Each aircraft type is sensitive to a particular element of operating costs. There are many operating cost elements and their relative proportions vary between different global regions. This influences the suitability of different regional aircraft types to their area of operation.

Global regional airline operating cost structures

This article examines the cost structures of five different global regions (the USA, Europe, Australia, South America and Africa) by breaking down the various elements that combine as the total direct operating cost of a modern regional aircraft.

The data that has been used to compile this article has been taken from a variety of sources, including the Air Transport Association, European Regional Airlines Association (ERA) and Regional Airlines Association (RAA) and the annual reports of several airlines.

While a great deal of information is published in the US, there is not so much for the rest of the world. The figures that have been derived from this data are not representative of any one airline within these regions, but are a compilation of typical examples from within that region. Used in the right context, this article illustrates the relative difference of operating cost elements for different regions of the world. It further shows how total operating costs vary between global regions.

There is wide variation in airline cost structures within these regions. For example, an airline operating in the UK will have a lower cost base than one in Germany.

What are DOCs?

Total operating costs (TOCs) are divided into direct operating costs (DOCs) and indirect operating costs (IOCs).

DOCs are items directly related to the operation of an aircraft, predominantly ownership/lease costs, insurance, maintenance, crew, fuel, navigation and landing fees.

IOCs are items not directly related to the operation of an aircraft, including administration, marketing, training, catering and aircraft handling. They are independent of aircraft type.

The comparison of DOCs provides a measure of the cost-effectiveness of two similar aircraft. IOCs are largely a measure of the efficiency of the airline itself and the total amount of overhead that cannot be apportioned to a specific route or aircraft type. IOCs are also a better reflection of a country's or region's economy and cost structure. For example, the Asia Pacific has lower labour costs than Europe or the US.

Aircraft ownership

The largest element of DOCs is aircraft ownership. If the airline elects to purchase an aircraft its ownership cost will depend on depreciation and the cost of funds.

The depreciation policy employed by an airline will have an effect on 35%–45% of total DOC. It may be laid down by government or other regulatory bodies. In general it is left to the airline's own experience and accounting policy. Airlines therefore have widely different depreciation policies.

Regional aircraft have short depreciation periods. With the advent of the regional jet there has been a tendency to increase the depreciation period. European airlines have tended to be much more conservative than their US counterparts, but this trend may also be changing. SAS recently changed its depreciation policy from 15 years to 20 with a 10% residual value in both cases.

Twelve years is typical for European regional carriers. The US and Australia it is longer, typically 16 years. Data for Africa and South America was not available, but these regions are assumed to follow the European and USA policies, respectively.

Interest

The cost of borrowing is dependent on many factors, but particularly local financial conditions and the perceived risk of the borrower. Banks that finance aircraft have to evaluate the capacity of the debtor to make payments and the security available if he does not. This is achieved by having different interest rates available to varying levels of risk. For the purposes of this analysis interest rate is assumed to be 6% for operators in Europe, the USA and Australia. For operators in Africa and South America 8% is used.

Operating Lease

Regional airlines have the option of acquiring aircraft through operating leases or direct purchase. The majority of regional turboprops were acquired

The utilisation of regional jets generated by airlines in the US and Europe is less than for turboprops. There is little variation in utilisation achieved by north American carriers, but wider rates of aircraft productivity in Europe.

through operating leases during the late 1980s and early 1990s.

A comparison of the two 'ownership' alternatives is given in the table (*see page 41*)

The equivalent lease rate factors to the depreciation policies and interest rates detailed earlier are approximately 0.75% for the USA and Australia, 0.90% for Europe and 1.00% for Africa and South America.

Aircraft utilisation

Reliability, maintainability, ease of turnaround, congestion, slot availability, bilateral agreements and the nature of the route system, all affect aircraft utilisation.

Utilisation varies between the US and Europe. An American operator with average sectors of one hour is expected to achieve annual utilisation of 2,250FH with turboprops and 2,150FH with jets. The equivalent European operator would expect to achieve 2,050FH with turboprops and 2,000FH with jets.

The American operators are all quite close to the average result. However, European operators' results vary from the average of 2,050FH across the region. The extremes are best illustrated by VLM of Belgium and Norwegian Air Shuttle. Both operate single-type fleets of Fokker 50 aircraft, with six and seven aircraft, respectively. VLM achieves nearly 2,600FH, while Norwegian Air Shuttle can only manage 1,270FH.

Airlines in all other parts of the world use just turboprops. American operators surprisingly do not achieve the highest utilisation. Operators in Australia and South America can typically be expected to achieve 2,350FH and 2,400FH.

The African operators achieve annual utilisations equal to the European average at around 2,050FH.

Utilisation is not likely to be very much different for turboprops and jets.

Insurance

This can be divided into three categories:

- Hull insurance
- Passenger liability
- War risk

Only third-party passenger liability insurance is compulsory, although most airlines will take out hull insurance. Lessors will at the very least demand hull insurance and, depending on the location of the operation, war risk insurance as well.

Hull insurance is a function of the area of operation and safety record of the aircraft type. Europe, the US and Australia are considered low risk, while Africa and South America are considered high risk.

The annual cost for hull insurance of a regional aircraft in the Europe, the US and Australia is estimated at 0.30% of the insured value of the aircraft. Factors of 2–3% are possible, but assuming a mature operation, an African or South American airline should expect a 1.0% factor.

For passenger liability cover, most airlines insure their whole fleet. The premium is a function of the size of the fleet being insured and the number of passenger miles flown. As an approximation an annual rate of US$500 per seat is used for all regions, with the exception of the US, which assumes US$1,000 per seat.

War risk insurance (which also insures the aircraft against damage or loss due to sabotage, industrial action and highjacking) varies widely according to the location of the operator. The US is the lowest risk with a typical rate of 0.03%, Europe and Australia are 0.04%, South America 0.06% and Africa 0.10%

Spares investment

The degree of investment in aircraft spares is a function of the desired protection level and fleet size. Larger fleets require less investment per aircraft.

When comparing the costs of similar 'new' aircraft it is common practice to approximate the spares investment required to a percentage of the new aircraft acquisition price. A figure of 15% is commonly used.

A practical consideration is that where an operator is located close to the manufacturer's spares facilities he may stock only a very limited supply of essential AOG spares.

An operator located a substantial distance away from such facilities may 'stock-up'. This is particularly true of operators outside Europe and the US.

Flightcrew

There is a significant regional variation in flightcrew costs. For example, European flightcrews are typically paid 50% higher salaries than their north American counterparts. Some of the difference can be explained due to the link between salary and aircraft size.

Data from the RAA in the US and the ERA confirms average aircraft sizes as 28 and 62.

There is also a sizeable difference between turboprop and regional jet salaries. This is particularly true in the US where the average regional jet salary is typically 40% higher than his turboprop equivalent.

This is largely a function of the seniority system used by the majority of the worlds 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 the smallest aircraft in his airline's fleet to the largest. The regional jets are the largest and most technically challenging aircraft in most US regional airlines.

Data for jet pilots in Australia, South America and Africa was not readily available and is extrapolated on the basis of mainline pilot salaries and European experience with turboprop versus jet rates.

Cabin crew

Flight attendant salaries, like pilot salaries, are highest in Europe, although

there is a wide difference between different countries. For example, in Greece a typical salary will be about $10,000 per year, whereas in Scandinavian countries it may be as high as $40,000. In the US and Australia, salaries are much more stable with an attendant on a regional aircraft likely to be paid around $20,000.

The minimum number of cabin attendants is determined by the airworthiness authorities. It is mainly a function of the seats. Additional attendants may be required based on emergency evacuation considerations.

European airlines often choose to offer an enhanced cabin service which requires more than this minimum number. As well as the direct cost increase, the need to accommodate the additional attendant can result in the loss of a passenger seat.

Allowances & benefits

In addition to salaries the total remuneration received by aircrew is increased by allowances and benefits. These are typically based on the number of hours flown and overnight stays away from base. The allowance that is common to all airlines is for meals when crews are away from their home base. Benefits can also include profit shares, pension contributions, medical and dental assistance. European aircrew receive an average allowance and benefit package equivalent to about 15% of salary while in the US 25% is typical. Australian operators have the lowest with nearer 10%. This level is also assumed for the other regions considered in this analysis.

Social costs

An additional expense for an airline is its contribution to state pension schemes and medical insurance cover. For European operators these 'social costs' are equivalent to an average of 25% of basic salary. The range is between 10 and 40% for the individual carriers.

France has the highest social costs, while the UK offers the lowest of the larger European countries.

The equivalent percentage for the US and Australia is nearer 10%, which is assumed to be representative of other regions in this analysis.

Crew utilisation

Crew cost per FH is a function of crew productivity. The maximum number of hours that can be flown by the flight crew is determined by airworthiness authorities. The US limit is 100 hours per month. In reality most airlines are prevented by labour contracts from flying their flight crews more than 75–80 hours per month.

Actual pilot utilisation in the US averages 800FH per year. This compares favourably with Europe where the equivalent pilot will typically only fly 600FH per year.

European flight crew trip costs are therefore double US levels, due to the combination of higher salaries and lower utilisation. Pilots in Australia and South America typically achieve somewhere between the two extremes at about 700FH per year, while pilots in Africa only match the European level.

The aviation authorities of most countries allow cabin crew to operate for longer duty periods with shorter rest periods than for pilots. On short-haul operations its crew productivity is assumed to be the same as for the flight crew.

Fuel costs

Fuels cost vary enormously. North American operators benefit from the lowest prices, while African carriers suffer the highest at almost double the US rate. Country by country variation within these regions is also significant, depending mainly on local taxation.

In a given area price is a function of airline size and amount of fuel consumed. It is increasingly a function of a regional airline's relationship with the major carriers. Research suggests that in the US the cost of fuel can be some 20% higher for the independent regionals than it is for the wholly owned subsidiaries, such as AMR Eagle and Continental Express.

Fuel accounts for 15% of the overall direct operating cost of US regional airlines. This compares to 12% in Europe.

Airframe maintenance

The largest cost element within airframe maintenance is the overhaul and repair of the rotable components, avionics, propellers and landing gears.

Few regional airlines have a significant in-house capability and so the work is subcontracted. The majority of the repair facilities are based in North America and Europe.

Maintenance labour accounts for a relatively small proportion of the total maintenance cost, but there are significant differences in the labour rates. In the US, Australia and South America a rate of $15 per man-hour (MH) is typical, while in Europe $25 per MH would be representative.

Engine maintenance

Many airlines opt for power-by-the-hour (PBH) type maintenance agreements with their engine suppliers to guarantee costs. For similar-sized carriers operating in the same geographic area the cost of third-party overhaul or PBH type contracts will be the same. The biggest drivers to lower costs are the scale of the contract, for example Continental Express for 200 Embraer ERJ-145s versus only two aircraft for European Regions Airlines of Spain.

Aside from transport costs, geographical location can have a particularly big effect on the hourly rates for the PBH. Airlines considered to operate in a harsh environment would pay 20–25% higher rates.

Another major effect is the average sector length. Engine wear is largely a function of the time spent at take-off and climb power. Shorter average sectors result in a higher proportion of the flight, leading to more frequent hot section refurbishment and thus higher cost.

Annual flightcrew utilisation averages about 800FH in the US, but only 600FH in Europe, where salaries are also about 50% higher.

SUMMARY OF GLOBAL REGIONAL AIRLINE OPERATING COST STRUCTURES

Global region	USA	Europe	Australia	South America	Africa
Depreciation period	12	12	16	16	12
Residual value	10%	10%	10%	10%	10%
Interest rate	6%	6%	6%	8%	8%
Lease rate factors	0.75%	0.90%	0.75%	1.00%	1.00%
Annual aircraft utilisation	2.250	2,050	2,350	2,400	2,050
Hull insurance	0.30%	0.30%	0.30%	1.00%	1.00%
Third party liability insurance	$1,000/pax	$500/pax	$500/pax	$500/pax	$500/pax
War risk insurance	0.03%	0.04%	0.04%	0.06%	0.10%
Spares investment	15%	15%	15%	15%	15%
Fuel price	$0.60/USG	$0.75/USG	$0.90/USG	$0.90/USG	$1.10/USG
Turboprop captain salary	$45,000	$65,000	$40,000	$50,000	$15,000
Turboprop-first officer salary	$25,000	$40,000	$30,000	$30,000	$10,000
Jet-captain salary	$65,000	$75,000	$50,000	$60,000	$15,000
Jet-first officer salary	$35,000	$50,000	$40,000	$40,000	$10,000
Cabin crew salary	$20,000	$25,000	$20,000	$10,000	$1,000
Crew annual utilisation	800Fh	600FH	700FH	700FH	600FH
No of cabin crew	Minimum	Minimum plus one	Minimum	Minimum	Minimum
Allowances & benefits	25% salary	15% salary	10% salary	10% salary	10% salary
Social costs	10% salary	25% salary	10% salary	10% salary	10% salary
Maintenance labour rate	$15/MH	$25/MH	$15/MH	$15/MH	$5/MH
Engine maintenance cost factor	1.00	1.00	1.00	1.25	1.25
Landing charges	2.2046 x M	9 x M	5 x M	4 x M	6 x M
Navigation charges	n/a	$0.95 x s x (M/50)^0.5	$0.0625 x S x (M)^0.5	$0.75 x S x (M/50)^0.5	$115

En-route charges

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 the navigation charges that are found in the majority of the rest of the world.

In Europe en-route navigation charges within the 28 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 (MTOW) of the aircraft concerned. Since MTOW does not increase directly with seat capacity this method of charging penalises smaller aircraft. The 19-seat aircraft are charged nearly $5/seat for en-route charges, while larger aircraft are charged nearer $2/seat.

The average Eurocontrol rate (for the 28 participating countries for which 1999 data was available) was calculated and equated to the following:

N = 0.95 x S x (M/50)^ **(**x**)** 0.5. where

N = Navigation charge in US$

S = Distance in nautical miles

M = MTOW in metric tonnes

Airservices Australia uses a similar formula for aircraft with a MTOW above 20,000kg. The Eurocontrol formula is also used by Brasil and this is taken as representative of South American cost levels.

Several African states are grouped together in ASECNA (Agence pour la Securite de la Navigation Aerienne en Afrique et en Madagascar). Their charging formula is based on a unit rate multiplied by a coefficient, which is dependent on the MTOW and the distance flown. For regional aircraft flying up to around 400nm and with a MTOW less than 50,000kg this is a fixed charge of around $115.

Landing charges

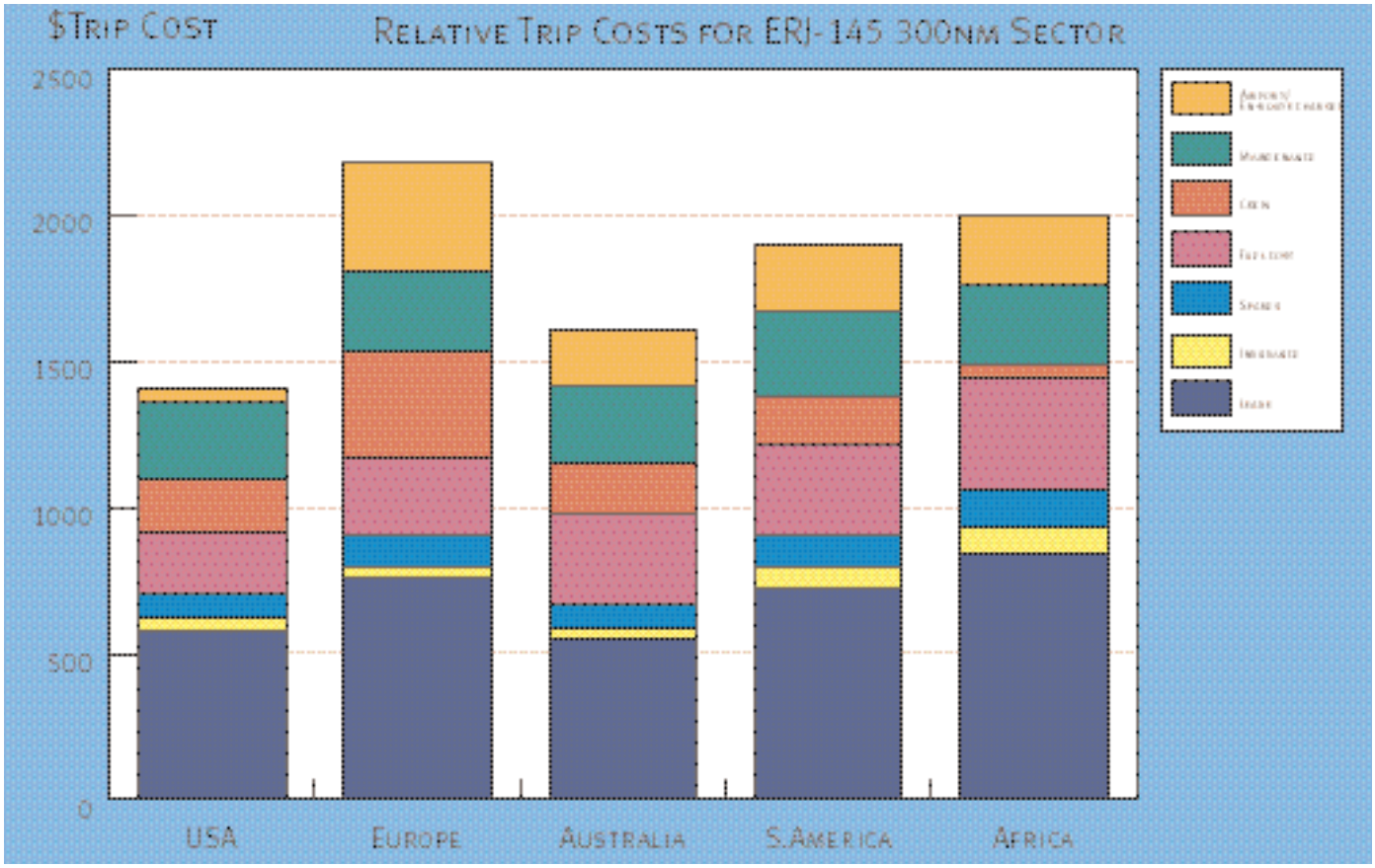
Landing charges at most airports around the world, are calculated as a function of MTOW (although some set a fixed charge and a rate per tonne). They vary widely throughout the world and are always subject to local negotiation.

Examining a sample of regional airports, together with the major airports contained in the IATA airport charges manual, typical rates per tonne varied between $9 in Europe and $4–6 for the rest of the world. Surprisingly, published African landing charges are among the highest in the world outside of Europe. In the US landing charges are less significant. A typical landing charge is $1 per 1,000lb of MTOW.

Summary

The bar chart *(see page 42)* summarises the different trip cost elements for the five geographic regions considered. It is based on data for an Embraer ERJ-145 operating 300nm stage lengths, but the detail is less important than the overall picture.

Once an aircraft type has been selected it has very little influence over the bulk of the cost elements. Insurance rates, fuel costs, landing and navigation charges are all a function of wider market conditions. The only cost elements that the airline has real control over are the labour cost elements, most importantly aircrew costs. These are highly cyclic. During an industry boom pilots are always in short supply and in a good position to dictate terms. In a downturn they are the first to suffer.



The United States

The US has the lowest cost base of regional operations with a total cost that is roughly two-thirds that of Europe. A significant proportion of the US' cost efficiency is the result of a complete absence of an en-route charging system as used by almost all other developed countries. If the US adopted a Eurocontrol-style charging system, US airline costs would increase by nearly 15%. This increase would obviously be passed on to the passenger, but the overall increase seen in an individual's ticket price could be cancelled out by a reduction in the tax on the ticket (which currently funds the FAA).

Europe

Europe has the highest overall cost structure, some 56% higher than that of the US. This is due to significantly higher costs in three main areas: ownership/lease costs, crew costs and en-route/landing charges.

With the exception of Europe, maintenance and fuel constitute the next two most important cost elements after ownership/rental costs. In Europe, however, these have less influence than crew and weight-related charges.

It confirms the European pre-occupation with MTOW related charges. This explains, together with high labour costs, the reason for a continuing demand for larger aircraft. To a large extent crew costs are the same on a 50-seater as they are on a 100-seater. To achieve an acceptable sea-mile cost larger aircraft are favoured.

The European pre-occupation is nowhere better demonstrated than on the Embraer ERJ-145, which has now spawned six different design weight options of between 19,200 and 22,000kg.

The difference in landing charges between an aircraft with a MTOW of 19,990kg and of 20,600kg can be $5 million over 15 years.

Australia

Australia manages to achieve DOCs closest to those of the US with only 14% higher costs. The difference is mainly the result of higher weight-related charges.

This achievement in combination with the size of the country and therefore the need for regional transportation will ensure Australia remains a smaller but significant market for the world's regional aircraft manufacturers.

South America

The perception that South America has a higher risk than the previous three regions considered has a dramatic effect on the overall cost structure, which is some 35% higher than the US.

Despite achieving an annual aircraft utilisation higher than the US, South America's higher lease rates and finance charges account for 10% higher DOCs. The Eurocontrol-style system for en-route charges adds a further 15% and fuel price differences a further 7.5%.

Africa

Ownership-related costs are the largest item for all five regions considered. Africa, by virtue of its higher lease rates/finance charges combined with low aircraft utilisation, give the highest cost of all. In addition, whereas insurance costs are almost insignificant for the US, Europe and Australia, they constitute 4–5% of the total for South America and Africa.

Despite very low labour costs the combination of both factors ensures that this region of the world suffers DOCs some 43% higher than those in the US. Since it is the least able to pay, the African market for new regional aircraft is likely to remain minimal for a long time to come.

Overall

There is no such thing as a 'typical' regional airline. The conclusion is that with the cost structures in the US and Europe (which constitute more than 90% of the world market for regional aircraft) and the preference for regional jets, the market for 30 to 50-seat aircraft will be in the US. European operators, rather than reverting to smaller aircraft, will continue to need larger aircraft to offset their higher labour costs and weight-related charges.