

Regional jets have dominated the market over the past seven years. Jets have been able to enhance revenue generation in high demand markets, and thus become the more economic option. Where is the place for the turboprop?

Where is the place for turboprops?

It was as recently as September 1996 that Continental Express placed its record breaking order for 25 Embraer EMB-145s with 175 options. Prior to this the largest single order for regional jets had been 20 Canadair RJs for Lufthansa Cityline.

Since then regional jet orders involving large numbers have become the norm. As a result of overwhelming passenger preference for jets, turboprops were seen as a liability.

There are circumstances, however, where airlines cannot justify the use of regional jets. One major constraint is the level of passenger numbers and revenue being too low to cover the trip costs of a regional jet, so dictating the need for a turboprop. Other factors include performance limitations. There are therefore circumstances where turboprops will continue to prevail over regional jets.

US regionals

The terrorist attacks of September 11th 2001 may have been expected to strengthen the view that turboprops have a role in the future. The reductions in capacity by US operators may have provided a possible catalyst for the re-examination of the relative economics of the turboprop versus the jet.

The evidence so far suggests that despite such considerations it is the turboprops that are suffering in the current round of cutbacks. An analysis of recent fleet changes among the US regional carriers shows that most have only reduced turboprop flying, with

regional jet operations largely unaffected.

One of the factors against the turboprop is that, while the previous plans to replace them with regional jets may now be questioned, it will be difficult for the airlines to extract themselves from their order commitments.

Used turboprops

Airlines that own their turboprops, such as American Eagle, face a dual problem. Not only are they committed to large numbers of jets, but they are also seeing a declining re-sale market for their turboprops. This was one of the reasons behind American Eagle's decision to retain a small turboprop fleet. As the owner of 90 Saab 340Bs it has been searching for customers for several years, but has so far only managed to place nine aircraft with Chicago Express.

Similarly, Mesaba Airlines, faced with long-term lease commitments for the world's second largest fleet of Saab 340s, has announced an interest in converting 20 to 35 into freighters.

The immediate reaction in the US does not appear to hold out much hope for continued large-scale use of the turboprop.

There is always the possibility that a prolonged period of depression in the US will lead to a re-assessment of the turboprop versus the regional jet. We will therefore re-examine the relative profitability of the two types and in the case of the turboprop we will consider both new and used equipment.

The aircraft analysed are the CRJ-

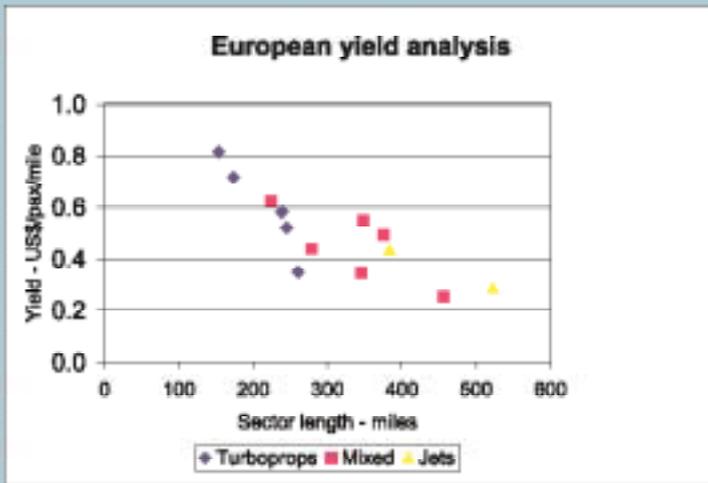
200, ERJ-145, ATR 42-500 and Fokker 50. The ATR4 42-300 and Fokker 50 are the used turboprops.

There is ultimately a dividing line between regional jets and turboprops, and this is determined by both revenue and costs. Revenues are determined by a combination of passenger numbers and average fares. The circumstances of certain operations means the revenue generated per trip cannot cover the cost of a regional jet. Regional jets are larger, burn more fuel, have higher maintenance costs, may in certain airlines have higher flightcrew charges, have higher weight-related user charges in certain circumstances and have higher finance or leasing costs. Turboprops thus provide a lower cost alternative to regional jets, and are the only alternative for airlines with particular operating and economic circumstances.

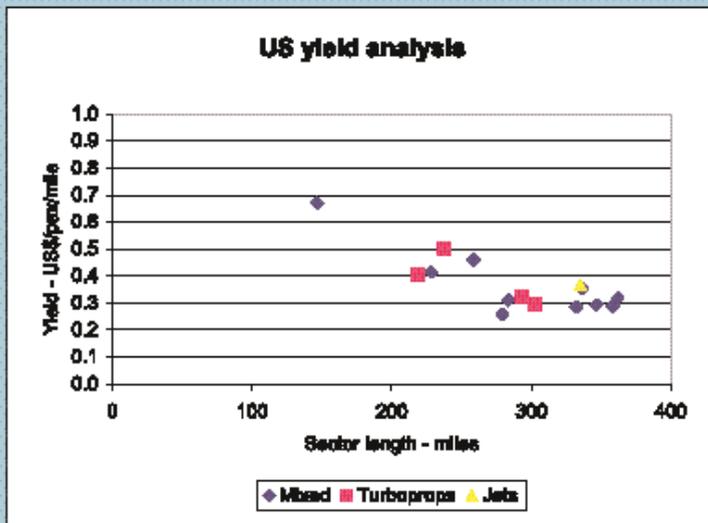
The two extremes of regional jet and turboprop operations are US regional carriers operating regional jets at main US hub airports and carriers in mountainous and other remote regions where passenger numbers and revenues are low, and operating conditions prevent operations as efficient as in the large US market.

Besides basic unit and trip costs, there are other physical and airline operating constraints which prevent the operation of regional jets. These are limitations posed by short runways, pilot scope clauses preventing the operation of regional jets over certain sizes or in particular numbers, and factors preventing high enough levels of aircraft utilisation.

European yield analysis



US yield analysis



Performance

In some cases even where economics would allow the replacement of turboprops with jets, performance limitations will not. Widerøe, which operates into Norway's short field coastal airfields, is probably the best example. The airline has recently ordered three Q400 aircraft to operate alongside its existing fleet of nearly 30 Dash 8 family aircraft.

Difficult airfields such as those found in Norway are a more common feature of the European market. One of the most popular examples is London City Airport, and it is a demonstration of how important these markets are to the turboprop manufacturers that Bombardier recently gained approval for steep approach operations with the Q400.

Subsidised routes

Public service routes such as those covered by the EAS program in the US, or equivalent state subsidies in Eire, Norway and Scotland are exclusively operated by turboprop aircraft.

Scope clauses

Probably the biggest obstacles to further expansion of the world's fleet of regional jet aircraft are the pilot scope clauses. These are well documented in the US market, but they also exist in Europe. Many industry observers believe that SAS Commuter, which has 40% of the total order book for the Q400, may have only selected the type to appease its pilot unions. Many other carriers have scope clauses limiting jet numbers. This has partially maintained turboprops.

Utilisation

The extent to which the overall economics of the slower turboprops can be superior to jets is a function of the utilisation achieved. The jet can offset its higher acquisition and operating costs and gain the full benefit of its higher potential with higher productivity.

If the aircraft cannot be productively employed throughout the day then the overall utilisation will be the same as the turboprop. In turn, capital or lease costs will not be amortised over as many flights and the turboprop will regain the commercial advantage. The relative difference of financing costs between two types has a combined effect on trip and unit costs between two aircraft.

The highly developed air transport system in the US allows operators to maximise the utilisation that is available with regional jets.

In Europe infrastructure constraints, combined with limited demand for business travel in the middle of the day, limits the ability of the operator to achieve the necessary utilisation.

Data published by the European Regions Airline Association (RAA) shows that during 2000 average utilisation across the fleets of its members (in the US) was 2,424 block hours for turboprops and 2,700 block hours for jets. Much of this difference is probably be accounted for by the longer average sectors flown by the jets. The USA's RAA does not break down its published figures by type, but the average utilisation during 2000 was 2,368 block hours per annum across the fleet.

Utilisations of regional jets and turboprops in Europe are close, so this assumes 2,000 flight hours (FH) per annum for all aircraft. Regional jets in both the US and Europe operate longer average sector lengths than turboprops, but the difference in annual FH achieved between the two groups is small.

Yields

Yield is the net income received from passenger fares, and is usually expressed in cents per revenue passenger mile (RPMs). This compares with revenue per available seat-mile, the average unit revenue per seat. jets are known to enhance revenue by stimulating passenger demand, thus increasing load factor and making large jets a requirement. jets are also used on longer sectors, partially because of passenger comfort.

Yield varies enormously between operators, but the most significant factor is distance. The only publicly available yield data is that published in the annual reports of individual airlines.

This data for the larger operators shows variation of yield with sector



distance for both the US and Europe. The variation with sector length is very similar for both markets, but yield in the US is on average some 25% lower than in Europe (see charts, this page).

The first chart (see, this page) differentiates the European data according to the predominant type of aircraft operated, either all turboprop, mixed turboprop and jet, or all jet. This reveals that yield is generally independent of aircraft type operated.

For example, both Lufthansa Cityline, with its all jet fleet, and Tyrolean, with a fleet of about equal numbers of jets and turboprops, operate with an average sector length of about 375nm. Despite what some would see as the drawback of turboprop equipment, Tyrolean achieves a 15% higher average yield than Lufthansa Cityline. Probably the highest yields in Europe are obtained by Wideroe, which operates an exclusively turboprop fleet of Dash 8 aircraft.

The second chart (see, page 38) confirms the same lack of correlation between yield and aircraft type in the US.

When regional jets entered service it was expected they would only displace the turboprops on the longer sectors. The overall economic benefit of the turboprops would seem them retained on short sectors. This is largely seen in practice with the turboprop operators flying the shorter routes.

Unfortunately for the turboprops yield per RPM tends to be at its highest on the shorter sectors, and this compensates for the jets' higher operating costs on these missions. As detailed later in this article the profitability advantage

for the turboprop is actually greater on longer sector lengths.

The following analysis of turboprop and regional jet profitability uses the yields shown in these charts.

Lease rates

While regional jet aircraft are largely discussed in terms of their absolute price, the turboprop market is still ruled by the operating lease.

Large fleets of 1980s and 1990s generation turboprops are controlled by their original manufacturers. As aircraft are being returned this is exerting considerable pressure on the lease rates that can be achieved in the market. This is making it more difficult for the surviving turboprop manufacturers to compete with their pricing linked to the cost of construction.

Used 50-seat turboprops such as the ATR42-300 and Fokker 50 are now typically leased at rates of about \$50,000 per month which is the figure used for both aircraft in this analysis. New production ATR42-500s, Canadair RJs and Embraer ERJ-145s, based upon their list prices of \$14.2 million, \$22 million and \$18.1 million respectively, are assumed to be financed for \$121,000, \$187,000 and \$154,000 per month. As a result of increasing availability at a time of low demand, turboprop lease rates will almost certainly continue to fall.

As well as lower lease rates, the turboprops are available under flexible short-term leases, typically three to five years. In contrast, to achieve acceptable economics regional jets are generally

Turboprops can be beaten by jets on economic grounds where passenger volumes and yields are high. jets can attract higher passenger volumes in these markets. Turboprops still have a place where passenger demand is limited and yields are low, thus generating low revenues.

acquired under long-term financing. This typically requires a commitment of more than 15 years from the operator.

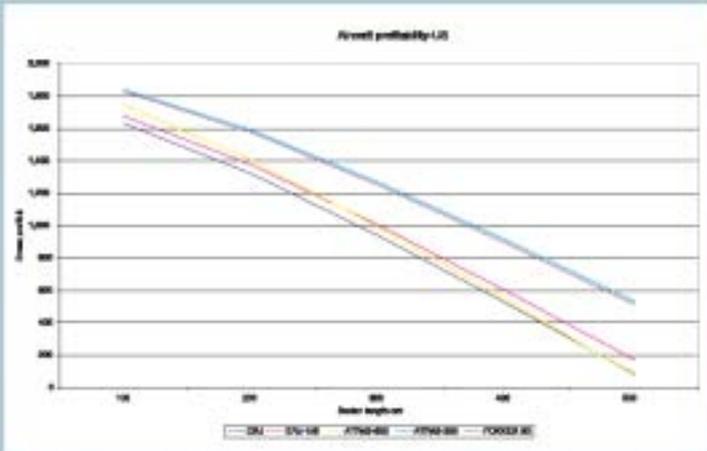
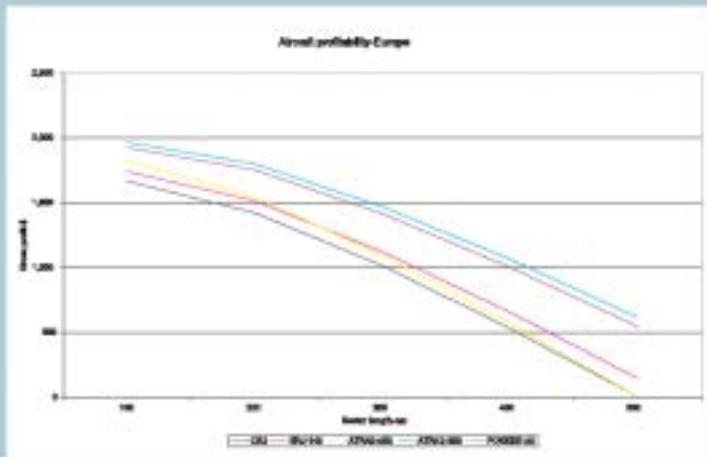
The steady decline in interest rates means the cost to finance both new turboprops and regional jets has come down. The success of the regional jet has destroyed confidence in turboprops, making it difficult to find investors willing to finance them. Following recent dramatic changes in the industry, the problem of finding finance may now extend to the regional jets. Financing will be harder to obtain for all airlines, let alone the smaller regional operators.

One popular source for financing regional jets in recent years has been enhanced equipment trust certificates (EETCs), but one of the first actions that Continental made following the terrorist attacks in the US was to default on EETCs. This action could undermine investor confidence in this form of financing.

Crew costs

One of the biggest threats to cost effective regional operations has been the steady rise in the cost of pilots. The recent wage dispute at Delta's subsidiary Comair resulted in a massive increase in pilot pay scales, up to 50% under certain conditions. This bitter dispute, which grounded the carrier for 89 days, was quickly followed by comparable rises at many other regional operators and has dramatically altered their cost structure.

While passenger attractiveness was the key behind the widespread introduction of the regional jet, the reason they were operated by the regional airlines rather than the mainline carriers themselves was the lower cost structure of these operators. When the cost difference between the bottom end of the mainline and the top end of the regionals' is reduced, so to is the logic behind having regional affiliates. This obvious conclusion is already causing a re-assessment of the relationship between the majors and their regional partners. Most immediately is at Northwest, where plans to assume full ownership of



Mesaba have been dropped.

There is a sizeable difference in the salaries paid to turboprop pilots compared to those who fly regional jets. This is particularly true in the US where the average salary of a regional jet pilot is typically 40% higher than his turboprop equivalent.

This is mainly because the seniority system used by airlines. As a pilot gains experience and seniority within an airline he expects a higher salary. At the same time he will probably progress from turboprops to jets. The regional jets are flown by the higher paid pilots.

Maintenance costs

One of the advantages jets have had over the turboprops is that the cost of maintenance for the regional jets has been relatively low in the few years that they

have been in service. This is the combined effect of young aircraft and warranties from the suppliers.

In comparison, the mature maintenance costs of the turboprops are well understood since they are based upon extensive in-service experience. The oldest regional jet is still only nine years old and the mature maintenance cost has yet to be seen.

Despite the increased complexity of jets compared to turboprops, the mature maintenance costs of all types are similar for similar sized aircraft.

Fuel

Rising fuel prices have increased the existing advantage of the turboprop over the regional jet. In many cases the regional jet operators are protected against fuel price variation by their fixed

fee per departure contracts. Under these the cost of fuel is paid directly by the mainline operator which in turn is covered by its fuel price hedging policy. For this analysis a fuel cost of \$0.80 per US gallon, typical of larger affiliated carriers, has been assumed. Smaller independent operators would pay far higher rates which would increase the appeal of the turboprop for such operators.

Discounting extremely short sectors then compared with the conventional turboprops, the ATR42-300 and Fokker 50, the regional jets burn typically 40-50% more fuel. In order to achieve its higher speed the ATR42-500 suffers a 15-25% increase.

User charges

In Europe en-route navigation charges within the member states of Eurocontrol are set by the individual states and collected by the Eurocontrol agency. The charging formula is based on the maximum take-off weight of the aircraft concerned. In the US the Air Traffic Control System is owned by the Federal Aviation Administration and is funded through taxation. There is therefore no direct equivalent to Eurocontrol style navigation charges in the US.

Landing charges, at most airports around the world, are calculated as a function of MTOW. They vary widely but typically the rate in the US will be around \$1 per 1,000lb (\$2.205 per metric tonne) compared with an average of \$9 per metric tonne in Europe. The combination of navigation charges and landing charges some four times higher than those in North America ensures that European operators are more focused on the MTOW advantage of the turboprops.

In Europe, landing and en-route charges driven by MTOW are substantial cost drivers, but with the exception of the ATR42-300, there is little difference between the turboprops and the jets.

While a modern conventional turboprop such as the ATR42-300 is lighter than older generation aircraft, the weight-efficient ERJ-145 design offers a lower MTOW and therefore a lower cost than the older Fokker 50. The ERJ-145 is also not much heavier than the ATR42-500. The CRJ suffers the highest MTOW of all the aircraft.

Indirect operating costs

These are the fixed costs of the airline that are independent of the type of aircraft operated. This includes administration, ground handling, catering, marketing, reservations and ticketing. These costs are generally the same whether the airline employs new regional jets or 20 year old turboprops. A

simple method that is often employed to account for the indirect costs is to assume that these are a fixed percentage of the direct operating costs for all aircraft.

An analysis of several US regional operators, together with historic data from the European Regions Airline Association, suggests that on average direct operating costs are twice as high as the indirect operating costs. For the purposes of the calculations that follow, indirect costs are therefore 50% of the ATR42-500's direct operating cost for all types, both new and used.

Profitability

The respective gross profit potential of the CRJ, ERJ-145, ATR42-300/-500 and Fokker 50 are compared on the European and US missions (*see charts, page 42*). These are both based on a 60% passenger load factor.

Clearly the older used turboprops, through their lower direct operating costs, are the most profitable, but the difference is not as high between jets and turboprops on short sectors.

The profitability gap actually increases on longer sectors, making the turboprops even more powerful. However, since the passenger appeal of the regional jet increases with distance, the turboprop has little opportunity to benefit from this.

The difference in profitability between the new production jets and turboprops is not large. This confirms the decline of the new production turboprop, since unable to generate a worthwhile cost saving on even short sectors, it has no benefits to offer on a mainstream route network.

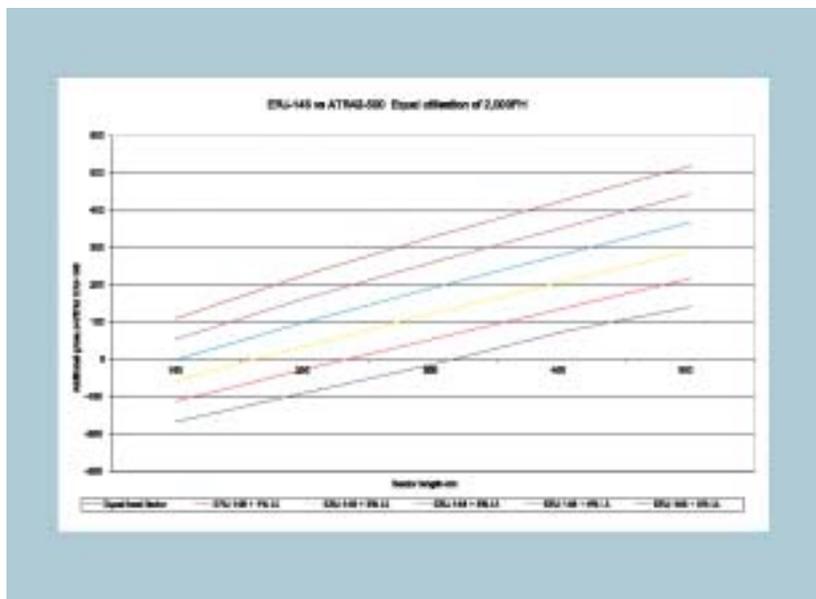
Considering just the ATR42-500 versus ERJ-145, where both have the same utilisation and load factor, the jet will be the more profitable option on sectors longer than 300 miles (*see chart, this page*).

The important consideration for the jet is its ability to obtain higher load factors than the turboprop. Regional jets are able to achieve about 10% increases in load factor. The chart (*see this page*) shows that where the jet achieves only a 3% increase in load factor, equal to just one or two passengers per flight on the 50 seaters examined, it will be the most profitable option on all sector lengths longer than 100nm.

This also therefore illustrates where the ATR 42, and so other turboprops will be more profitable than regional jets where higher loads are not possible. This will mainly be because of limited demand and low yield markets.

Turboprop's future

There are still several large niches where the turboprop remains the only



option. These are generally related to limitations which either exclude jets altogether or which make it very difficult to operate jets economically.

With large numbers of used turboprops available it is becoming increasingly difficult for the turboprop manufacturers to maintain their aircraft in production.

Before the terrorist attacks in the US, Bombardier announced it was laying off 450 staff from its de Havilland Canada factory at Downsview as a result of a reduction in turboprop production. The combined output of the Q100, Q200 and Q300 will be reduced to just one per month, while annual output of the Q400 remains at about 30. At October 2001 Bombardier had a one year backlog.

This is not to say that the market for new production aircraft is about to disappear completely, since there are always operators looking to acquire aircraft direct from the manufacturers providing the latter are sufficiently motivated to make the overall terms attractive.

There were 34 confirmed orders for 30- to 70-seat turboprops for the first nine months of 2001. ATR has placed five ATR42-500s and 17 ATR72-500s. The identity of the most recently announced order for four aircraft has not been revealed, but the remaining 18 aircraft are all going to existing operators. Bombardier has placed two Q300s and ten Q400s and again three of the four customers are loyal Bombardier customers, Petroleum Air Services, Tyrolean and Wideroe. The exception is Japan Air Commuter, which has ordered five Q400s to replace its fleet of YS-11s.

Of the 34 orders, 27 are for 70 seaters, which is not surprising since whereas there is a huge availability of used 19- to 50-seat turboprops and only

two 70-seat turboprops available on the used market. The lack of availability of the ATR72 pushes operators to new aircraft.

The independent regional

One negative impact of the regional jet revolution in the US has been a decline in the number of destinations served. Data from the RAA highlights that since 1993, the year Comair introduced the CRJ to North America, the number of airports served by its members has fallen from 829 to 729. At least 100 airports which had regional airline services therefore have lost them as the US industry has focused on its hub feed mentality.

This opens up a big opportunity for the turboprop, since with large numbers of cheap used aircraft available a new generation of independent regional airlines could emerge to serve these markets.

Until now, the dominant strength of the larger mainline operators and their regional partners has made it almost impossible for smaller independent operators to survive. In the face of a growing divide between the operating cost structure of the all-jet carriers and independent operators, there may be opportunities for the smaller carriers to flourish.

This effect has already seen the successful re-birth of 19-seater operations in the UK. Eastern Airways, based at Humberside International Airport, has carved out a business which has grown in a few years from a single wet leased Metro III to Europe's largest fleet of BAE Jetstream 31/32 aircraft.

If operators such as these can survive then the future for the turboprop may be more positive. 