

# FINDING THE FORMULA

All airlines flying into Europe will soon need to show how they intend to disclose their carbon emissions and transport data, the first time aerospace's environmental impact has ever been so publicly held to account

AIMEE TURNER LONDON



Climate change is hot and aviation is about to feel the full blast of regulatory heat. The directive incorporating aviation into the European Union emissions trading scheme (EU ETS) entered into force earlier this year, meaning that from 2012 all airlines landing or taking off from EU airports will have to surrender carbon dioxide allowances – or carbon credits – under the bloc's cap-and-trade system.

And while member states have the next 12 months to draft the directive into national law, airlines are being warned that they need to look sharp because by the end of August (see 2012 timeline) they will need to have submitted a monitoring plan outlining the exact methodology of how they will go about accurately, reliably and transparently monitoring and reporting emissions and payload data.

Simply put, they will have to show exactly how they go about declaring how much fuel they burn carrying freight, mail and passengers between city-pairs.

The whole purpose of the directive essentially is to cap greenhouse gas emissions from aviation to 3% below average 2004-6 levels in 2012, with the cap increasing to 5% for the 2013-20 period. The cap means that fast-growing aviation will start trading carbon with an effective "shortage" from the outset, especially as, under the new rules, it may have to purchase 15% of its carbon credits either via auction or on the allowance market, or simply reduce emission to surrender allowances equal to their verified emissions.

#### CREDIT DISTRIBUTION

The distribution of carbon credits will be based on the number of tonne-kilometres (TK), which is basically the distance – a great circle, plus 95km (50nm) – times payload carried during the crucial 2010 benchmark year. So the method by which that data is collected and collated needs to be officially signed off by the end of 2009.

Benchmarking will determine the number of free allowances an airline receives based on its verified TK number divided by the total verified TK numbers for all airlines.

Should the quality of an airline's monitoring plan be queried by those charged with policing the system, however, then a carrier could severely jeopardise its all-important application for those free carbon credits from the competent authority of their administering member state.

From the first quarter of 2013, when carbon trading goes live, those allowances will need to be surrendered based on actual 2012 emissions that have been monitored and verified – until then, in 2010 and 2011 an airline needs simply to monitor and submit verified emissions reports. It goes without saying that all airlines will ultimately want as many free al-

lowances as possible when trading starts.

The European Commission, which is still hammering out the detailed guidelines for the monitoring, reporting and verification (MRV) of the emissions and tonne-kilometre data stresses that these rules are necessary to ensure a harmonised application of the directive regardless of nationality and of which member states will be overseeing an airline's compliance with them.

Jeroen Kruijd heads MRV services for consultancy and verifier PricewaterhouseCoopers, which also advises member states and aircraft operators on the emissions trading scheme.

"MRV is an important concept in the EU ETS to ensure aircraft operators monitor and report both TK and emissions data in an accurate and comparable manner, verified by independent auditors," Kruijd says.

"Still, there may be a number of issues or gaps either in the regulations or the forthcoming guidance that will only become apparent

#### "Operators must focus on producing a complete set of data in a reliable manner"

JEROEN KRUIJD  
PricewaterhouseCoopers

when aircraft operators start to do the real thing, as some of the things they do in practice may not meet with the requirements."

Even so, he expects operators to have to make IT system changes throughout 2009 and have a constant dialogue with verifiers during that time in an attempt to develop workable and efficient solutions.

"Operators must focus on producing a complete set of data in a reliable manner. If they report incomplete data or data that cannot be sufficiently proven to be accurate, then the verifier will not be able to sign off on the numbers presented.

"There is no point in saying yes, we possess all the source TK data and emissions reports

for the year, but sorry, we can't reconcile and present it in a verifiable way."

Kruijd says large airlines will have much of the data systems available, although even they need to beware of missing out on specific issues such as wet-leasing and codeshares.

"The cost burden for some aircraft operators may be relatively high, and while bigger companies will have the means to develop robust data management systems that meet the ETS requirements, some smaller ones such as business jet operators may suffer from having inefficient reporting processes," he says.

#### STEERING GROUP

Kruijd forms part of an International Emissions Trading Association steering group in which verifiers, operators and regulators are working together to determine what differentiated airlines face in terms of issues and how to prepare for them. This may lead to effective group solutions for smaller operators such as joint IT-based MRV systems.

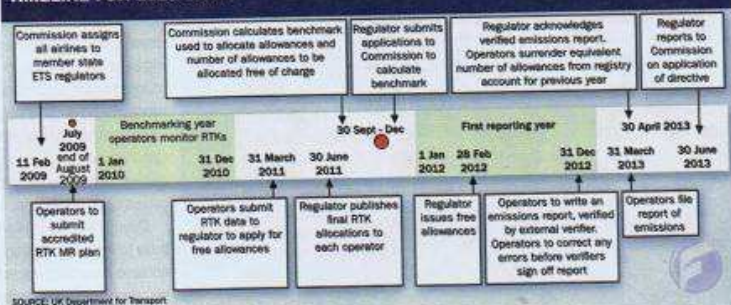
For Chris Essex, who heads business development at UK low-cost carrier EasyJet, the EC's approach has so far drilled down to the nth degree on the specifics of an individual flight and accuracy of fuel flow meters or weighing scales, something which he thinks is misguided when the real challenge resides in reporting data from mobile sources.

"For EasyJet, it's the complexity of getting the data back off the aircraft – and that's not such a simple task when you are running 1,000 flights a day with aircraft based all over Europe. We're facing a huge challenge," he says.

"Do you load it on to a USB stick, post it, use a terminal download or send it via a mobile phone link?" asks Essex. "All we are saying is keep it simple. The more the guidelines attempt to be specific, the more problems airlines will encounter. The original template issued by Entec – the consultancy charged by the Commission to formulate the MRV rules – went into micro-detail and we questioned whether this was necessary."

Essex adds that data needs to be presented on a simple aggregated emissions basis, be-

#### TIMELINE FOR 2012 START





Airlines do not want to ruin the environment, but emissions trading complexity could trip them up

yond which a verifier can delve in an effort to plug any gaps in knowledge: what fuel was uplifted, what was burned plus data from any on-board metering device.

"Airlines will find themselves tripping up not because they want to ruin the environment, but simply because it's so complex. Emissions trading for most airlines will be owned by the finance department. That reality provided much of the motivation for EasyJet's launch of its carbon offset programme, allowing our treasury function to gain experience in this field."

Airlines will go to the allowance markets and buy extra carbon credits from industries that have excess allowances or alternatively invest in project credits Certified Emission Reductions and Emission Reductions Units to compensate for shortfalls.

Regarding revenues, business adviser Merrill Lynch attempted last year in its report

*Aviation in EU ETS: An Incentive for Efficiency* to gauge the potential cost to the industry. While it admits that its analysis is highly sen-

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**KOSTYA ZOLOTUSKY**  
Boeing Financial Services managing director

sitive to key assumptions on growth and business model, carbon pricing and auctioning levels, in 2013 it estimates that the international airline community could be tapped for an annual €2 billion (\$2.56 billion), rising to €3 billion in 2015 due to the lower cap.

Brussels says auctioning revenues should be used to combat climate change at home and in

the developing world, but has ultimately left this to the discretion of individual member states, something that has caused consternation in the ranks of the world's airframers, who would like to see that level of money at least invested back into research and development of future aircraft technologies.

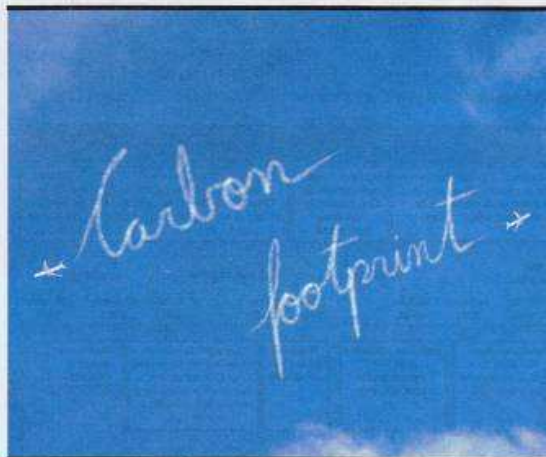
**EXAMINATION**

An examination of the preliminary list of administering states based on Eurocontrol data shows that France, Germany and the UK will administer half the operators actively flying into Europe. Data generated by *Flight International's* partner data service Innovata on the basis of available-seat-kilometres of non-EU airlines bears this out (see table P32).

It could be a gold-plated bonanza moment for the three European powerhouses, although Boeing, for one, is rallying airlines in calling for vital government assistance to help tackle this costly environmental burden. Boeing managing director of environmental strategy Billy Glover says this cross-industry effort will include a focus on government policy and regulation so that it is more effective in accomplishing environmental progress – in other words help to fund it.

Boeing Financial Services managing director Kostya Zolotusky also envisages the costly environmental burden making an impact in a distinctly unilateral fashion. "Europe's plan creates non-market-based dynamics and we hope Europe can blend it into a sensible single global regulation," he says.

The prospects of such a single global regulation for aviation is elusive. While newly inaugurated President Barack Obama has moved forward with automotive emissions reduction plans, how his manifesto pledge on introducing an economy-wide, market-based cap-and-trade system to reduce carbon pollution will relate to aviation remains a mystery.



**GREENHOUSE GASES** MEGAN KUHN WASHINGTON DC

**PREPARING A GLOBAL FRAMEWORK**

Developing nations and countries below a certain greenhouse gas emissions threshold should be held to a different standard than developed nations when addressing aviation's contribution to climate change, according to a US recommendation to an International Civil Aviation Organisation working group focused on measuring progress in emissions reductions.

Developing nations should not have to report emissions until they achieve a certain percentage of passenger revenue kilometres, says

Nancy LoBue, US Federal Aviation Administration deputy assistant administrator for aviation policy, planning and environment and the USA's formal representative to the Group on International Aviation and Climate Change (GIACC).

Tasked in 2007 by the ICAO general assembly with creating emissions reduction recommendations for the aviation industry, the 15-member GIACC considered the developing versus developed nations proposal during its 17-19 February meeting in Montreal. The third GIACC meeting came as the United

GROWTH SCENARIOS AIMEE TURNER LONDON

## OPERATING IN A CARBON CONSTRAINED WORLD

A fundamental change in air travel behaviour and technology will become a necessity if climate protection measures such as a halving of global emissions by 2050, are to be achieved.

"Given the size of this sector, already superseding that of large nations, the inclusion of international aviation in the second post-2012 commitment period under the Kyoto Protocol could allow this sector to play its role within the overall mitigation effort across all sectors," says Dr Sarah Raper of Manchester Metropolitan University.

The study, part of the UK's Omega aviation research initiative, is intended to help UK decision makers by putting the effect of aviation on climate in perspective and help determine whether there is a

need for a substantial deviation from business-as-usual aviation growth scenarios in a future that seeks to mitigate the effects of global warming.

Using a simple MAGICC gas cycle-climate model, adapted to account for non-carbon dioxide aviation emissions such as high-altitude NOx emissions, contrails and aviation-induced cirrus, the researchers examined the radiative forcing – or the global warming effect – in the UK due to greenhouse gases controlled under the Kyoto Protocol and therefore non-aviation sources.

The researchers found that up to the mid-to-late 1960s these contributed more to climate change than aviation, at which point air travel started to overtake.

"A strong increase of total an-

thropogenic forcing after 1970 affects the relative role of aviation and UK Kyoto-greenhouse gas emissions to the extent that the UK forcing share declines after 1970 while the aviation share still increases, but less strongly than before 1970," says Raper.

The aviation contribution to global-mean temperature change exceeds that of the UK Kyoto-greenhouse gases from around the 1980s.

"Our analysis suggests that the UK climate contribution since 1940 was likely to have been lower than the aviation contribution throughout the 20th century. In 2005, we estimate that temperatures are 0.028°C [0.05°F] higher due to aviation, with further increases expected for the future," says Raper.

The team then generated a range of aviation growth scenarios from 2000 underpinned by a global multi-sector mitigation approach that would see a halving of greenhouse gas emissions by 2050 relative to 1990, with further reductions, a long-term vision referred to by the G8 countries and within the Kyoto Protocol negotiations as a minimum requirement to avoid dangerous levels of climate change.

"Our set of aviation reference scenarios suggests that as early as 2045, the aviation share of global fossil carbon dioxide emissions could exceed 20% in a carbon constrained world. "This result indicates a fundamental inconsistency between standard aviation growth forecasts and lower global mitigation pathways," says the report. ■

Even so, it is worth remembering that a cap-and-trade programme does not necessarily translate to a unilateral EU-style emissions trading scheme, according to Air Transport Association of America vice-president of environmental affairs Nancy Young, who says she would be surprised if the new administration does not challenge the legality of Europe's ETS.

However, Merrill Lynch points out, that if the USA was to implement a scheme similar to the EU's in an effort to cut aviation emissions, the upside to the aircraft and engine makers would be significantly larger. "This could accelerate the replacement demand in North America, where the US fleet represents

around 7,070 jet aircraft [50% more than the EU fleet] and the average age of the fleet is 13 years above the world fleet average," it says.

## MUSING ON THE POSSIBILITIES

While it is interesting to muse on the possible OEM effect, there is plenty of potential for radical shifts in business thinking at airline level: all airlines will need to assess their business model and operations – that could mean making strategic right-sizing fleet decisions on certain routes and maintenance scheduling.

Even a wholesale overhaul of network planning, with the traditional hub and spoke system a possible casualty, could be on the cards

as direct "point-to-point" services typically produce lower emissions than two flights via a hub.

Airlines could further attempt to right-size their narrowbody fleets by fitting extra capacity, allowing them to spread their carbon costs over a greater number of passengers. Adding 20 more seats on an aircraft does not increase proportionally the required fuel to fly, with the only cost needing to be offset being for additional cabin attendants.

"Short-term sizing-up could imply some shift within the European airlines' narrowbody orderbook, as the A318/A319 could look much less attractive, as would the Boeing 737-

Nations Framework Convention on Climate Change prepared to set general greenhouse gas emission targets in December that will be effective after the Kyoto Protocol expires in 2012.

One challenge for the GIACC effort is collecting high-quality data. While the USA has systematically collected fuel burn and operational figures, data collection is less straightforward elsewhere, says Carl Burleson, FAA director of the office of environment and energy and an adviser at GIACC.

Another GIACC working group has been discussing aspirational goals and a third is developing measures

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that will help the industry to achieve those goals. The latter group has broadly quantified an initial list of measures – such as air traffic control improvements and renewable fuels – by cost and by short, medium- and long-term goals, LoBue says.

Meanwhile, the aspirational goals group has been zeroing in on short, medium- and long-term timelines. GIACC discussed deadlines for medium- and long-term goals and the kind of technology that will be available to deliver particular emissions reductions at certain points, Burleson says.

The goals group has not agreed on a medium timeframe, but it is

likely to be between 2020 and 2025, he says, adding that the inclusion of carbon neutral growth is up for debate.

The consensus is that 2050 should be used for the long-term timeline and the goals group will also propose discussing 2012 as a deadline for short-term plans, Burleson says. He adds that the basis for extrapolation will be historic trends between 1990 and 2006 for litres of fuel divided by revenue tonne per kilometre.

GIACC will gather again from 1-3 June and it is likely another meeting will be convened towards the end of the year. ■

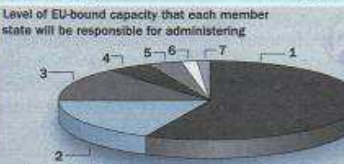
**MOST POPULAR EU DESTINATIONS BASED ON CURRENT PASSENGER-CARRYING CAPACITY OF ALL NON-EU AIRLINES**



Share of direct EU-bound available seats kilometre (ASK) by non-EU based operators

SOURCE: Innovivia - January 2009

|    |                          |        |
|----|--------------------------|--------|
| 1  | United Kingdom           | 28.86% |
| 2  | Germany                  | 19.28% |
| 3  | France                   | 16.27% |
| 4  | Netherlands              | 8.01%  |
| 5  | Italy                    | 7.75%  |
| 6  | Spain and Canary Islands | 5.73%  |
| 7  | Belgium                  | 5.01%  |
| 8  | Austria                  | 1.67%  |
| 9  | Denmark                  | 1.62%  |
| 10 | Sweden                   | 1.25%  |
| 11 | Ireland                  | 1.13%  |



|   |                          |        |
|---|--------------------------|--------|
| 1 | United Kingdom           | 55.92% |
| 2 | Germany                  | 17.41% |
| 3 | France                   | 13.49% |
| 4 | Netherlands              | 4.75%  |
| 5 | Spain and Canary Islands | 3.53%  |
| 6 | Belgium                  | 1.54%  |
| 7 | Italy                    | 1.19%  |

Total share of direct inbound ASKs by non-EU based airlines to be administered by the EU country whose operators individually fly the most - where they account for the greatest estimated attributed aviation emissions on a destination basis

700," says Merrill Lynch, which adds that in the long term, an increase in the number of seats could ultimately determine the next-generation single-aisle airframe design.

Then there are the merger and acquisition implications within this new carbon trading paradigm, as PwC's report *Ready for Take-Off* notes: "Benchmarking as an allocation method may impact mergers and acquisitions decisions, as aircraft operators with inefficient aircraft will be less attractive due to the higher cost to be in compliance with the EU ETS."

It adds: "The baseline period 2010 will determine future allowances and are thus a value driver for the company. Carbon assessment therefore needs to be a core component of mergers and acquisitions strategy and processes. Is the full carbon risk or opportunity of the asset understood and factored into the compa-

ny's deal calculations? Has the market factored carbon into values - of the potential purchaser as well as the target? Are there synergies? Do due diligence processes look at carbon?"

**LOW-COST MODEL**

Hikmat Mahawat Khan, who heads consultancy CapGemini's Centre of Excellence Aviation is convinced. "Emissions trading stands to change the aviation industry - it could even have a similar impact as the emergence of the low-cost model, which led to a deep shift in thinking. In fact, we could see many of the themes that made low cost a success persisting: smaller aircraft using smaller airports. That could have a tremendous impact on the whole aviation supply chain."

EasyJet's Essex says that while carbon trading's cost pass-through effect is estimated at €1-2

per ticket, as an airline it will not know the costs until the 2010 benchmarking period is over.

"We are, however, expecting to do well on the benchmark due to our high load factors, although there is still huge uncertainty on auctioning and level of pricing. As an airline we actually like the ETS because it's a differentiating thing - it sets us apart - we are operating modern aircraft, we cut out waste wherever we find it and don't operate to many congested airports. That really is the unsung story of low-cost carriers," he says.

Khan at CapGemini can even foresee the value of these carbon assets appearing on the balance sheets of airlines - very much in the way UK carrier BMI last year added £770 million (\$1.5 billion) to its balance sheet by revaluing its London Heathrow slot holdings in an attempt to reflect better its net asset value.

"That could see the accelerated fallout of many a shaky wet-leased airline that never made a dime of profit and simply decides to call it a day and cash in their carbon chips," he says.

For now, those airlines planning to keep flying should really think about the implications of their 2009 winter schedules, which implicates production throughout 2010.

He says they need to factor their TK aspirations into their strategies now to maximise their allocation of free allowances by boosting payload in that reference year.

"It's about uplift of payload - fly as much as you can during 2010 and then rein back on flight capacity if possible from 2012," says Khan.

He says that while airline boardrooms should be focusing on getting a bigger bang from their free carbon buck, so to speak, it is about more than simply compliance in the short term.

"It's about business transformation and strategy. It requires the collaboration of the entire business - not just a business manager printing out a spreadsheet," Khan adds. ■



**AIR TRAFFIC MANAGEMENT** JEFFREY DECKER OSHKOSH  
**CALCULATING OPTIMUM ROUTES**

Foresight and broad planning could reduce commercial aviation fuel consumption by up to 6% annually. That is more than 3.8 billion litres (1 billion USgal) a year that could be saved, predicts the Partnership for Air Transportation Noise and Emissions Reduction (Partner).

En route traffic optimisation would mean fewer aircraft queuing up in the air needlessly. The plan would assign aircraft the most direct and efficient routes possible using 21st century monitoring and co-ordination, and they would only

change speed and direction when necessary, and then only in "small and efficient ways", says John-Paul Clarke, director of the Georgia Tech Air Transportation Laboratory and principal investigator for the fifth project of Partner, which is led by the Massachusetts Institute of Technology.

Analysing flights to see where inefficient holding patterns and needlessly long routes could be eliminated involved processing a lot of radar data, Clarke says. Airports and the US Federal Aviation

RATIONING AIMEE TURNER LONDON

## GAUGING PERSONAL CARBON FOOTPRINTS

It is a sure-fire way of losing friends and alienating people, but rationing air travel – or personal carbon trading – remains in the arsenal of every ambitious policymaker determined to find ways, however politically unpalatable, to make individuals manage their own carbon dioxide emissions.

Lord Turner, chairman of the independent Committee on Climate Change, recently proposed the rationing idea to the UK Parliament, arguing "we will have to constrain demand in an absolute sense with people not allowed to make as many journeys as they could in an unconstrained manner".

The Committee on Climate Change advises the UK government on progress towards meeting some of the harshest self-imposed national carbon reduction targets in the world.

Turner's idea was quickly condemned by pro-aviation lobby groups such as FlyingMatters. "One always suspects with these half-baked proposals that the people who put them forward really intend them to apply to ordinary people, many of whom have only recently gained access to air travel, rather than to themselves," says FlyingMatters chairman Brian Wilson.

Turner says his committee will study aviation emissions to consider what can be achieved through

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efficiency gains, what biofuels can contribute, and only then – if neither of these can be shown to deliver reductions compatible with the UK carbon account – would demand management be considered.

Even so, Wilson makes the point that any political party inclined to support flight rationing should tread warily since voters do not take kindly to limits being placed on their mobility.

And the UK Department for Environment, Food and Rural Affairs (Defra) seems to have already quietly swept under the carpet the concept of a national emissions cap with carbon credits allocated across the population.

A Defra study last year concluded that while personal carbon trading had the potential to engage individuals in taking action to combat climate change, it remains "essentially ahead of its time" – not to mention costly.

It was the cost equation that convinced the original architect of the European Union Emissions Trading Scheme, Dutch consultancy CE Delft, to drop any idea of the passenger as the trading entity in the scheme design, explaining that "obliging passengers to surrender allowances would involve enormous transaction costs, as millions of allowance traders would have to be supervised and monitored". ■

Administration had data on which aircraft came and left, but not on their routes.

Primarily, the analysts studied radar from the Cleveland air route traffic control centre. A graduate student then extracted the trajectories for the aircraft that were flying at FL370 [37,000ft/11,300m] and used the trajectory data to create statistics for the rate at which aircraft were entering and leaving points on the boundary of the traffic control centre. "This was an important step," says Clarke, "because, to make sure we had an apples to apples comparison, we had to keep

**En route traffic optimisation would mean fewer aircraft queueing up in the air needlessly**

the entry and exit points the same as we allowed the aircraft to depart from the existing route structure to fly the most direct routes."

Operations were then simulated with algorithms embedded to make optimal decisions about heading and speed changes, and the results compared with the existing route structure.

Implementing this plan nationwide would require live co-ordination and in-depth planning to ensure required safety margins.

Dr Lourdes Maurice, chief scientist for the environment in the FAA's Office of Environment and Energy,

which is funding the research, adds: "While safety and technical limitations make some transport inefficiencies inevitable, the FAA is aggressively alleviating inefficiencies wherever possible and practical. Partner's research is key to identifying and developing new technologies and procedures that make this possible."

Air traffic congestion is estimated to cost the aviation industry, passengers and shippers a total of \$10 billion a year and the situation is expected to worsen given projected aviation growth in the next few years. ■

PRODUCTION MAX KINGSLEY-JONES LONDON

FORECASTING AIRLINER DEMAND

The world's civil airframers provide regular long-term forecasts on airliner demand, which give their view about the general size of the market in terms of numbers of units.

While there are some areas where Airbus and Boeing concur on how the demand dynamics will play out over the next 20 years – such as in the twin-aisle category – these forecasts are ultimately an arm of their marketing programmes so are driven by each airframer's product strategy and throw up some significant differences in opinion.

A good example of this is the forecast for large airliner demand, where Airbus, with the all-new 500-seat A380 in its product line, has always been extremely bullish. The airframer's latest global market forecast predicts demand for 1,700 aircraft. Boeing, on the other hand – ever since it dropped plans for a major stretch of the 747 around a decade ago – has consistently put demand at fewer than 1,000 aircraft.

Boeing first delivered its current market outlook in 1964 and has been updating its forecast annually ever since. Airbus began publishing 20 year market studies in 1988 – which crystallised as its "global market forecast" in 1995 – but has not stuck to the annual publishing schedule of its rival.

The airframers' forecasters build a long-term model of demand based on individual airlines' network and fleet plans. A variety of sources feed into the final reports, including independent data and outlooks from trade organisations and analysts, as well as economic research on world and regional gross domestic product development to assess long-term traffic growth scenarios.

While short-term shocks such as 9/11, last year's oil price escalation dramas or the current global financial crisis have some bearing on demand in the near term, the tendency is to assume, backed by historic prerogatives, that any impact will be ironed out and will not influence long-term trends.

For example, Boeing says in its

2007 AIRLINER FLEET - COMPARISON OF BOEING'S 1998 10-YEAR OUTLOOK WITH REALITY



latest current market outlook, produced amid the high fuel prices in 2008, that "the forecast has been developed in a manner that considers today's market environment, but takes a long-term view of the

**Forecasts are an arm of marketing programmes so are driven by each airframer's product strategy and throw up some significant differences in opinion**

market and the fundamentals that drive commercial aviation. These include economic growth, world trade and new aircraft capabilities."

So how close have forecasts come to matching reality? Comparing Boeing's 10-year outlook published in its 1998 current market outlook for fleet growth from 1997-2007 with the actual fleet data included in its 2008 current market outlook indicates that its demand forecast was optimistic. The fleet (excluding regional jets) was expected to grow to 17,700 airliners in 2007, but the data in Boeing's 2008 current market outlook shows that the 2007 fleet was 15,840 units. However, in 1998, Boeing's current market outlook did not include regional jets – the boom was still in its infancy then. This category is now included, putting the total airliner fleet in 2007 at 19,000 units.

Significantly, back in 1998 when Boeing was still toying with ideas for a 500-seat airliner, it predicted

that the fleet in this category would grow to 1,240 units, whereas in reality it would contract over the 10 years from 1,016 units to 910.

Airbus has traditionally stuck to taking only a long-term, 20-year view in its global market forecast, meaning that it is not yet possible to compare its 1997 view of the market with reality. However, it is worth pointing out that its 2003 global market forecast failed to predict the size of demand for the A380 from Emirates as it did not include the airline's Dubai base among its forecast of the top 10 large-aircraft hubs.

In the wake of Emirates boosting its A380 orders to more than 50 aircraft, Airbus quickly remedied this omission in its next global market forecast and now has Dubai placed third in the rankings behind London Heathrow and Hong Kong. ■



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