Embraer	40,000
Saab 340A	Saab Aircraft Leasing	45,000
Saab 340B	Saab Aircraft Leasing	60,000
ATR 42	ATR Asset Management, GECAS	75,000
ATR 72	ATR Asset Management, GECAS	110,000
BAe ATP	BAe Asset Management	65,000
Fokker 50	AFT, debis AirFinance	65,000
Saab 2000	Saab Aircraft Leasing	110,000

alone will be about \$150,000 and \$75,000.

Even more of a barrier to US aircraft finding their way overseas is the US tax lease. These generally limit operation of the aircraft to the USA.

Untying a tax lease involves such expense that it is only attempted in extraordinary circumstances.

Conclusion

Following the introduction of regional jets demand for new-production turboprops is unlikely to recover to anything like its heydays of the mid-1980s/early 1990s. While the number of manufacturers in the market and the variety of types available have fallen dramatically, none of the aircraft currently available offer any significant cost savings relative to their predecessors. Average turboprop demand over the next few years is estimated to be as low as:

- 30-seaters, 18 aircraft per year
- 50-seaters, 27 aircraft per year
- 70-seaters, 27 aircraft per year.

For some types, notably the ATR and Dash 8 families, there are already a significant number of aircraft in storage with the manufacturer.

If this forecast level of demand is confirmed in practice, then ATR and de Havilland will be contesting a total market of only 72 turboprops a year.

Since ATR does not compete in the 30-seat market this will give Bombardier an advantage. ATR will still have to compete against Embraer and Fairchild until they withdraw from turboprop manufacture.

Assuming Bombardier takes a 50% market share of the 30-seat market and that ATR takes a 60% share in the other two sectors, then total Dash 8

production would be about 31 units per year, compared to the ATR family at 32 units per year.

Even this reduced level of demand faces severe competition from the imminent entry of a large number of used aircraft on to the market. Most of the second-generation aircraft are just becoming available. Fortunately as availability is increasing, so too is airlines' acceptance of used aircraft. This will keep the supply of used aircraft to a minimum.

A situation is developing in the US in which anti-turboprop hysteria is still unabated and a large number of turboprops could potentially be freed up by the introduction of regional jets. The complication of US tax-based leasing should protect the rest of the world's markets from a sudden deluge of ex-US turboprops, but availability in the US is likely to be high and demand low. The effect will be particularly severe on the 30-seat market.

The two main players in the US turboprop market of the future will be ATR and Bombardier. Provided ATR can adjust to a new order, it is in a reasonable position with a good global market base and a pair of complimentary products. Lacking a regional jet of its own ATR can concentrate on promoting the benefits of the turboprop, something its competitors cannot do. ATR could become the Avro of the turboprop business, slimming down capacity to meet a more limited demand, but remaining in the business as a niche player. ATR has said, of course, that it is studying a large regional jet project.

Bombardier may face a more troublesome situation with a narrower market base centred on its 30-seater Dash 8-100/200 in North America. The Dash 8-400, however, is in the size bracket where there is less competition from regional jets than in other size brackets. 