



From the days of this Caravelle 12, preparing here for a return trip with a group of holidaymakers in 1979, the annual gain in fuel efficiency has been 1.4% (in terms of reduction in fuel or energy equivalent per seat-km).

## AIR TRANSPORT: QUARTERLY REPORT NO.16 3rd QUARTER 2007 (July to September)

<b>1</b>	<b>OVERVIEW.....</b>	<b>1</b>
<b>2.</b>	<b>HIGHLIGHTS AND KEY DEVELOPMENTS.....</b>	<b>3</b>
2.1	REGULATORY.....	3
2.2	AIRLINES.....	4
2.3	AIRPORTS.....	11
2.4	SAFETY AND SECURITY.....	14
2.5	ATM.....	15
2.6	MANUFACTURERS.....	15
2.7	THE ENVIRONMENT.....	16
	<b>THE POTENTIAL FOR AVIATION FUEL AND CO<sub>2</sub> EMISSIONS REDUCTION.....</b>	<b>18</b>
	PAST TRENDS.....	18
	THE FUTURE.....	19
	SUMMARY AND CONCLUSIONS.....	22

**Disclaimer and copyright:** This report has been carried out for the Directorate-General for Energy and Transport in the European Commission and expresses the opinion of the organisation undertaking the contract TREN/05/MD/S07.52077. These views have not been adopted or in any way approved by the European Commission and should not be relied upon as a statement of the European Commission's or the Transport and Energy DG's views. The European Commission does not guarantee the accuracy of the information given in the report, nor does it accept responsibility for any use made thereof.

Copyright in this report is held by the European Communities. Persons wishing to use the contents of this report (in whole or in part) for purposes other than their personal use are invited to submit a written request to the following address:

European Commission - DG Energy and Transport - Library (DM28, 0/36) - B-1049 Brussels [e-mail](mailto:ec-energy@ec.europa.eu)  
([http://ec.europa.eu/dgs/energy\\_transport/contact/index\\_en.htm](http://ec.europa.eu/dgs/energy_transport/contact/index_en.htm))

# 1 Overview

The EU has been successful in implementing an emissions trading system which is expected to be extended to cover aviation. The aim of this is to assist in the reduction of greenhouse gas emissions from the industry, although some research suggests that at the current carbon price, the emissions trading scheme will have little impact on aviation. ICAO failed to reach agreement at its Assembly in September on a path towards reduction of such emissions.

From 26 July Commission Regulation (EC) No 1107/2006 has meant that airlines and tour operators cannot refuse to carry passengers on the basis of any reduced mobility. At the same time, airlines and airports must provide levels of service such that persons with reduced mobility enjoy full access to air transport.

LCCs have continued to develop their networks. In Q3, fifty-three new low-cost routes were started, served by an additional 232 flights each week. Overall, LCCs now provide around 30% of all intra-European capacity.

AEA airlines reported passenger traffic up by just over five percent in the three months to the end of September 2007. Average load factors were up on services to all regions except the important North American routes, where growth in demand did not match the increase in capacity provide. Among the largest European carriers, Air France and Lufthansa saw growth in capacity and passenger demand with increases in average passenger load-factors. At British Airways, capacity fell, but the airline was able to maintain its load factor.

Q2 financial results were available for a number of airlines. The period covers Easter and the start of the summer season. Financial results were good among the major airlines, with the exception of Alitalia, where margins continued to slip. Operating margins improved by 1.7 points to 8.4%, an encouraging level for the industry.

ACI's European airports were up 5.7% in passenger throughput to end-September, slightly above the 5.5% increase in the association's world-wide airports. April to June growth in passenger traffic among the largest European airports was particularly strong at Madrid (up 12% year-on-year), fuelled to some extent by the activity of LCCs but also by the new airport passenger terminal capacity coming online.

Madrid was one of very few airports where AEA member airlines reported fewer departures subjected to delays. Even so, one in four flights left the airport more than fifteen minutes late, and the average delay to these flights was forty minutes. In delay terms, Brussels was the "best" performer – only 16% of flights were late leaving the airport. Heathrow was worst performer, with over one-third of departures were over fifteen minutes behind schedule.

## **2. Highlights and key developments**

### **2.1 Regulatory**

The 36th Assembly of ICAO held in September failed to reach agreement on a way forward to reduce greenhouse gas emissions from international aviation. Jacques Barrot, European Commission Vice-President and Commissioner for Transport, expressed his disappointment at the outcome. The EU has set up a comprehensive emissions trading system and is in the process of agreeing legislation that will extend the scheme to cover aviation emissions.

In July, the Commission introduced new rules that will ensure that persons with reduced mobility have access to air transport comparable to that of any other passenger flying from airports in the EU. Around 10% of the EU population is affected by reduced mobility and while most airlines and airports make genuine efforts to offer the necessary assistance not all do. Regulation (EC) No 1107/2006 provides for persons with reduced mobility to travel by air without difficulty and covers three areas: equal treatment of persons affected by reduced mobility; free assistance in all EU airports; and assistance on board an aircraft. From 26 July, the Regulation prohibits airlines and tour operators refusing to carry passengers or to take bookings on the basis of reduced mobility. From the same date, airports have had to provide a specific set of services for persons with reduced mobility and on flights from EU airports airlines are obliged to provide certain services, such as the carriage of wheelchairs or guide dogs, free of charge.

In July, the Commission authorised the creation of a marketing fund for Norrköping airport in Sweden, which allows the Municipality of Norrköping and seven private companies and entities to participate in a marketing and business development fund amounting to €640,000. The fund is designed at developing air routes to and from the city, which will enhance the economic and social well-being of Norrköping. The Commission concluded that the fund did not constitute State aid.

In July, the Commission opened an investigation into suspected State aid being granted by Finnish authorities in respect of Tampere airport. The potential beneficiaries were identified as two State-owned companies, Finavia and Airpro, and the Irish low cost carrier, Ryanair. During the same month the Commission launched a further three investigations into potential State aid having been granted to respectively: Dortmund airport, Lübeck airport and Flughafen Schönefeld GmbH. In each case the issue relates to contracts having been concluded by the respective airport authority with one or more low cost carriers, and to the provision of financial support to cover airport operating losses.

As of July, the Commission had approved State aid for airport infrastructure totalling €17 million. The total amount of start-up aid approved so far is €162.6 million.

In September, the EU signed “horizontal” agreements with Armenia and Mongolia removing nationality restrictions in the bilateral air services agreements with Member States. These agreements represent respectively the 27th and 28th such “horizontal” agreements.

In September, the Commission began an investigation into support given by the Sardinia Region and SOGEAAL SpA, the publicly owned company operating

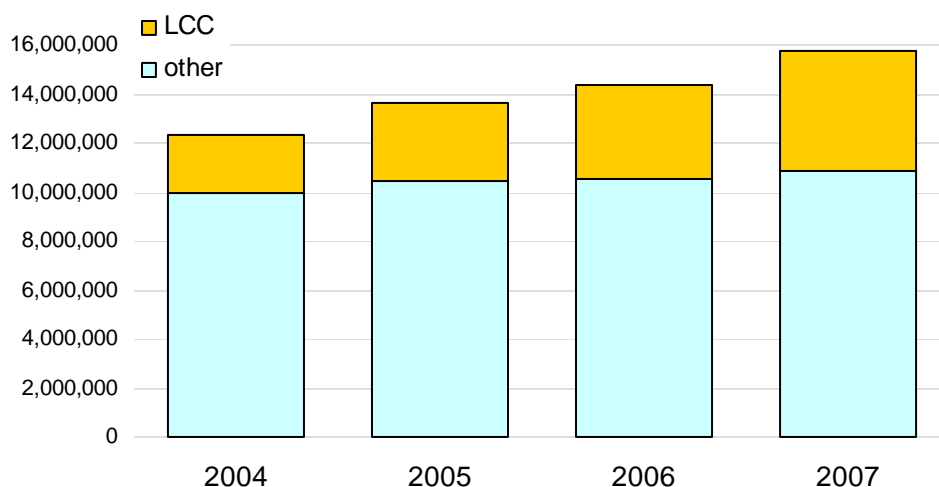
Alghero airport, to various airlines, and by the Sardinia Region to SOGEAAL SpA. One of the main aspects of the Commission's inquiry will be to assess whether the support provided to Ryanair could have been granted by a market economy investor. If not, then the support would fall under the rules governing State aid. The Commission will also investigate a number of handling fee rebates which have apparently been given to low cost carriers at Alghero airport. In addition, the Commission considers that financial support and compensation given to SOGEAAL SpA to cover its operating loss and capital increase might constitute State aid in favour of the airport operator.

## 2.2 Airlines

### 2.2.1 Capacity and routes

By the summer of 2007 LCCs accounted for around 30% of capacity on European routes. The following chart shows clearly that much of the capacity increases within Europe between 2004 and 2007 can be explained by the routes served by LCC.

**June capacity (seats/week) within the European air transport network, 2004-2007**



Source: OAG

Sixteen LCC started a total of fifty-three new routes during Q3. These new services (see following table) accounted for 232 flights per week. Click Air, part-owned by Iberia, was one of the newest and busiest of LCCs, launching services to six international destinations, and two within Spain.

## New LCC routes started in Q3 2007

Airline	Route	Start date	Flights per week
Air Berlin	Berlin TXL Saarbrucken	03-Sep	12
Air Berlin	Dusseldorf Faro	01-Sep	2
Air Berlin	Dusseldorf Stuttgart	02-Jul	22
Air Berlin	Munich Faro	01-Sep	1
Air Italy	Verona Naples	17-Sep	12
Blue Air	Arad Stuttgart	01-Sep	3
bmibaby	Cardiff Ibiza	16-Jul	2
Click Air	Barcelona Edinburgh	01-Aug	7
Click Air	Barcelona Granada	01-Aug	14
Click Air	Barcelona Jerez	01-Aug	7
Click Air	Barcelona Lyon	01-Jul	4
Click Air	Barcelona Nador	01-Jul	3
Click Air	Barcelona Rome FCO	01-Jul	21
Click Air	Barcelona Tangier	08-Jul	3
Click Air	Barcelona Tunis	01-Aug	2
easyJet	Belfast BFS Ibiza	07-Jul	1
easyJet	Edinburgh Paris CDG	10-Sep	6
easyJet	London LGW La Rochelle	14-Jul	12
easyJet	Milan MXP Bucharest BBU	10-Sep	7
easyJet	Milan MXP Catania	13-Jul	7
easyJet	Newcastle Mahon	14-Jul	2
FlyGlobespan	Teesside Nice	01-Jul	2
FlyGlobespan	Teesside Pula	05-Jul	1
Germanwings	Berlin SXF Balaton	06-Jul	2
Iceland Express	Keflavik Luxembourg	28-Sep	2
MyAir	Bari Ibiza	20-Jul	3
MyAir	Bucharest BBU Ibiza	19-Jul	3
MyAir	Milan BGY Bastia	20-Jul	2
MyAir	Milan MXP Santorini	10-Jul	2
Norwegian	Oslo Moscow DME	16-Aug	3
Norwegian	Trondheim Alicante	02-Jul	2
OnAir	Pescara Bucharest BBU	02-Jul	1
OnAir	Pescara Kiev	05-Jul	2
OnAir	Pescara L'viv	06-Jul	1
OnAir	Pescara Split	07-Jul	1
Ryanair	Bremen Alghero	28-Sep	2
Ryanair	Bremen Bratislava	25-Sep	3
Ryanair	Bremen Malta	25-Sep	3
Ryanair	Bremen Milan BGY	26-Sep	4
Ryanair	Bremen Paris BVA	25-Sep	7
Ryanair	Bremen Trapani	26-Sep	2
Transavia	Paris ORY Catania	15-Jul	2
Transavia	Paris ORY Monastir	11-Jul	5
Transavia	Paris ORY Oujda	10-Jul	3
TUIfly.com	Memmingen Antalya	01-Jul	1
Wizz Air	Katowice Bournemouth	14-Jul	3
Wizz Air	Katowice Coventry	14-Jul	3
Wizz Air	Katowice Glasgow PIK	03-Sep	2
Wizz Air	Katowice Malmo	07-Jul	3
Wizz Air	Poznan Stockholm NYO	28-Jul	3
Wizz Air	Warsaw Belfast BFS	28-Jul	3
Wizz Air	Warsaw Oslo TRF	28-Jul	3
Wizz Air	Warsaw Teesside	28-Jul	3

## 2.2.2 Charter carrier news

Lufthansa has chosen not to exercise its option on the stake owned by Thomas Cook in charter carrier Condor. The German flag carrier had sold its 50% shareholding in Thomas Cook to the retailing group KarstadtQuelle earlier in the year, leaving the airline with a 24.9% stake in Condor. Lufthansa held first right of refusal on Thomas Cook's 75.1% shareholding in Condor. This will now enable Air Berlin to proceed with its plan to acquire Condor in two stages, firstly by purchasing Thomas Cook's shareholding in Condor in February 2009 and secondly by taking over the remaining stake in 2010 after Lufthansa first sells its stake in Condor to Thomas Cook.

In August, the German Competition Authority gave unconditional approval for Air Berlin's acquisition of LTU. Air Berlin expects to make annual savings of between €70 million and €100 million following the take-over. Also in August, Air Berlin was granted formal clearance to proceed with its purchase of a 49% stake in Swiss charter carrier, Belair.

Martinair has announced that it is to cease its short haul charter operations in November. KLM, which currently owns half of the shares in Martinair, is interested in acquiring full ownership of the charter carrier.

TUI Travel announced in September its intention to cut charter capacity from its German and UK operations in 2008.

## 2.2.3 Traffic

Passenger traffic carried by AEA airlines in the three months to the end of September 2007 was up by just over five percent on the same period 2006, totalling over one hundred million passengers. More than three-quarters of this traffic was carried on intra-European sectors (domestic and cross-border), although these routes accounted for only one-third of total RPK. Air services between Europe and North America generated 26% of total passenger capacity (ASK), while Europe and Far East/Australia-Pacific routes contributed 17.5%.

### Scheduled services of AEA members, July – September 2007

	Passengers	ASK	RPK	Load Factor
	thousands	millions	millions	%
Domestic	29,545	23,151	16,761	72.4%
Cross-border Europe	48,555	70,230	53,505	76.2%
Europe / N Africa Mid East	3,424	12,168	9,520	78.2%
North Atlantic	8,479	68,876	57,801	83.9%
South/Mid Atlantic	3,126	29,184	25,134	86.1%
Europe/rest Africa	2,165	16,800	14,081	83.8%
Europe /Far East, Australasia	4,879	46,864	40,130	85.6%
Other	42	84	58	
<b>TOTAL</b>	<b>100,215</b>	<b>267,356</b>	<b>216,990</b>	<b>81.2%</b>

Source:AEA

AEA carriers attracted increasing intra-European traffic (RPK) at a higher rate than they created additional capacity (ASK) producing a growth in average passenger load-

factors on these services of 1.3 percentage points for domestic services, and just under one-half a percentage point on cross-border European routes.

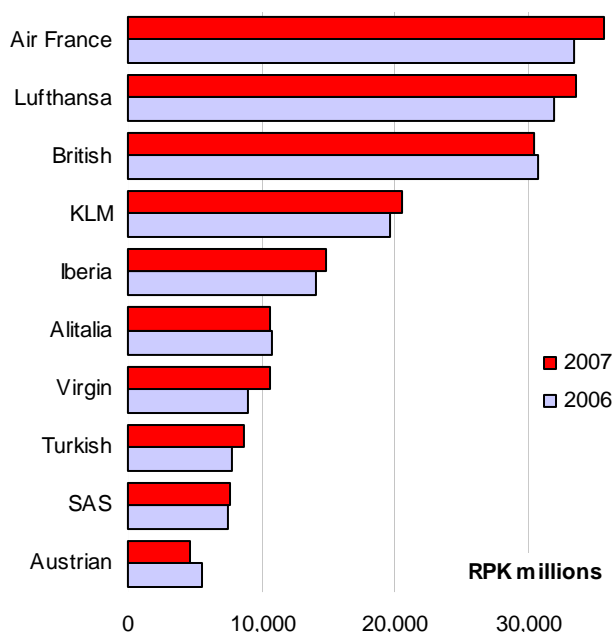
#### AEA members, July – September 2007, growth over same period 2006

	Passengers	ASK	RPK	Load Factor
	thousands	millions	millions	change (points)
Domestic	2.2%	1.5%	3.4%	1.3
Cross-border Europe	6.3%	7.2%	7.7%	0.4
Europe / N Africa Mid East	12.4%	2.0%	8.4%	4.7
North Atlantic	5.9%	5.7%	5.6%	-0.1
South/Mid Atlantic	7.7%	6.6%	7.7%	0.9
Europe/rest Africa	5.9%	5.4%	6.8%	1.1
Europe /Far East, Australasia	3.3%	0.1%	2.4%	1.9
<b>TOTAL</b>	<b>5.1%</b>	<b>4.6%</b>	<b>5.8%</b>	<b>0.9</b>

Source: AEA

There were higher load-factor increases in other markets, with the Asia Pacific routes improving by 1.9 percentage points. On the highly competitive North Atlantic market traffic increases in these busy summer months did not keep pace with the growth in capacity, leading to a load-factor of 83.9%, down slightly against the same period in 2006.

#### Ten largest AEA members, July – September 2007, RPK growth over same period 2006



Among AEA member airlines, Air France and Lufthansa increased capacity by 6% and 4% respectively while managing to increase revenue passenger kilometres at higher rates (AF 7% and LH 6%). British Airways records reduced capacity (down 1.4%) after a number of flights were cancelled in July due to external events, including a security alert which prompted the closure of London Heathrow's Terminal 4 on 3 July and extreme weather in the UK on 20 July, but RPK fell by only 1.1%.

The result was an increase in passenger load factors for the three largest European network carriers, Lufthansa managing a lift of just over one percentage point to 81.9%. KLM average load factor fell slightly as the airline extended its capacity by 5%. RPK at Austrian fell significantly, by almost 17%, while the airline rationalised its long-haul route network and Alitalia fell by just half of one percent. Virgin's extended network began to attract fill aircraft, the carrier recording RPK up 17%, feeding through to a six point growth in its cabin load-factor, to 79.2%.

#### Air freight traffic AEA members, July - September 2007 vs same period 2006

Freight (TFTK)		
	millions	change
Domestic	29	-9.2%
Cross-border Europe	184	-1.9%
Europe / N Africa Mid East	302	0.5%
North Atlantic	2,711	5.8%
South/Mid Atlantic	1,000	5.6%
Europe/rest Africa	857	22.5%
Europe /Far East, Australasia	4,361	1.1%
<b>TOTAL</b>	<b>9,445</b>	<b>4.4%</b>

Source: AEA

Air freight carried in the three months was 4.4% up on the same period one year earlier. Domestic and cross-border European markets represent only around 2.3% of total freight carried by AEA airlines: both recorded the weakest, and only negative, performance. The market with strongest growth, at over 20%, was Africa, and this performance together with improvements on the important North Atlantic and Far East routes contributed to the solid growth recorded by AEA carriers.

## 2.2.4 Financial

### *European carriers*

#### Financial performance of major EU carriers for April to June 2007

	Revenues (\$m)	Operating result (\$m)	Net result (\$m)	Op.margin %	Net margin %
Air France-KLM	8,024	560	560	7.0	7.0
Alitalia	1,685	-18	-60	-1.1	-3.6
Austrian Airlines	895	22	11	2.5	1.2
British Airways	4,363	523	535	12.0	12.3
Finnair	726	50	35	6.9	4.8
Iberia	1,833	77	84	4.2	4.6
Lufthansa Group	7,279	763	591	10.5	8.1
Ryanair	935	213	187	22.8	20.0
SAS Group	2,381	136	89	5.7	3.7
Swiss	995	133	145	13.4	14.6
<b>Total above</b>	<b>29,116</b>	<b>2,459</b>	<b>2,177</b>	<b>8.4</b>	<b>7.5</b>

Source: Airline Business, October 2007

Results for the second quarter of calendar year 2007 were available for the majority of larger EU airlines, and are shown in the table. This quarter covers both Easter and the start of the busier summer period. For the group as a whole, operating margins further improved from 6.7% to 8.4%, an enviable level by airline standards.

All the major European airlines produced positive operating and net profits for this quarter with the exception of Alitalia, whose position worsened. Ryanair's operating margin dropped from 24.1% to 22.8%, with these margins increasing for all the network carriers apart from Alitalia. Swiss continued their turnaround already evident in previous quarters, with operating profits up from US\$61m to \$133m, with around the same improvement at the net level.

In addition to the airlines reported above, Air Berlin's operating profit was down from US\$61m to \$32m over the same period, its operating margin declining from 11.2% to 4.3%. The Icelandair Group also reported lower profits and a fall in operating margin from 7.7% to 3.9% in the quarter.

TAP Air Portugal and Aer Lingus only reported for the six months to the end of June 2007: TAP improved its operating loss from US\$46m (-1.9% of revenues) to \$20m, while Aer Lingus's operating profit fell from \$14m to \$4m or only 0.5% of revenues. easyJet also only reports on a six monthly basis but their latest results were for the period to the end of March 2007, and not comparable.

Other European airlines reporting their first quarter results were Air Berlin (an operating margin of -16.3%, Icelandair (-0.7%), Turkish (20.9%) and Vueling (-17.3%). Virgin Atlantic Airlines reported their financial results to end February 2007 in August: excluding hefty losses in their Nigerian subsidiary they made a pre-tax profit of £47m on £2.14 billion revenues compared to £78m the previous year.

The US dollar averaged 0.742 to the euro for the second three months of 2007, compared to 0.796 for the same period in 2006, or a depreciation of 7%. This gave European carriers an advantage when translating dollar denominated costs such as fuel into euros.

### *USA and Asia network carriers*

#### **Financial performance of major US carriers for April to June 2007**

	Revenues (\$m)	Operating result (\$m)	Net result* (\$m)	Op.margin %	Net margin %
Alaska Airlines	904	78	46	8.6	5.1
American Airlines	5,879	467	317	7.9	5.4
Continental	3,710	263	228	7.1	6.1
Delta Air Lines	5,003	490	168	9.8	3.4
Northwest	3,181	357	205	11.2	6.4
UAL	5,213	537	274	10.3	5.3
US Airways	3,155	289	263	9.2	8.3
Southwest	2,583	328	278	12.7	10.8
JetBlue	730	73	21	10.0	2.9
AirTran	504	13	2	2.6	0.4
<b>Total above</b>	<b>30,862</b>	<b>2,895</b>	<b>1,802</b>	<b>9.4</b>	<b>5.8</b>

Source: Airline 10Q SEC Filings; \* excluding reorganisation items

The US majors together recorded an operating profit of US\$2.9 billion for the second quarter of 2007 (or 9.4% of revenues), compared with a profit of \$1,802m for the same quarter in 2006.

Total revenues were roughly unchanged and the net result after tax but before reorganisation add-backs items moved from a profit of \$1.2 billion to a healthier \$1.8 billion. All airlines improved their operating margins significantly.

#### Financial performance of some major Asian carriers for April to June 2007

	Revenues (\$m)	Operating result (\$m)	Net result* (\$m)	Op.margin %	Net margin %
AirAsia	126	33	54	26.2	42.9
All Nippon Airways	2,875	109	718	3.8	25.0
Japan Airlines	4,281	-71	-35	-1.7	-0.8
Jet Airways	485	12	8	2.5	1.6
Korean Air	2,276	81	-231	3.6	-10.1
Malaysia Airlines	1,037	14	33	1.4	3.2
Thai Airways	1,370	4	2	0.3	0.1
Singapore Airlines	2,371	303	278	12.8	11.7
<b>Total above</b>	<b>14,821</b>	<b>485</b>	<b>827</b>	<b>3.3</b>	<b>5.6</b>

Source: Airline reports

Not all Asian airlines report quarterly financial results, but of those that do, Singapore Airlines made an operating profit of US\$303m for April to June 2007 (up from US\$179m), or 12.8% of revenues. Japan Airlines, by contrast, reported an operating loss of US\$71 billion for the same period, -0.7% on largely unchanged revenues. However, this was a significant improvement over the US\$262m operating loss for the same three months of 2006. All Nippon managed an operating profit of US\$109m down from \$161m. Malaysian and Thai made small operating profits, the latter moving from loss to profit, with Thai's operating result well down on the previous year. Jet Airways moved into operating profit for the quarter, while AirAsia improved its operating margin from 19% to 26%, well ahead of the next highest (Singapore). The group as a whole improved its operating margin from just above breakeven to 3.3% for the latest three months.

#### Key developments and announcements- network carriers

World average jet kerosene prices continued their increase from February 2007 through to July with a welcome fall in August (compared to the previous month) after a 9% drop in January 2007. However, the September 2007 price was higher than August 2007 and 17% up on September 2006 at US\$2.24 per US gallon (Rotterdam spot price from the US EIA).

#### Acquisitions and disposals:

British Airways and its consortium are still undertaking the due diligence steps required before making a formal offer for Iberia. In mid-September, Air France-KLM CEO Jean-Cyril Spinetta has reaffirmed the group is studying potential merger moves with Alitalia and Iberia, though stresses no talks are taking place with either carrier.

bmi postponed their transatlantic launch from Heathrow until at least April 2009, focusing instead on building on the routes its acquired with its acquisition of BMed in

February 2007. New African routes are also planned, including Dakar and Cairo. The network diversification strategy will help bmi to stand alone when its European Co-operation Agreement (ECA) joint venture with SAS and Lufthansa ends later this year. Both SAS and Lufthansa incurred heavy losses as a result of the risk-sharing agreement, which began in 2000.

Rumours circulated in August 2007 that Singapore Airlines was thinking of selling its 49% stake in Virgin Atlantic Airlines. Little more was heard of this, but a very recent open skies agreement negotiated between the UK and Singapore lends greater credibility to the story. Under this agreement Singapore Airlines would be allowed to base aircraft in the UK with seventh freedom rights.

Lufthansa has decided not to exercise its option on Thomas Cook's 75% stake in charter carrier Condor (see more under 2.2.2, page 5).

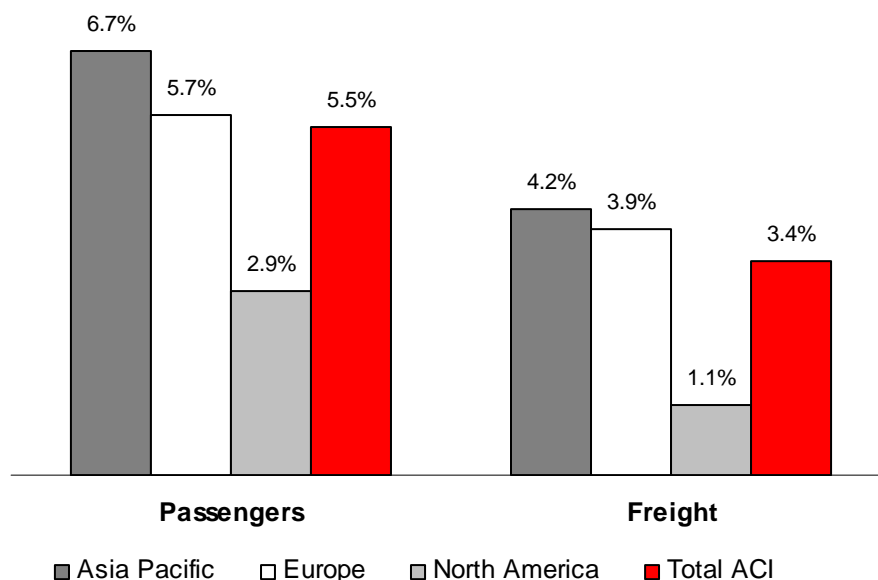
Lufthansa Cargo is preparing to set up a new joint 50:50 freight operation with express freight specialist DHL, according to German competition authorities. The two sides already work together through the Aerologic freight partnership created in 2004, as well as other specialised operations such as the US-based LifeConEx.

## 2.3 Airports

### Traffic

Europe's ACI member airports increased passenger throughput by 6.7% in the nine months to end-September 2007, compared with the same period in 2006. This was comfortably above the worldwide ACI growth of 5.5%. The organisation's North American airports showed some recovery from relatively low growth rates in the earlier months of the year, particularly in international passengers (up 6.4% in September).

Year to September growth (2007/2006) at ACI airports worldwide



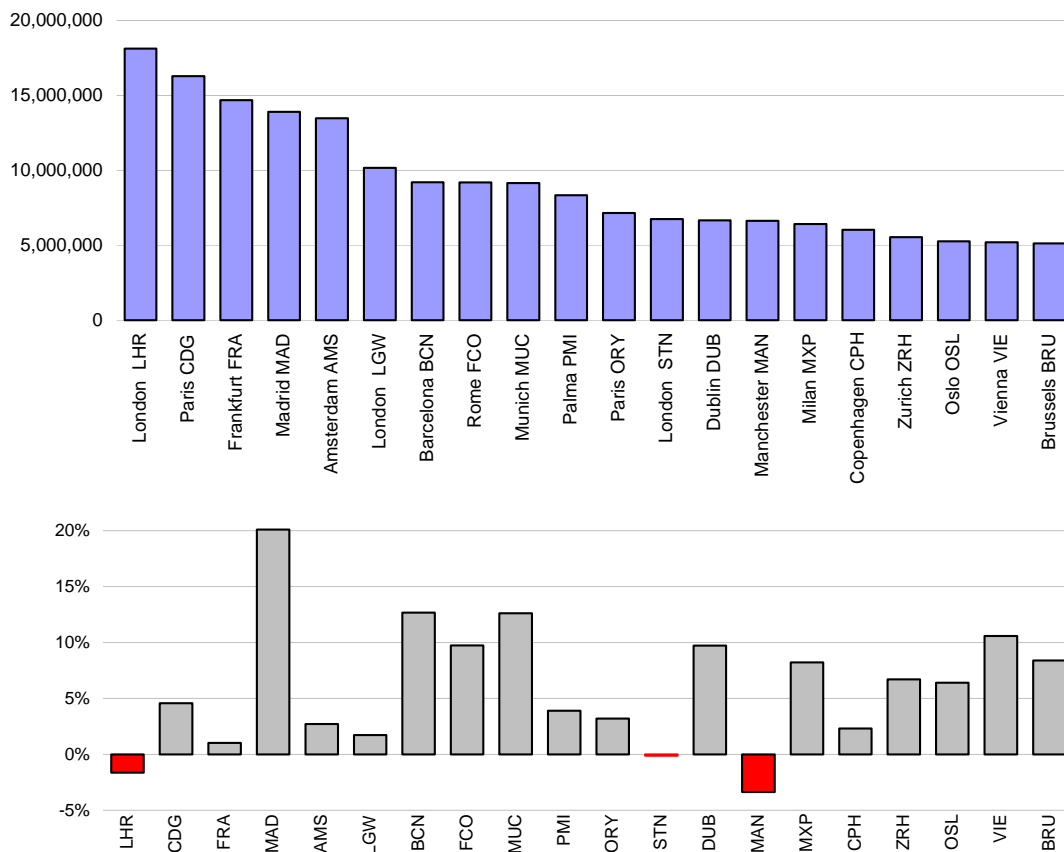
Source: ACI International

Cargo traffic growth worldwide was less strong, with the ACI airports worldwide recording 3.4% annual growth for the same period. The Asia Pacific region was well ahead of the world average, held back by relatively weak performance from North American airports (the second largest market in absolute terms). Freight throughput at ACI's North American airports fell sharply in September (measured on a year-to-year basis), while European airports recorded an increase of 4.7%.

Looking at European airports in more detail, the top twenty increased passenger traffic in the three months to end-July 2007 by an average of 5.4%, compared to the same period in 2006.

Just two airports recorded significant falls in passenger traffic, both in the UK (London's Heathrow and Manchester). While a number of UK airports felt the continuing impact of uneven implementation of security requirements, Heathrow was also recovering from labour unrest at BA. Other BA-related activity had an impact on Manchester's passenger traffic, where the cancellation of BAConnect services, as the airline sold off its regional subsidiary to Flybe, pushed the traffic drop Manchester down to over 3%. In absolute terms, Heathrow's downturn represents an average loss of over three thousand passengers each day over the three month period, contrasting starkly with Madrid, where passenger traffic increased by over 20%, equivalent to an extra twenty-six thousand passengers each day. The stellar performance at Madrid reflects the success of the airport's new passenger terminal complex, and the traffic generated by low cost carriers.

#### Passenger traffic and growth, three months to July 2007 at the top European airports



Source: ACI Europe

No other airports achieved traffic increases on the scale of Madrid's, although Barcelona, Munich and Vienna reached double-digit growth.

### Delays

AEA's latest delay statistics cover Q2 2007 and include punctuality records reported by the organisation's member airlines. The table below summarises departure and arrival delays at the ten best performing, and ten worst performing, airports. A delay is defined as leaving more than 15 minutes' later than scheduled departure time.

At the best performing airport, Brussels, the airlines recorded delays to just over 15% of departures, while at London Heathrow one in three departures was delayed. At the airports in the table, only Madrid and Paris Orly recorded improved delay rates over the same quarter in 2006. Apart from London Gatwick, average departure delays were above 30 minutes, often significantly. At Larnaca the average delay reached over one hour.

#### Major European airports with the best, and worst, record for departure delays (AEA airlines) Q2 2007

Airport	departures %	compared to Q2 2006	average delay (minutes)	arrivals %	average delay (minutes)
London Heathrow	33.8	▲	30.9	30.0	34.6
Rome	31.2	▲	41.9	24.7	40.9
Paris CDG	27.8	=	38.2	21.2	38.7
Larnaca	27.6	▲	63.0	36.5	55.1
London Gatwick	27.4	=	27.9	28.3	33.8
Madrid	26.7	▼	40.0	31.0	38.0
Barcelona	26.5	=	42.7	25.9	40.3
Dublin	26.2	▲	39.1	26.7	37.8
Athens	25.9	▲	43.5	29.3	42.5
Manchester	24.9	▲	42.5	23.0	42.0
Brussels	15.5	▲	40.0	16.6	37.8
Vienna	16.9	=	32.9	17.7	36.3
Oslo	18.0	▲	35.4	20.9	35.7
Dusseldorf	18.9	▲	37.2	23.1	36.2
Geneva	19.3	▲	38.7	23.0	32.7
Helsinki	19.5	▲	35.8	16.6	37.5
Istanbul	19.9	▲	36.4	32.3	38.5
Amsterdam	20.1	▲	38.5	12.9	50.4
Lisbon	20.4	=	40.8	22.3	35.7
Paris Orly	20.5	▼	46.9	23.9	39.4

Source: AEA

### Ownership and airport developments

- Macquarie and Dublin Airport Authority sold their stakes, totalling 48.8%, in Birmingham International Airport Ltd. In transactions worth around €600 million, the shares were sold to Canadian and Australian pension funds. The West Midlands local authorities continue to hold a 49% with employees also holding a 2.7% stake.

- Abertis secured a 90% stake in Desarrollo de Concesiones Aeroportuarias (DCA). DCA operates 15 airports in Mexico, Jamaica, Chile and Columbia. The remaining 10% was secured by Abertis' airport subsidiary TBI.
- Ireland's national planning authority approved Dublin Airport Authority's plans for a second terminal and second parallel runway at Dublin. The projects, worth €2 billion, are opposed by Ryanair.
- Flughafen Munchen has applied to the district government of Upper Bavaria to build a third runway at Munich.
- Munich and Frankfurt airports announced they are implementing of new emissions fees from the start of 2008. The fees are being introduced on a trial basis and will amount to €3 per kg of nitrous oxide.

### *Regulatory news*

- The Irish Commission for Aviation Regulation announced that it was maintaining its existing price cap on regulated aeronautical charges levied by the Dublin Airport Authority at Dublin until at least 2009.
- The World Bank's International Centre for Settlement of Investment Disputes (ICSID) turned down an application by Fraport to hear its claim for compensation against the Philippines Government over losses incurred relating to the Manila Airport terminal project. The ICSID claimed that it does not have jurisdiction to adjudicate over this dispute. Fraport subsequently submitted an appeal against the ICSID ruling in September 2007
- Acting on the UK government White Paper's advice for airports to make best use of existing capacity, London City airport submitted an application to raise its annual movement limit from 80,000 to 120,000 by 2010.

## **2.4 Safety and security**

The European Commission's blacklist of banned airlines was updated on 11 September to include Mahan Air (Iran) and Ukrainian-Mediterranean Airlines. Seven countries: Indonesia, Kyrgyzstan, Liberia, Sierra Leone, Equatorial Guinea, Swaziland and the Democratic Republic of Congo, still have a blanket ban imposed upon air transport operations to Europe.

One of very few airlines offering scheduled commercial services to Iraq, Austrian Airlines suspended operations to Erbil in the north of the country following an incident in August in which a Swedish-operated aircraft was apparently the target of a missile attack in the country.

There were no accidents in Q3 involving fatalities or hull loss of commercial passenger flights within Europe. There were three accidents causing repairable damage. Two of these involved collapsing landing-gear of DHC-8 aircraft operated by SAS. The accidents occurred only days apart, provoking the grounding of the airline's Dash-8 fleet for extensive inspection. The third accident involved the hard landing of an RJ-100 aircraft of Swiss European at London's City airport.

Elsewhere, the worst accident recorded his quarter occurred at Sao Paulo's Congonhas airport, where an A320 operated by TAM overshot the runway. A total of

199 fatalities were recorded, 187 passengers and crew, the remaining ground casualties. This was Brasil's second fatal air accident in the last twelve months. IATA criticised all aspects of Brazilian aviation safety infrastructure and began working with the Brazilian government and its aviation agencies to assess priorities for action.

## **2.5 ATM**

Industry bodies broadly welcomed the findings of a report which investigates ways of improving the efficiency and performance of Europe's aviation system. A group of aviation experts was formed by the European Commission in late 2006 and charged with finding ways to simplify and increase the effectiveness of Europe's regulatory framework for aviation. In their findings the group has come up with ten recommendations and a roadmap for the future development of European air traffic management. Key recommendations put forward by the report focus on performance and governance, in particular concerning the pan-European functions of Eurocontrol and the transfer of responsibility for safety regulatory activities to EASA. They stress a need for acceleration of existing projects, like the single European sky initiative, stronger performance regulation and bridging of the gap between decision making and funding.

NATS Holdings, the parent of UK air navigation service provider NATS, increased full year pre-tax profits 18% for the year-ended 31 March 2007 to £94.4 million, on a turnover of £701.2 million. The increased group profitability was driven by a strong performance from NATS (en route), where pre-tax profits rose 15% to £86.3 million. Traffic grew by 3.2% over the 12-month period. NATS handled a record 2.4 million flights with an average per flight delay of 22.6 seconds.

European transport representatives continue to discuss proposals to finance the deployment of the Galileo satellite navigation programme entirely through public funding, after the collapse of concession contract negotiations. Responsibility for the deployment phase will be taken on by the European Community with a budget of €3.4 billion to fund Galileo, as well as the related European Geostationary Navigation Overlay System project, for the period 2007-2013.

## **2.6 Manufacturers**

### **2.6.1 Aircraft manufacturers**

Helped by large orders announced at the Paris Air Show in June, Airbus was able to announce at the beginning of July that its sales for the first half of 2007 totalled 680 aircraft, some 100 more than Boeing.

EADS, however, posted weak results for the first half they year. Earnings (before interest) fell to €367 million compared to €1.7 billion for the same period for the previous year. Looking to the future EADS senior management stated that it was pinning its hopes on the success of Airbus' Power8 restructuring programme.

Boeing meanwhile announced that deliveries in the second quarter were up by 17.5% from 97 to 114 aircraft, of which 86 were 737 models. On 8 July Boeing rolled-out the first 787, by when the aircraft had some 400 orders. Towards the end of July,

Boeing was announcing second quarter profits of over \$1.1 billion despite taking a hit on increased Research and Development costs for the 787.

On the regional aircraft front, the situation was generally positive, although somewhat mixed. In terms of regional jet aircraft sales Bombardier announced first half net orders for 107 aircraft, while Embraer's total amounted to 37 aircraft between its ERJ and E-Jet family. Deliveries for the first half of the year totalled 73 aircraft, with Embraer making up 64% of the total.

Turboprop regional aircraft continued to sell well, with Bombardier announcing it had received a total of 68 orders for its QSeries, just beating ATR whose total was 63.

Looking at the regional market overall it is interesting to note that the difference between the total orders and deliveries for regional jets and turboprops is narrowing.

## 2.6.2 Engine manufacturers

General Electric announced that they were investigating new flow and control techniques at their Global Research Center (based at Nisakuyana, New York). The combined effect of the technologies being proposed will be to reduce drag, noise and fuel consumption.

Pratt & Whitney continued to push ahead with development of its Geared Turbofan (GTF) with a planned entry into service of 2012 on the basis of being used on Bombardier's C-Series and Mitsubishi's Regional Jet (MRJ). In comparison, P&W's main rivals, GE/SNECMA and Rolls-Royce, are expected to make improvements to their existing engine cores up to 2012 and then perhaps then move to open rotor technology from around 2015 onwards.

## 2.7 The environment

In July, a study was published that had been commissioned by the UK Department for Transport. It evaluated the impact on airlines of various benchmarking methodologies, assuming a cap that equated with the actual level of emissions (based on UK data). This was not because they thought this was where the cap would be set, but to make it easier to assess winners and losers (the winners in reality unlikely to have surplus allowance to sell in a growing market). They looked at eight methods of allocation and ten different carrier types, including four network carriers and two LCCs. They concluded that an RTK benchmark with a passenger weight of 150kg and a fleet age benchmark (rewarding airlines with younger than average fleets) had the two smallest distributional impacts of the eight evaluated.

In August 2007, Boeing announced that within five to ten years Boeing and Airbus jetliners could be flying the friendly green skies with a blend of fuel made from plants rather than petroleum. A Virgin Atlantic 747-400 will be taken out of passenger service in 2008 and one of its tanks filled with biofuel as part of a series of demonstration test flights by Boeing, the airline and engine maker General Electric to prove the technology. Fuel produced from plants, which take carbon dioxide from the atmosphere, would essentially be carbon neutral. Burning the fuel in jet engines would add no net greenhouse gases to the atmosphere. Biofuel would also burn cleaner, which is another benefit.

A major disadvantage, however, is that biofuel tends to freeze at a higher temperature than a petroleum-based fuel. But Boeing are aiming for a fuel blend that will be so

close to a conventional fuel that to the aircraft operator that it will make no difference. In other words, if an airline go to the pump and get a biofuel blend one day and the next day you get a more traditional petroleum-blend from another pump, it wouldn't know the difference in terms of how the plane flies or engine maintenance. The industry term for this is a drop in replacement fuel.

Also in August, the UK Conservative Party was reported to be considering various options to address the environmental impact of air travel. These included VAT on aviation fuel, the transfer of airport slots to long-haul operators, a switch of air passenger duty (APD) to a tax on CO<sub>2</sub> emissions and a moratorium on airport expansion.

In September 2007, research was released by the UK's Tyndall Centre and Friends of the Earth: Aviation in a low carbon EU. The main messages from this study were:

- Constrained and responsible growth of the aviation sector can be reconciled with a 450 ppmv CO<sub>2</sub> future
- Immediate policies are necessary to substantially constrain passenger-km growth in the sector prior to the introduction of the EU ETS
- Urgent and radical adjustments to the sector are necessary to bring about substantial efficiency improvements
- The carbon price currently being discussed is an order of magnitude too low to stimulate the necessary changes
- The EU ETS will require additional and substantial flanking instruments
- The European Commission had already responded to their last point in July 2007 by launching a study to evaluate possible European measures to reduce NOx emissions from aircraft.

# The potential for aviation fuel and CO<sub>2</sub> emissions reduction

## Past trends

The need for airlines to be more fuel and thus CO<sub>2</sub> efficient will be driven in the coming years both by high fuel prices and environmental taxes or caps. Past trends in fuel efficiency vary considerably depending on the measure and the period chosen. However, there are few forecasters predicting future changes of greater than 1-2% a year. With traffic and capacity growing at 4-5% a year, it is easy to construct scenarios where aviation's share of global emissions will be 20% to 50%, taking a long enough time horizon and optimistic assumptions on reductions in other sectors.

In a 2001 paper entitled 'Historic and future trends in aircraft performance, cost and emissions' Lee et al identified that fuel efficiency per RPK reductions between 1959 and 1998 came from better specific fuel consumption (57%), improved lift to drag ratio (22%), load factor (17%) and seating capacity (4%). The first two are related to aircraft selection, the latter two to business models and service standards. The selection of larger aircraft could be in response to increasing traffic or through network and other industry structural changes.

The Lee et al paper mentioned above also reviewed the trend of past aviation fuel efficiency from work from the United Nations' Intergovernmental Panel on Climate Change (IPCC). Over the past 40 years, efficiency has improved by 75% or 3.4% a year, although the authors stress that only jet aircraft were included. If the trend goes back further and the most efficient piston-engined aircraft are included little improvement is discernible over the longer timescale. However, the jet era has brought benefits of speed and comfort that today's market would be unlikely to sacrifice.

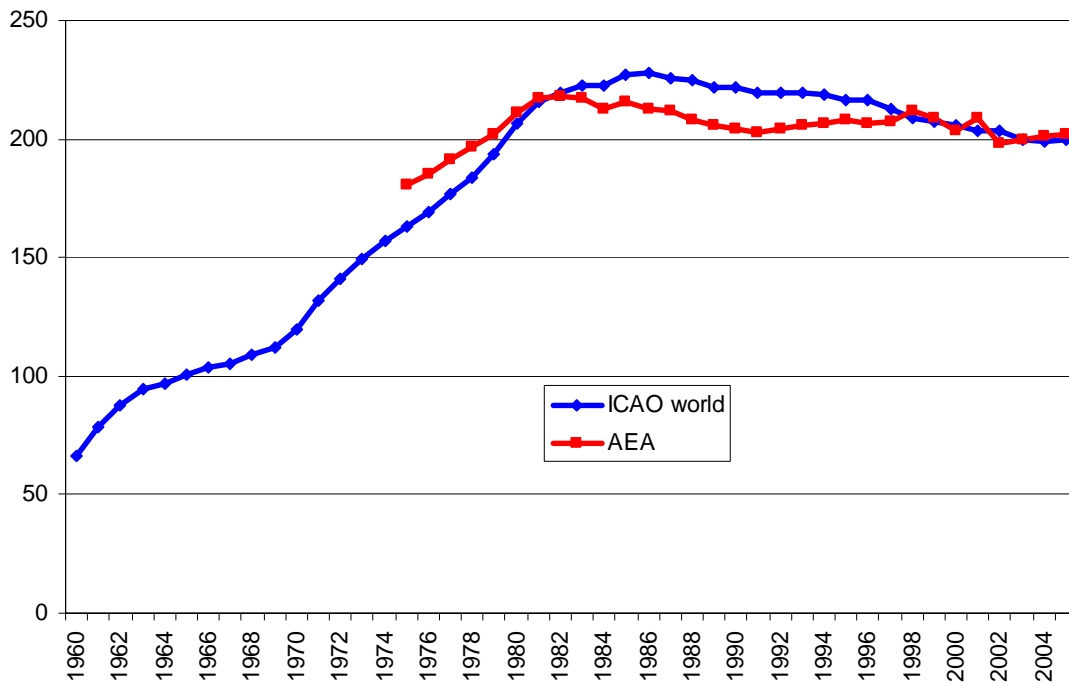
### Past trends in fuel efficiency

	MJ/Available seat-kms
1960 to 2000	-75%
1960 to 1980	-67%
1980 to 2000	-26%

Source: Lee et al (2001)

From the table above it can be seen that much of the gain had already been achieved by 1980, with 5.4% annual improvements (in terms of annual reduction in fuel or energy equivalent per seat-km) over the first twenty years. Over the second twenty year period, the improvement was only 1.4%. It should be added that the first twenty years coincided with a large increase in average size or capacity of aircraft operated, while the more recent period was characterised by a levelling off or even decline in average size.

## Average seats on international scheduled flights



An article in the ICAO Journal (August 1992) reported a 2.5% a year improvement in fuel consumed per ATK between 1983 and 1990, but more recent estimates from IATA (Environmental Review, September 2004) show a somewhat lower average annual reduction of 2.2% between 1994 and 2003. Surprisingly, the latter source reported a smaller annual improvement in fuel used per RTK (1.9% pa), even though gains from load factor increases might have been achievable over this period.

CO<sub>2</sub> efficiency can be measured in terms of units of traffic (passenger-kms or revenue tonne-kms) or capacity (seat-kms or available tonne-kms). The first is derived from the second by applying a load factor. On international scheduled flights these have increased from around 66% in the early 1990s to almost 80% in 2006, but an upper limit of 85-90% of flown traffic would restrict future improvements. Whichever metric is used, forecasters expect a slowing down in improvement.

Many fuel efficiency ratios are reported in terms of passenger traffic or capacity only. This is especially true of US sources, where little lower deck cargo is carried by the passenger airlines; it is also true of the major aircraft manufacturers in spite of their selling widebody aircraft with significant lower deck cargo capacity. Omitting cargo payload distorts the analysis of longer term past trends in aircraft efficiency with the increasing importance of widebodies especially on long-haul sectors.

## The future

Aviation Strategy examined various scenarios of air traffic and emissions growth (What happens to traffic growth if emissions are capped, December 2006). With aircraft replaced after twenty-four years, fuel efficiencies of 1% a year were examined for a base case, as well as more optimistic scenarios of 2% and 3% a year. These equate to aircraft being introduced for replacement and expansion of between 24% to 72% greater fuel efficiency than the retirements.

The bottom end of this range looks the most realistic in the light of American Airlines' accelerated replacement of its 300 or so MD-82s with 25% more fuel efficient B737-800s (Wall Street Journal, 29 March, 2007, A12). Assertions that 'the A320 and Boeing 737-300, for example, transport twice as many revenue passenger miles per gallon of fuel as the DC-9 and earlier versions of the 737A' are not comparing like with like, the former being of much larger capacity (see Eurocontrol: 'Forecasting civil aviation fuel burn and emissions in Europe', Interim Report, EEC Note No. 8/2001, May 2001). New aircraft bring efficiency improvements both from the application of new technology to the same sized aircraft and also the potential scale effects of moving to larger aircraft using existing technology. The B737-800s offer only 9% more seats per aircraft, so most of the gains are likely to have come from new technology.

Another airline facing the replacement of relatively fuel inefficient aircraft is SAS: they have 82 MD-80s with an average age of 17 years. SAS report that these aircraft are reliable and offer a similar level of unit costs to their much newer B737s with fuel price levels of up to 2.5 times the average price in 2006 (SAS Group Annual Report, 2006, p.27). SAS studies showed that replacing these aircraft with the best technology available (i.e. A320/B737) in the next few years giving 15-20% better fuel efficiency would give a much smaller environmental benefit than waiting to 2013 to 2015 when a further increase in fuel efficiency of 15-20% is expected (SAS Group Sustainability Report, 2006). This is based on the new generation of short/medium haul twin-jets having between 30% to 40% better fuel burn than the MD-80s. Given the expected life of these investments of 20-25 years, this would only give an average fuel efficiency improvement of 1-2% a year.

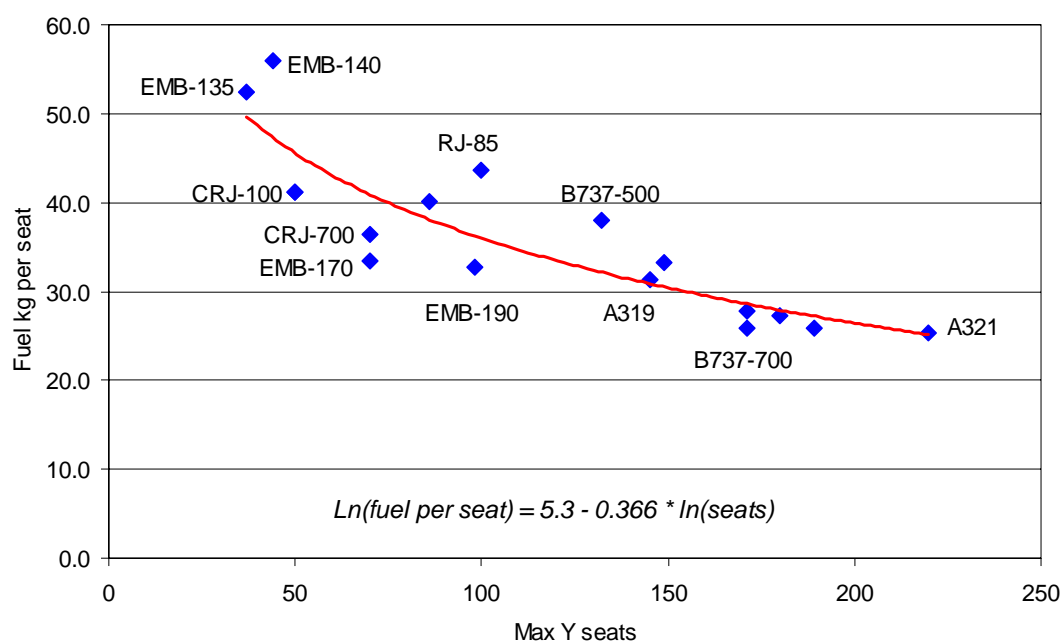
The Department for Transport in the UK summarised other forecasts of rates of fuel efficiency: IPCC in 1999 assumed a 1.3% pa improvement from 2000 to 2010, falling to 1% pa from 2010 to 2015. OXERA in a 2003 EU study assumed 1% a year to 2030 in the absence of any additional economic incentives. Arthur D Little in a 2000 study for the UK Department of the Environment, Transport and the Regions was more optimistic with a 2% pa improvement to 2030, including operational changes (Department for Transport: Aviation and global warming, London, January 2004).

The IPCC forecasts may look pessimistic, but, as can be seen from the table above, the declining trend suggests that the average rate over the past 20 years might not be achievable in the future. On the other hand, continued high fuel prices combined with a polluter pays mechanism might provide sufficient signals to industry to make a technological step change.

Efficiency in terms of emissions per ATK can be captured by improved operational performance or by applying new technology to aircraft of a similar size. Replacing an older aircraft at the end of its 20-25 years' life in passenger service would give a one off improvement in fuel efficiency of 20-25%, which equates to around 1% gain per year. Reducing aircraft life in service does not add much to this: easyJet proposed the premature retirement of 678 older jets operated by EU airlines on the basis that they were all more than 22 years old ('How to green Europe's skies', posted on [www.easyjet.com](http://www.easyjet.com), April 2007). This gave a one-off fuel and emissions reduction of 4-5%, neutralising only one year's traffic growth. A precedent for such measures is the compulsory withdrawal of noisier Chapter 2 aircraft, but the economic penalty incurred by EU airlines might be significantly greater from the easyJet proposal.

Increasing the fuel efficiency trend line above that of the past 20 years might happen if airlines move to larger aircraft once again and reap the benefits of fuel economies of scale. On long-haul sectors this might mean moving to A380 and B747 type aircraft, but these giants tend to compromise fuel benefits to meet noise and airport operating restrictions (e.g. wingspan). However, growing use of composites in the B787 and A350 should give these smaller types very attractive fuel burn.

### Fuel efficiency versus aircraft seat capacity: short/medium haul



On short/medium hauls the hub system gives little opportunity for any trading up without compromising feed frequencies. But the growing share of low-cost airlines with their higher seat densities and somewhat larger aircraft will push up the average. At the shorter haul regional end of the spectrum the replacement of the smallest regional jets by turbo-props of a similar size would make these operations much more fuel efficient, as can be seen in the preceding figure, without sacrificing much in sector times. The problem with this speculation is that there are other factors determining network shape, fleet mix and aircraft size.

### Fleet fuel efficiency for short/medium haul fleet, 2004

	RPKs/US gallon	% industry	ASKs/US gallon	% industry
British Airways	76.8	91	118.1	91
easyJet	117.5	140	138.3	107
Britannia/Thomsonfly	147.6	176	164.0	127
Industry (IATA)	84.0	100	129.2	100

Source: UK CAA and IATA

As the table above shows, average fuel efficiency of UK airlines representing the three business models varied considerably. The capacity measure (ASKs per gallon) was dependent on average sector lengths and size of aircraft operated (Thomsonfly benefits from this), seating density (easyJet gains here) and type and age of aircraft. The latter is probably the least important factor of the three. The concept of best

industry practice in this regard needs to be applied within each model and adjusting for sector length.

## **Summary and conclusions**

With traffic and capacity expected to grow at 4-5% a year, it is easy to construct scenarios where aviation's future share of global emissions will be 20% to 50%, taking a long enough time horizon and optimistic assumptions on reductions in other sectors. None of these scenarios assume increases in fuel efficiencies of much over 2%, which means that emissions are likely to increase at over 2% a year for the next 20-30 years.

Fuel efficiency projections are usually based in some way on past experience, taking into account the slowing in gains available from new technology. The largest part of the benefits over the past 40 years has come from improved engine performance, which cannot be replicated in the future at least without radical changes which will have costly implications (eg speed, airport infrastructure, noise etc).

The current dilemma of two major airlines in replacing their short/medium haul jets illustrates the need to allow for the fact that aircraft will be in the airline's fleet for 20-25 years. Current replacement aircraft only offer 15-20% better fuel burn, or nearer 1% a year over the lifetime of the aircraft in service.

Other fixes such as early retirement of older, less fuel efficient aircraft and operational improvements make valuable one-off contributions, but are more limited when considered over the longer term.

Some gains might also be achieved by moving to larger aircraft and higher seating densities (and higher load factors if traffic based efficiencies are used). However, most long-term forecasts do not expect much increase in average seats per aircraft worldwide. Apart from the replacement of the smallest regional jets by turbo-props of the same capacity it is difficult to see any major changes in networks without very significant price signals.