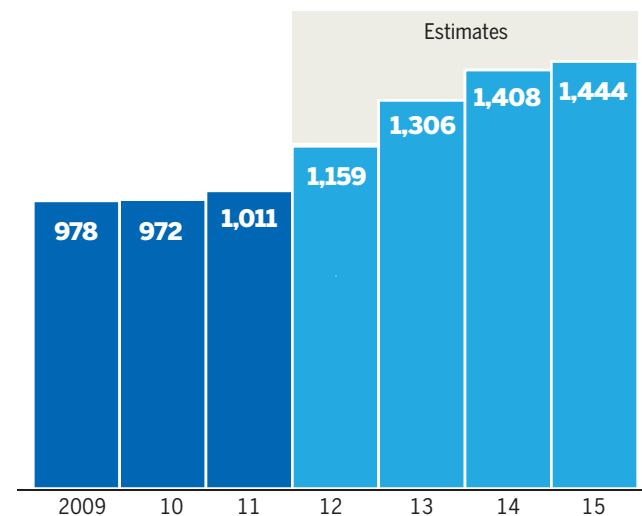




Airbus 350 prototype in Toulouse

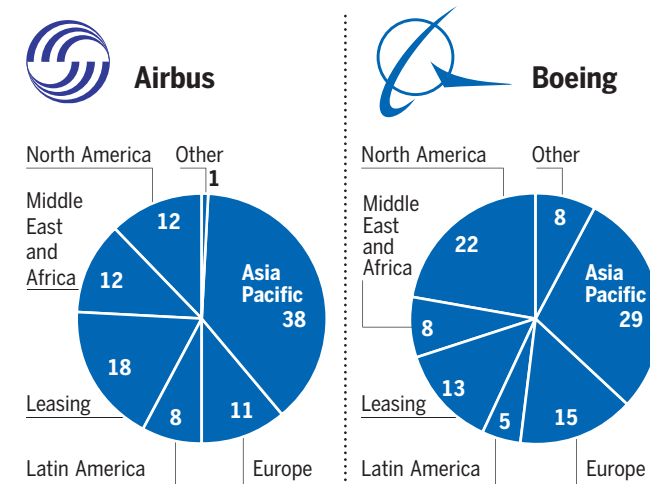
Boeing and Airbus production ramp

Aircraft units



Regional split of orders backlog

Q1 2012 (%)



Sources: Barclays; RBC

Builders must prove they can deliver

Manufacturers' ambitious production plans depend on their supply chains, writes **Andrew Parker**

Inside what will soon be the factory making the latest addition to the world's wide-body passenger aircraft, mechanics are busy working on the 65m-long fuselage of the Airbus A350.

There is a palpable sense of excitement on the final assembly line in Toulouse, because the A350 involves a big technology leap – it is made mainly out of carbon fibre-reinforced plastic, rather than traditional aluminium alloy, which means the aircraft should be lighter and burn less fuel than current generation passenger jets.

This one will never fly, however, because it is a so-called static aircraft that is used to test the A350's strength – culminating in the wings being snapped off by pushing them upwards until they break.

But, after making this prototype, Airbus will build another that is due to fly by mid-2013. Qatar Airways, the A350's launch customer, is supposed to get its first aircraft in mid-2014 – and four years after that, Airbus hopes to be making 10 of these jets every month.

This demanding timetable is because of broader and highly ambitious plans by Airbus and Boeing to increase production of single and twin aisle passenger aircraft by an estimated 40 per cent between now and 2015, taking output to record levels.

The plans – which will be a big discussion point at the Farnborough air show – are questioned by some analysts, because airlines are vulnerable to the ups and downs of the economic cycle, and the world is experiencing not just the eurozone crisis but also slowing growth in many developing countries, including China and India.

But Fabrice Brégier, Airbus' new chief executive, is far more worried about the supply chain's ability to rise to the production challenge than the deteriorating economic environment. "I'm more concerned with the problems we are facing every day coming out of the supply chain," he says.

It was problems with suppliers to the A350 that prompted EADS, Airbus' parent company, to announce last November that the aircraft's entry into service was being pushed back to the first half of 2014.

But Mr Brégier's concern may also be rooted in lessons from the past.

In 1997, Boeing tried to increase production of the 737 and 747 jumbo jet – but its factories – and parts of the supply chain – could not cope, and the company ended up having to shut down production of these aircraft for one month. The crisis helped push Boeing to a net loss in 1997 – its first in 50 years.

Fifteen years on, Airbus and Boeing feel they need to increase production because they have amassed large order backlogs, mainly because of demand for aircraft from fast growing airlines in Asia and carriers in the US that want to replace ageing, gas-guzzling jets.

These backlogs represent about seven years of production, and the two manufacturers worry they risk alienating customers by having to say that any new orders for aircraft may not be delivered for a long time.

The backlogs have swelled partly because Airbus and Boeing have focused on minimising the opportunity for new competitors – such as

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Comac After a slow start, China offers a serious challenge to the duopoly of Boeing and Airbus **Page 2**

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China Developing a new stealth fighter all by yourself has its drawbacks **Page 7**

Fighters Global dogfight for sales has unexpected results **Page 8**

Canada's Bombardier and China's Comac – in the narrow body jet market. Airbus and Boeing have unveiled plans for more fuel-efficient single aisle jets – and witnessed strong demand for these aircraft because of high oil prices.

Airbus led the way with its A320neo aircraft, which last year became the company's fastest selling jet by securing 1,226 orders. Boeing is playing catch-up with its 737 Max aircraft, and it is expected to announce orders for this jet at Farnborough.

But such is Airbus' concern with the supply chain's ability to support its planned production increases that it has put on hold a tentative plan to raise output of A320 narrow-body aircraft to 44 a month in 2013 or 2014.

"We have all got some scars on our back in terms of where we have... put capacity in, and the ramp-up never actually materialises"

It is making 40 A320s a month, and plans to increase to 42 at the end of this year, but then go no further.

Mr Brégier says the proposal to build 42 A320s every month is a "hell of a challenge" for Airbus's 1,500 suppliers. "We have, globally, in the supply chain a lot of companies probably who didn't invest enough during the financial crisis of 2008-2009," he adds. Jim Albaugh, head of Boeing's commercial aircraft division until last month, insists the company can increase from its current rate of making 35 737 narrow-body jets a month to 42 by mid-2014.

"But the supply chain has been stressed – there's no question about that," he adds.

Investors are most interested to see

whether Boeing can increase production of its 787 Dreamliner aircraft, its fastest selling jet ever, for which the company has 854 orders.

The first 787 was delivered three years late to ANA, the Japanese airline, last September, because of problems with the unprecedented level of outsourcing on the widebody aircraft, and its extensive use of carbon fibre.

The pressure is on Boeing to boost output of the 787, from 3.5 each month now to 10 by late 2013.

Mr Albaugh says the plans are on track, although Boeing has had to take some extraordinary measures along the way.

In 2009, Boeing paid \$590m in cash for Vought Aircraft Industries' 787 business, which made the rear section of the Dreamliner's fuselage in South Carolina.

Kent Fisher, an executive at Boeing's commercial aircraft division who supervises the supply chain, says the Vought acquisition was partly driven by questions as to whether the previous owners would invest enough to support the planned Dreamliner production increase.

Similarly, last year Airbus paid €4m for a controlling stake in PFW Aerospace, a Germany company that makes tubes, pipes and aerostructures for aircraft manufacturers.

Tom Williams, Airbus head of aircraft programmes, says it felt compelled to intervene because PFW "ran out of cash" and was "a critical supplier", including on the A350.

Analysts and consultants say smaller aerostructures manufacturers, typically making parts of the fuselage and wings for Airbus and Boeing, are potential weak supply chain links.

Aircraft equipment suppliers – such as engine makers and providers of electronic systems – often have operating profit margins of 10 per cent or more, partly because they repair and service the components they make.

But the profitability of smaller aerostructures manufacturers can be much lower than equipment suppliers, say analysts and bankers. They add that some aerostructures companies ran into difficulties when Airbus and Boeing started asking them to design products as well as make them.

Airbus and Boeing – which gave up long ago on the idea of designing and building entire aircraft, because the development cost of a new jet programme is about \$10bn – are encouraging consolidation between smaller aerostructures companies in the hope it will produce stronger suppliers.

GKN, the UK group that is one of the world's large makers of aerostructures, says it has been asked by Airbus and Boeing to consider buying other suppliers.

Marcus Bryson, head of GKN's aerospace division, says aerostructures companies underestimated the challenge of switching from aluminium to carbon fibre on Boeing's 787.

He adds that some suppliers are wary, as they have experience of increasing their output to match planned production increases by Airbus and Boeing, but then found that the aircraft makers did not implement their plans.

"We've all got some scars on our back in terms of where we've ramped up and we've put [manufacturing] capacity in, and the ramp-up [by the aircraft makers] never actually materialises," says Mr Bryson.

However, Boeing's Mr Albaugh insists suppliers will not be left "high and dry", because the company can see demand for 34,000 passenger jets over the next 20 years.

But Rob Stallard, an analyst at RBC Capital Markets, says Airbus and Bo-

ing risk making too many aircraft, based on their planned production increases and his calculations for passenger traffic growth.

He estimates 675 of the aircraft to be made by the two companies between 2011 and 2015 may struggle to find buyers, although he says this problem may not happen, partly because of the possibility of

higher than expected traffic growth.

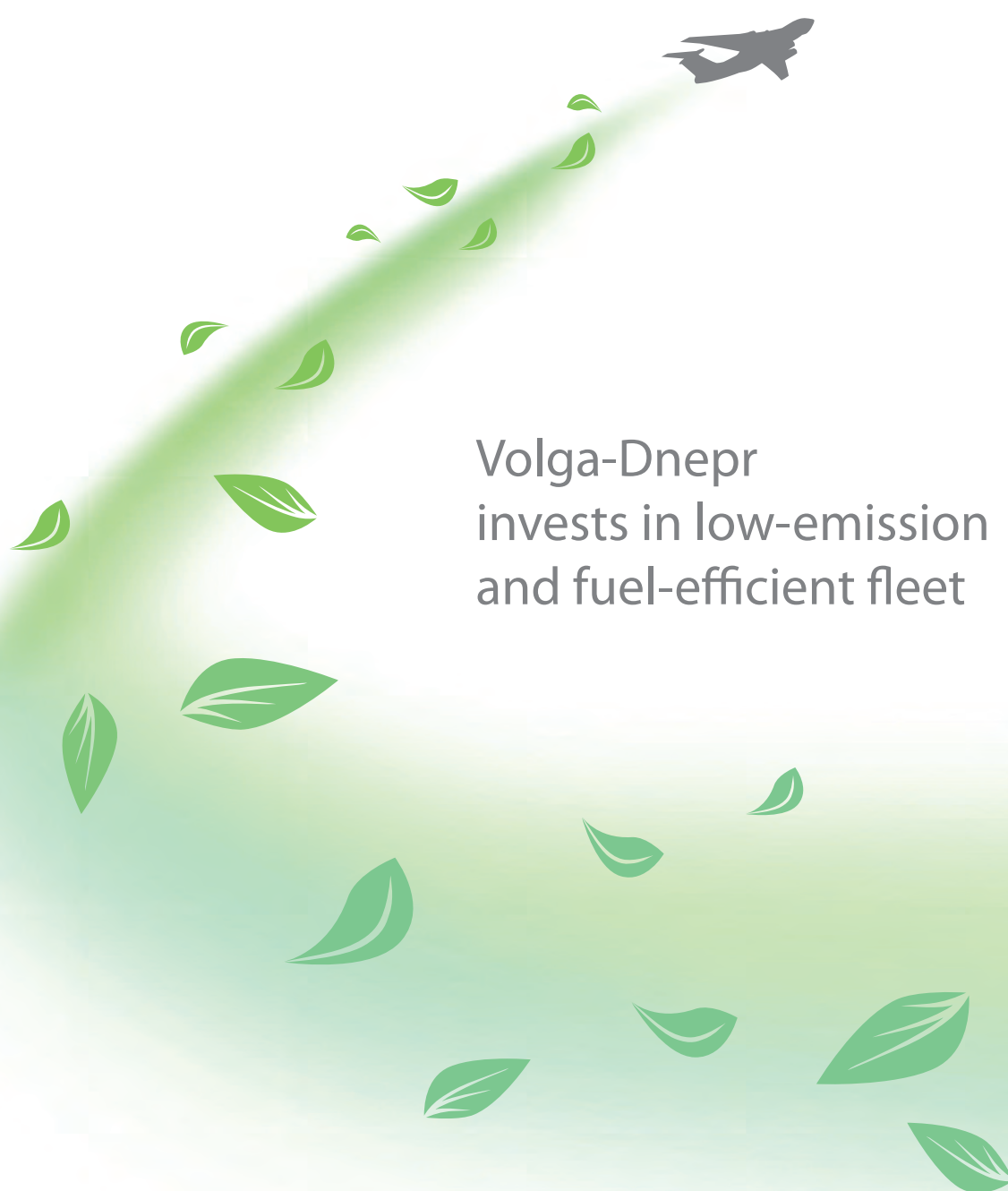
Meanwhile, Penelope Butcher, analyst at Morgan Stanley, notes how aircraft financing is becoming harder to obtain and more expensive, and says this issue may require Airbus and Boeing to reconsider their planned production levels in the near future.

But Mr Brégier is having none of it, saying that while some European

banks have pulled back from aircraft financing others in Asia are stepping in. "There is no uncertainty about aircraft demand," he adds, pointing to Airbus' order backlog of 4,341 single and twin aisle passenger jets.

Mr Albaugh, unsurprisingly, agrees. "I haven't seen anything that would lead me to believe you're going to see this market dry up any time soon."

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Aerospace

China offers serious challenge to Boeing and Airbus

Comac

Progress may be slow but the builder has potential, says **Simon Rabinovitch**

Historians might one day look back on June 2012 as an important turning point for China's ambitions in aerospace.

However, it will probably take more than a decade for it to develop an aircraft manufacturer to rival Airbus and Boeing.

The Commercial Aircraft Corporation of China, or Comac, was founded in 2008 for the express purpose of breaking the Airbus-Boeing duopoly, a goal that the Chinese government believes has strategic importance given the 5,000 jets that the country is expected to buy over the next two decades.

To meet those lofty ambitions Comac sensibly opted to start small. Its first step was to produce the

ARJ21 Xiangfeng, a regional jet meant to compete with Embraer and Boeing.

The plan was then to build on the hoped-for success of the ARJ21 and move up a size with the C919, a narrow-body aircraft family that would take on the workhorses of the industry, the Airbus A320 and the Boeing 737. Only after that would it graduate to twin-aisle, longer-distance jets.

Comac, however, has stumbled at the starting blocks. The ARJ21, which it inherited from other Chinese state-run companies, completed its first maiden flight in 2008, a full three years behind schedule.

Airworthiness certifications have been repeatedly delayed since then, because of a series of setbacks: a wing cracked on a test flight in 2010 and industry insiders say there have also been wiring and computer problems.

The struggle to get the ARJ21 into the air is a serious threat to the C919 timetable, which was supposed to enter commercial service in 2016 and, by extension, to Comac's larger objective of challenging Airbus and Boeing.

But things are finally starting to look up for the Chinese manufacturer.

On June 28, Comac said that the ARJ21 had undergone multiple landing and take-off tests on a flooded runway, a crucial and tricky phase in assessing whether an aircraft is airworthy.

It also said it had completed air-speed calibration, icing and crosswind tests and that it was preparing for a stall flight test.

He Dongfeng, Comac president, gave one of the most optimistic assessments heard in years from a company official.

"After 10 years, the development of the ARJ21 has entered its final stage. The last step is to complete the airworthiness tests and to obtain the airworthiness certification," he said in a statement.

Last month, Comac sealed a series of deals that could also strengthen its hand. With France's Safran Labinal, it formed a joint venture to work on the electrical wiring connection systems for the C919.

Comac also reached an agreement

with Bombardier of Canada to co-operate on research and development.

And it has signed a memorandum of understanding with Russia's United Aircraft Corporation to develop a wide-body long-range aircraft.

On top of these agreements, Comac received an order for 20 C919s from the financial leasing arm of the Agricultural Bank of China, bringing its backlog to 280 orders.

The joint ventures and the orders, by themselves, do not necessarily mean all that much.

Comac already has a dizzying array of joint ventures with foreign companies supplying critical components.

And the vast majority of the jet orders come from Chinese companies, which appear to be buying Comac aircraft more out of state-directed patriotic duty than out of any kind of commercial rationale. But, taken together, the deals add

much-needed momentum to Comac's progress.

Chaker A. Chahrour, executive vice-president of CFM International, a venture between General Electric and Safran that is supplying Leap-X1C engines for the C919, says he believes the narrow-body project is moving ahead as planned and would not suffer delays like the ARJ21.

"We have confidence in Comac. We think it will be on schedule, we seek updates just about every day," he told Bloomberg.

Airbus and Boeing are not yet losing sleep over Comac, and they face other potential competitors in Brazil, Canada and Russia.

But the two companies are keeping an especially close eye on their aspiring Chinese rival.

"I don't believe all of them are going to be successful," Jim Albaugh, executive vice-president of Boeing, told Aviation Daily last month. "My guess is one of them will emerge and become a very good competitor for us, and I won't be surprised if it was China."



A Comac ARJ21 takes off during an air show in China



Watching like a hawk: the Northrop Grumman RQ-4N Global Hawk on display at the previous Farnborough show

Attempt to break into civil market

Russia

The industry is trying to rebalance from its 90% military bias, writes **Charles Clover**

The development of Russia's Sukhoi SSJ 100 Superjet, a short range airliner, was supposed to revive Russia's moribund civil aviation industry.

But those hopes were put on hold after one of the jets struck Mount Salak during a demonstration flight from Jakarta in Indonesia on May 9, killing 45 passengers and crew.

Two months later, the future of Russia's civil aviation programme is in the hands of Indonesia's National Transportation Safety Committee. If a fault in design or mechanical failure was the cause of the accident, it could end or curtail critical projects.

The NTSC could take a year or more, but safety recommendations published on June 25 appeared to clear Sukhoi, the Superjet's manufacturer, concentrating on rules for pilots on demonstration flights and flying in mountainous terrain.

Olga Kayukova, a representative of majority state-owned United Aircraft Corporation (UAC), the parent of Sukhoi, says: "The investigation has not come to any conclusion regarding the aircraft malfunctioning. There are no direct indications or indirect indications that the aircraft was not functioning properly."

But she adds: "It is necessary to say that the agency has not issued any official conclusion on the investigation."

Reaction among potential customers has been muted.

None of the 174 orders for the aircraft has been cancelled, and Transaero, the Russian carrier, agreed to buy six in June. "We are still marketing and still working with customers," says Ms Kayukova, who adds Sukhoi is on schedule to deliver 42 aircraft to two Indonesian airlines by the end of this year.

The 100-seat short-range regional jet is positioned to compete with Brazil's Embraer and Canada's Bombardier and is the first in a planned series of civilian aircraft.

If the Superjet succeeds it would be followed by the short-to-medium range MC-21, which will compete directly with the Boeing 737 and the Airbus 320, and which aims to start test flying in 2015, with mass production in 2017.

Russia's military jets compete well internationally. However, its old civilian aircraft, cramped and ill-ventilated, used to sell almost exclusively in the former Soviet Union, Iran and parts of Africa.

Mikhail Pogoyan, UAC chairman, has said his plan was to

increase civilian aircraft production, as the sector constitutes 75 per cent of the world aviation market.

Currently, Russia's industry is the reverse of this – 90 per cent military and 10 per cent civilian.

The Superjet is the first Russian aircraft to be built using modern production techniques, rather than relying on the Soviet Union's vertically integrated manufacturing shops. The airframe is built in Russia, but most of the parts are purchased from 30 suppliers worldwide.

"This project was a game-changer for the Russian aircraft industry. In taking it on, the industry turned westwards," says Ms Kayukova.

While the order flow has been steady over the past few years, the numbers purchased remain short of the programme's break-even point, according to an analyst note by Fitch Ratings. This said it expected orders to be negatively affected by the crash in Indonesia. "Further orders outside the CIS are vital to its success," said Fitch.

Vedomosti, a Russian business newspaper, reported in May that, because of low orders, UAC makes a \$10m-\$15m loss on each aircraft, though Ms Kayukova

disputes this. She says the project will make its first operational profit next year, when it produces 40 of the \$31m aircraft.

The Kremlin has thrown its weight behind the project. Alexander Lebedev, the billionaire who owns 15 per cent of Aero-Flot, says the 30 aircraft that Russia's national carrier has ordered are seriously delayed, but the government exerted pressure to buy anyway. "Any other aircraft supplier would have had to pay serious penalties, but not them," he says.

As for the deal: "There was always some government interference and lobbying."

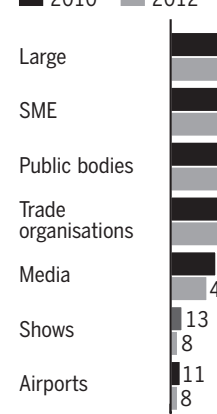
Plans are also moving ahead to produce the MC-21. But if UAC stumbles, the competition is close on its heels. China is developing a regional jet, the Comac ARJ21, to be followed by the C919, to compete in the medium range.

UAC rejects charges that it is overambitious in trying to develop two jets simultaneously. In May, Vedomosti said UAC should take things slowly. It asked: "Our automobile industry isn't trying to make Bentleys and Maybachs, so why is our aircraft industry trying to make Boeings and Airbuses?"

Ms Kayukova says the company needs a range of projects in different segments of the market. "At this point, the industry needs to be ambitious," she says.

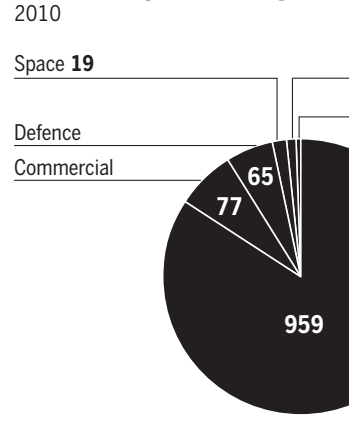
Watching brief: a Sukhoi Superjet 100 crashed in May, killing 45 passengers and crew members

Exhibitors by type



Source: Farnborough International

Exhibitors by market segment



Defence keeps a lower profile

Farnborough

Quieter show but still gripping for insiders, writes **Carola Hoyos**

Northrop Grumman, one of the US's biggest defence contractors, will not be coming to the Farnborough Air Show this year, while other defence companies are cutting their numbers, budgets and lunches. The fall in defence spending and promotions, which is largely being made up for by the booming commercial aerospace sector, is a sign of the times. Not only is the defence industry going through one of its worst times in recent history, but the pendulum of power is swinging from Europe towards oil-rich and emerging economies.

The fact that David Cameron, UK prime minister, is due to make a rare appearance to promote UK aerospace could be seen as the economic downturn in action, with senior UK politicians finally coming to help promote to foreigners the equipment their own military no longer has the funds to procure. Finmeccanica has halved its budget for Farnborough, is

having no significant parties in London and has done away with the restaurant at its pavilion – though there will be a coffee vending machine, Giuseppe Orsi, chief executive, reassures.

"We need to concentrate on the business. We were doing business in the previous year, but there was a big emphasis also on the PR."

Northrop Grumman said in a statement the move was "in full alignment with its affordability and cost reduction goals."

Though it was quick to note the decision did not diminish its commitment to the UK, it hinted there was more important business to be done elsewhere: "Northrop Grumman continues to focus its international business development activities and resources in areas that better support its customers' needs."

Even the UK's BAE Systems, Europe's biggest defence contractor, is slimming down, sending fewer executives and cutting its exhibits to only its aerospace business, rather than the broader displays of past events.

Sash Tusa, analyst at Echelon Research and Advisory, calls Farnborough "a largely civil aerospace-oriented show" and sees the potential collapse of the Franco-British unmanned aerial vehicle (UAV) collaboration as

one of the only key issues for defence at the show.

France and the UK in January signed an agreement to explore the development of a UAV and during Farnborough are expected to sign a commitment to invest further in the early exploration of the project.

BAE and France's Dassault Aviation are the two participating companies. People close to the deal believe it will be signed at Farnborough, but analysts suggest the election of François

Military budgets are growing in countries to which western companies have very little exposure

Hollande as French president could reduce Paris's willingness to engage in a deal that leaves out Germany.

Whether the deal is signed or not, UAVs will be a big part of the show. Europe lags behind the US and Israel in developing this new generation of surveillance and attack aircraft, mainly because no individual European country is rich enough or has the need for enough UAVs to justify the

investment. But in the US, the UAV industry is progressing far more quickly and suppliers at Farnborough will be showing off their latest advances.

Other areas of defence are making up for some of the ground lost to those cutting back, says Shaun Ormrod, chief executive of Farnborough International, who says: "The space zone has doubled in size with companies and agencies specialising in products and technology related to satellites, while security has grown and the UAVs are likely to be one of the busiest."

But he admits that much of the compensation for the fall in defence has come from the boom in commercial business.

Geographically, US executives from the likes of Northrop Grumman have been replaced by executives from Russia and China, where defence budgets and investment are growing, rather than shrinking.

The last show in 2010 was hit by the financial crisis and saw a steep drop in related orders.

The total value of orders for the show was \$47bn compared to \$88bn in 2008.

"If I were a betting man, I would say it is going to be north of \$47bn, because of the Queen's Jubilee, the Olympics, and the profile and support we are get-

ting this year from the [UK] government," says Mr Ormrod.

But on the defence side, it's a tough call. Markets for western defence contractors are shrinking as western democracies cut back on spending because of budget constraints and the end of wars in Afghanistan and Iraq.

The deepest cuts are happening in Europe and the US, two of the biggest markets for companies such as BAE and Lockheed Martin. Meanwhile, military budgets are growing in countries to which western companies have very little exposure.

In 2011, China and Russia increased their military budgets more than any other nations, the Stockholm International Peace Research Institute found.

Meanwhile, even India and Brazil, countries western contractors often name as big new markets, cut their military budgets in real terms in 2011.

That trajectory is likely to change, as both countries are in the process of buying fleets of new jet fighters, analysts note.

Signs of who wins in Brazil, where Saab's Gripen, Dassault's Rafale and Boeing's F/A-18 are competing for a \$4bn-\$7bn contract, would cause much excitement at Farnborough, as would any hint that India's decision to select Rafale fighters (see page 8) was unravelling.

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Aerospace



Europe's three leading flag carriers – Air France-KLM, IAG and Lufthansa – are taking steps to reduce costs at underperforming short and medium haul operations

Bloomberg

Consolidation should improve prospects

European airlines

Carriers are facing losses, writes Andrew Parker

Being the chief executive of a European airline is an apparently thankless job right now.

The immediate outlook is grim – European airlines are expected to report combined net losses of \$1.1bn in 2012, principally because of the eurozone crisis, says the International Air Transport Association, the industry's main representative body. That compares with a combined profit of \$500m last year.

"The eurozone crisis is standing in the way of improved profitability," said Tony Tyler, director-general of Iata, last month.

But there are some tentative signs that European airlines are heading towards a more profitable future – and that earnings could become more sustainable on a long-term basis.

Significant industry consolidation has been progressing for almost a decade. The latest move came in April, when International Airlines Group, parent of British Airways, bought

BMI British Midland, in order to strengthen its position at London's Heathrow airport.

Amid the EU's sovereign debt crisis, consolidation is being accompanied by a spate of airline failures.

Hungary's Malev, and Barcelona-based Spanair have been the most high profile casualties this year.

This reduction in the number of airlines provides the remaining carriers with the opportunity to curb seating capacity growth – or even cut it – and therefore potentially raise fares.

Meanwhile, Europe's

'The eurozone crisis is standing in the way of improved profitability'

Tony Tyler, Director-general of Iata

three leading flag carriers – Air France-KLM, IAG and Lufthansa – are taking steps to reduce costs at underperforming short and medium haul operations.

And all of this comes against a backdrop of some relief from high fuel prices.

Since March, European jet fuel has fallen more than 15 per cent in price to

about \$940 per tonne. Europe undoubtedly has too many airlines – 320 in the 27 EU member states – partly because countries cling to the idea of having their own flag carrier.

The problem is arguably exacerbated by large aircraft leasing companies renting jets to airlines that cannot afford to buy them.

But it is possible to see the emergence of five large airline groups – Air France-KLM, easyJet, IAG, Lufthansa and Ryanair.

easyJet and Ryanair are enjoying the economic downturn, as consumers and business people increasingly use the budget airlines for European travel in an effort to reduce their spending.

The big question for both carriers is how they tap further growth.

For example, Ryanair is seeking to buy more aircraft because its existing deal with Boeing is coming to an end, but Michael O'Leary, chief executive, may find it hard to purchase jets at cheap prices because the manufacturers have large order backlogs.

Air France-KLM, IAG and Lufthansa are also finally responding to the competitive challenge from Ryanair and easyJet by seeking cost savings at short and medium-haul operations.

They have laid out ambitious plans to cut staff costs, although it is far from certain that they will succeed because of resistance from trade unions.

Andrew Lobbenberg, analyst at HSBC, said: "We expect union opposition, industrial action and cost creep to erode the benefits that are ultimately negotiated. But we do expect progress."

Air France-KLM, which is burdened by high operating costs and a large debt load, last month announced plans to cut more than 5,000 staff in France, or 10 per cent of the domestic workforce. In a nod to the new Socialist government of President François Hol-

lande – and in an effort to avoid conflict with France's strike-prone unions – Air France said it would seek voluntary redundancies.

But it warned that compulsory job losses would be unavoidable if no deal was possible with the unions.

IAG, which is also the parent of Spain's Iberia, last year created a new low-cost carrier in Spain called Iberia Express, where pilots are paid less than their counterparts at the main airline.

The move prompted strikes at Iberia, and last month the company announced that it would mount a legal challenge to an arbitrator's ruling that the carrier must include all

of its pilots in the same overall pay scale, even if working conditions in the two parts of the business are different.

The bright spot for Europe's main flag carriers has been their transatlantic long-haul operations, where they are benefiting from the quasi-consolidation that stems from them forming joint ventures with US airlines over the past decade.

Christoph Franz, chief executive of Lufthansa, said in May: "We do feel that this is bringing more rationality in the development of capacity and pricing."

One of Mr Franz's key concerns is the competitive threat posed by the three fast-growing Gulf carriers –

Emirates, Etihad and Qatar Airways.

There is little sign of the threat diminishing, although it could reduce as the Gulf carriers enter code-sharing agreements with European airlines.

Meanwhile, Europe is expecting more consolidation between carriers.

TAP Portugal, the Portuguese flag carrier, is due to be privatised this year, and could attract interest from Lufthansa and IAG.

One closely watched move will be Ryanair's third takeover bid for Aer Lingus, the Irish flag carrier, which was launched last month.

The two previous bids failed after objections by

European competition authorities, and it is likely that the European Commission will also have objections to Ryanair's latest offer for Aer Lingus, which values the carrier's equity at €694m.

But this time around the Irish government may look more favourably at Ryanair's bid because, under the terms of the country's bailout by the EU and the International Monetary Fund, it wants to sell its 25 per cent stake in Aer Lingus.

The dilemma therefore for the competition authorities is whether – knowing Europe has too many airlines – they should block Ryanair's third bid.

Procurement Dependent on vision and strategy

The acute challenges facing the largest airlines in the US as they devise strategies for their fleets were summed up by two contrasting events surrounding AMR, the parent of American Airlines, in the second half of last year.

In July, the company announced the largest single aircraft order, committing to take on 460 narrow-body aircraft from Boeing and Airbus, the world's two largest commercial jet makers. It was the kind of deal that many observers believe the US's large legacy airlines – the others being United Continental, US Airways and Delta – delayed for too long. The age of many airlines' fleets has worsened the challenges they face, which also include coping with the pressures of weak worldwide economies at a time of near record high fuel prices.

Yet, just over four months after it announced the order – intended to give it the youngest, most fuel-efficient fleet of any large legacy US airline within five years – AMR was forced to file for bankruptcy protection, brought down by high staffing and other operating costs.

The question for American and other large airlines is whether extensive and expensive fleet renewal programmes, are too big a risk under current circumstances – or whether it is too big a risk not to invest, given their potential to reduce costs.

Virasb Vahidi, American's senior vice-president commercial, says the company had long been convinced of the benefits of renewing its fleet, which apart from reducing fuel consumption per seat mile by 35 per cent, included new seats, better in-flight entertainment and better standardisation.

However, it was only after Airbus and Boeing offered \$13bn in manufacturer financing for the orders that the airline was able to accelerate the pace of deliveries to the 40 to 50 aircraft annually it wanted.

That financing will remain in place despite the bankruptcy filing, American insists.

"It paid for itself," Mr Vahidi says of the investment. "Obviously, it fits in with our overall strategy of modernising the brand, modernising the customer experience and having the most modern and most innovative products and services."

Virasb Vahidi: fleet plan



"The faster you go, the better the economics." But American's attitude is far from universally shared. Although some other airlines are expected to

place big orders – United Continental is expected to order up to 100 new aircraft soon to replace its ageing Boeing 757s – Atlanta-based Delta Air Lines is taking a different view.

Delta, the only leading carrier to have a fleet older than American's, has ordered 100 of Boeing's new generation 737-900ER, for delivery between 2013 and 2015, replacing some of its oldest, least efficient models. Among the types the carrier plans to phase out are its ageing McDonnell Douglas DC9s and Saab turboprop aircraft, which are especially unpopular with passengers.

But the company says it is also "mindful of the total value" of aircraft it buys. It has been an enthusiastic buyer of second-hand McDonnell Douglas MD90 aircraft shed by other airlines, including China Southern. It has also taken over the leases on 88 Boeing 717 aircraft that Southwest Airlines, the fast-growing no-frills airline, acquired as a result of its takeover of Air Tran in 2011.

Southwest prefers to operate only a single aircraft type – Boeing 737s – to simplify its operations and maintenance.

Delta backs itself to operate a more complex mix of aircraft than other operators and to operate older aircraft more efficiently because it mostly undertakes its own maintenance and has more direct control over its fleet.

Yet the test for the airlines' strategies will be whether they help with the wider objective of improving on recent decades' patchy – often non-existent – profitability.

In June, Jeff Smisek, United Continental's chief executive expressed confidence that, after a series of mergers, managements were now focused on making money as opposed to obtaining market share.

Delta took over North-West Airlines in 2008, United and Continental merged in 2010, Southwest Airlines and Air Tran joined forces last year, and there could be a further merger if US Airways succeeds in efforts – which its suitor has rebuffed – to bring American out of Chapter 11 and merge with it.

The question will be which of the various approaches to improving profitability will prove most effective. Delta continues to operate a wide variety of aircraft, partly because it operates a wider variety of point-to-point services aimed at passengers keen to travel direct between smaller cities.

American, by contrast, set out in 2009 to concentrate its operations on five hubs – New York, Dallas, Chicago, Los Angeles and Miami – to catch the business travellers. Between 98 and 99 per cent of flights in this summer's schedule go to or from one of those hubs, Mr Vahidi says. To fit in with that prime objective American decided it needed to buy the latest, most efficient aircraft to match.

"It all started really with our network," Mr Vahidi says. "This fleet plan is a byproduct of the network plan."

Robert Wright

Industry in need of a shakeout and restructuring

India

Overcapacity and a subsidised national carrier are hurting, writes Neil Munshi

At the beginning of 2011 things were looking up for the Indian aviation industry: the number of domestic passengers had grown 19 per cent in 2010, to 52m, an all-time high, and there were still nearly 1.2bn Indians that had yet to fly.

That growth has continued – up nearly 20 per cent last year – but 18 months on the industry is in crisis. It finds itself crippled by a price war set in motion by the highly indebted, heavily subsidised state carrier, Air India; powerless against a high and complicated tax structure for jet fuel; and disadvantaged by a lack of world-standard infrastructure.

With a \$20bn industry-wide debt burden and annual losses of \$2bn there is likely to be more pain – and possibly the exit of at least one company – before the sector soars again.

The central government has so far been unable to enact any of the reforms the industry desperately needs to bring down escalating costs. But if it could shake off its policy paralysis,

and if crude oil prices remain low, there is hope the industry could rebound.

The price war began last year, when an Air India pilots' strike forced the company to ground most domestic flights for 10 days. Afterwards the airline aggressively cut domestic fares by up to 20 per cent. The country's five private carriers were forced to follow suit, which took a heavy toll on balance sheets.

Ironically the very price war that set the industry reeling may ultimately save it, says Sharan Lillaney, analyst at Angel Broking.

Kingfisher Airlines has suffered the worst, and has been forced to cancel dozens of flights – so has Air India, because of labour strife. That allowed other carriers to step into the void, driving prices up by 20 per cent to 30 per cent in May and June alone, according to analysts.

Mr Lillaney says: "Competition has been reduced to quite an extent – so I don't think ticket prices will come down significantly, which will result in [the airlines] making money this quarter and next."

Air India has survived, propped up by the government, with the latest \$5.7bn aid package aimed at helping it cope with its estimated \$10bn in debts. But even the national flag carrier, long a source of patriotic pride, has come under the spotlight, with the civil aviation

minister recently hinting at privatisation.

Still, despite the occasional freezing of accounts because of non-payment of service taxes, or labour strife related to non-payment of salaries, Air India is still flying.

At least one of the country's private carriers may not be able to say the same for long.

"If market forces prevail, then one carrier or other will definitely be struggling and could go down," Aditya Ghosh, president of Indigo Airlines, recently told the Financial Times. Indigo is the only Indian airline making a profit.

Indigo has gained market share as its rivals have faltered. It is now the biggest airline in the country, with 24.9 per cent of passenger traffic.

Indigo, a low-cost airline in the mode of Southwest of the US, has made money in each of the past four years, with net profit rising from Rs5.5bn in the year to March 2010 to Rs6.5bn in the year to March 2011.

The same cannot be said for Kingfisher. The premium carrier launched by billionaire liquor baron Vijay Mallya is, say analysts, on its last legs. Second in terms of market share as recently as November, it is now last, with 5.2 per cent.

In between are SpiceJet, GoAir and Jet Airways, India's first truly international private carrier, and once a benchmark



Walkout: last year an Air India pilots' strike forced the company to ground most domestic flights for 10 days

AP

for the industry. Each is in debt to varying degrees because of the price war and because of the high taxes on jet fuel.

India operates on a patchwork system of state-specific taxes. In the case of jet fuel such taxes add an average of 24 per cent to a cost that constitutes half of total expenditure.

This year, the government threw the industry a lifeline by announcing it would allow the direct import of fuel, allowing carriers to sidestep local taxes.

But India's airports are simply not equipped with the infrastructure necessary to import fuel directly, meaning that airlines would have to spend more

to enjoy the benefits or tie up with an oil company.

SpiceJet is the only airline so far to announce its intention to import directly. It said it hoped its first shipment would arrive in early July.

The overall lack of infrastructure is compounded by the fact that it is shared between full-service and low-cost carriers, says Deven Choksey, managing director of K R Choksey Shares and Securities.

He adds that the shortage increases prices for everything from parking to navigation services.

High airport charges make low-cost carriers less viable – in

May, the private consortium that operates Delhi's Indira Gandhi International Airport raised tariffs by 345 per cent, and wants to raise them more.

Mr Choksey says: "The constraint on the airport, the inefficiency is resulting in higher costs – higher parking and landing charges, higher charges to the passengers, and that is making the aviation industry unviable."

The government has also proposed two key reforms that could go a long way toward saving the industry: standardising fuel taxes at 4 per cent and allowing foreign airlines to own stakes of up to 49 per cent in

domestic carriers. The former was proposed in early June. The latter has been floated for months as a possible remedy for the suffering sector. The industry has been clamouring for the reform, including Kingfisher's Mr Mallya.

Given how much potential growth the domestic market offers, an Indian airline could make an attractive investment for a foreign carrier, says Mr Lillaney, if perhaps not at the price the owner of a debt-laden carrier might previously have received.

But, so long as Delhi remains paralysed, so too does the industry.

Big opportunities at home and abroad

Chinese airlines

The sector has been expanding at 10 per cent a year, writes Kit Gillet

In spite of a rocky first half to the year, when profits vanished with rising fuel costs, the seemingly unstoppable rise of China's leading carriers looks set to continue.

Industry insiders say this is likely to be the decade of the Chinese airline, despite a near 80 per cent fall in combined first-quarter earnings at state-owned Air China, China Southern and China Eastern Airlines, to Rmb825m, compared with the first quarter of 2011.

"In the first half of 2012 they have probably all lost money," says Patrick Xu, a transport analyst at Barclays Bank in Hong Kong. "Long-term, however, the story looks rosy."

"The years 2010 and 2011 were probably Chinese airlines' most profitable years, period, and demand is still likely to grow at more than 10 per cent a year."

The country ranks second in the world for domestic passengers, with numbers at its airports hitting 620.5m in 2011, up 10 per cent year-on-year.

China also ranks seventh for international passenger travel and fourth worldwide for international cargo volume, according to Iata.

Home grown airlines dominate the local market and have been expanding rapidly domestically and internationally to meet demand.

They added 167 aircraft in 2011, according to official statistics, and some estimate the country will need 5,000 new aircraft, worth in excess of \$600bn, over the next 20 years to keep up with demand.

"With the overall growth in China, the demand for new airplanes won't reach capacity in my lifetime," says Scott Hamilton, founder of US-based aerospace consultancy LeeHam.

Like many industries across the country, its aviation industry has been growing year by year over the past few decades, helped by the economic boom and the rise in the country's middle class.

The three main carriers were formed in the 1980s, along with Hainan Airlines, the country's fourth-largest airline in terms of fleet size and the largest private Chinese airline.

There has been consolida-



Chinese carriers are at the mercy of market forces Bloomberg

tion in the industry, beginning in 2001, when Air China merged with one of its chief rivals, China Southwest, and continuing up to 2009, when China Eastern merged with Shanghai Airlines.

These mergers have created a market dominated by three and a half big companies which the government hopes have the financial muscle to expand and buy the latest technology and aircraft for years to come.

"It is happening just like in the US," says Li Xiaojin, a professor at the Civil Aviation University of China. "Small Chinese airlines didn't have enough money to promote safety and services, so consolidation was

'In the first half of 2012 they probably all lost money. Long-term, the story looks rosy'

Patrick Xu, Barclays Bank, Hong Kong

needed to improve across the board.

"With the current level of competition, I could see more consolidation, with maybe just two large airlines remaining. But I have no idea which of the big three would go," he adds.

The airlines are also benefiting from the country's economic stimulus plan and the government's desire to increase the size and scope of the aviation industry.

At a conference held in Beijing in May, Li Jiaxiang, director of the Civil Aviation Administration of China (CAAC), told the audience that in five years 70 additional airports would be built across the country, with 101 existing airports rebuilt or expanded. The country had 180 airports in 2011.

"The increased economic importance of western Chinese provinces means there will be more cargo and passengers from places that haven't traditionally had airports," explains Prof Li.

The country's main airlines are increasingly involved in the international market. At the beginning of the year, China Southern announced eight new international routes, along with 24 new domestic ones.

All of these planned expansions and new routes are likely to be vastly beneficial for the big Chinese airlines, so long as they have the capital to take advantage of it.

In early June, Liu Shaoyong, chairman of China Eastern Airlines, told the Chinese media that between them the three largest carriers had paid Rmb15bn in fees and taxes in 2011.

"That amount is close to the total profits earned by the three carriers, and thus their capabilities for sustained growth are seriously restrained," he told reporters.

Despite their status as state-owned enterprises, the big three airlines are at the mercy of market forces just as much as are commercial companies.

"Small changes in prices of oil or airport taxes can destroy their profits and balance sheets," says Prof Li.

This year, each of the big three announced plans to raise money by issuing bonds and shares to increase working capital and reduce debt.

The capital they hoped to raise varied from Rmb1.05bn and Rmb8.8bn.

Even so, Chinese airlines are in a great position to develop, both domestically and internationally, says Wang Yukui, vice-president of Boeing China. "They have the aircraft, the demand and the expertise."

Aerospace

Groundwork under way for efficiency in Europe's skies

Regulation

Air traffic control reform is overdue, writes **Rose Jacobs**

Late last month, Richard Deakin, chief executive of Nats, the UK's air traffic controller, found himself sitting on a runway in Rome half an hour after his flight had been due to take off.

Personally he was not exactly delighted, but professionally Mr Deakin was pleased.

The flight had been running slightly late and was therefore due to miss its scheduled landing slot at Heathrow. In the past, that problem would have been dealt with once the aircraft arrived in UK airspace – and it would probably have meant the aircraft entering a holding pattern over London while

waiting for a new slot to open up, wasting expensive fuel in the process.

But Europe is creeping toward the sort of co-ordinated air space management that allows controllers in one country to communicate better with their counterparts in another. This means that increasing numbers of aircraft can pass the time of their delays on the ground rather than in mid-air.

The co-ordination effort is part of an ambitious project called Single European Sky, which aims to rationalise Europe's highly fragmented approach to air traffic control. It should also help to bring down costs and carbon emissions significantly.

The effort has been more than a decade in the making, with two rounds of EU legislation, in 2004 and 2009. The disjointed response to the Iceland volcanic ash cloud in 2010 further underscored the need for reform.

However, reluctance by EU member states to give up sovereignty over their national air space has consistently held up the process, while concern among unions over job losses, and bigger questions about funding will likely prove further challenges. The new equipment alone is estimated to cost €30bn and, while the European Commission is providing some cash, the vast bulk of the money will need to be paid for by companies and from the budgets of cash-strapped governments.

Still, the rewards are great – and this year marks something of a turning point, say EU officials, with performance measures in effect for the first time. “The performance scheme lies at the very heart of the project,” said one official last month.

He hopes the legally-binding targets – for safety, the environment, capacity and cost-efficiency – will drive implementation of the other pillars of the

single-sky package, including the formation at the end of this year of nine “functional airspace blocks” across Europe, which will accustom the 38 national air traffic control centres to working across borders.

Moreover, in late 2014, the implementation of new technologies and practices should cut

Europe spends twice as much per flight hour on air traffic control as the US

flying times and carbon emissions and increase safety and capacity.

In some ways, says Mr Deakin, the technical side is the simplest to deal with – the “low-hanging fruit”. This includes synchronising traffic, introducing 4-D management of routes (“telling pilots not just where to

be, but when to be there”) and making sure aircraft ascend and descend on smooth trajectories to minimise noise and fuel burn.

It is the political and regulatory hurdles that worry him and fellow members of the A6 – an alliance of Europe's biggest air traffic controllers, which Mr Deakin also chairs.

“It's all very well and good to have a functional airspace block with, say, five countries joined together, but behind that you have those five countries with their own regulators saying what's right and what's wrong.”

Meanwhile, the airlines' trade body – the International Air Transport Association – has complained that performance targets are being missed and watered down, and need to be made more ambitious for coming regulatory periods.

Just as the benefits of timely adaptation are clear – Europe spends twice as much per flight hour on air traffic control as the US's unified system – the danger of dawdling looms large.

Alain Siebert, head of economics and environment at Sesar, the organisation co-ordinating the technical implementation of more than 300 research projects related to efficient air-traffic management, estimates that the EU stands to miss out on €268bn of gross domestic product if the programme were to be delayed by another decade, and €117bn if adoption of new measures is not synchronised.

Stark as those numbers may be, many aviation experts are doubtful about how quickly change will come.

“It's one of the few things the entire industry can agree on,” says one airline analyst in London. “But I'm not holding my breath.”



Total control: a much more co-ordinated approach would bring benefits



Clean skies: Lufthansa ran eight daily commercial flights between Hamburg and Frankfurt for six months last year on a fuel made in part from vegetable oils

Rolf Bewersdorff

Airlines begin to realise green fuel is a complex proposition

Environment

Biofuels have arrived but they remain too costly, says **Rose Jacobs**

Jeremy Woods, a lecturer in bioenergy at Imperial College in London, has created a chart that describes pathways you might follow if you were working to produce a biofuel. It is a mess of labels and lines, showing a range of feedstocks – from algae to eucalyptus to sugar cane – technologies and possible final products.

“I call it the ‘horrendogram,’” he jokes. Yet airlines are serious about navigating that maze as they seek to meet environmental targets set out by their main trade body, the International Air Transport Association.

The aviation industry aims to halt carbon emissions growth from 2020 and to halve emissions from 2005 levels by 2050, even as air traffic increases.

A significant part of those savings will have to come from carriers switching

from traditional fossil fuels to alternatives.

But while the technology is already available in some cases, as made clear by multiple test flights in recent years, a commercially viable synthetic fuel remains a middle to long-distance prospect.

Lufthansa, the only airline with a dedicated biofuels department, ran eight daily commercial flights between Hamburg and Frankfurt for six months last year on a fuel made in part from vegetable oils. Government funding brought down the premium from three times the cost of traditional jet fuel to two times, but Joachim Buse, head of biofuels for the airline, said no rollout is imminent, nor could one happen without board approval.

While most experts predict the biofuel premium will fall as production ramps up, feeding economies of scale, there is uncertainty surrounding the ease with which greater production can be achieved.

Vegetable oils are an expensive feedstock, even those that are not part of the human food chain (which airlines such as Lufthansa now insist upon), while alternative sources

such as carbon captured for recycling require processing at hugely expensive plants.

“It's a chicken and egg situation,” says Mr Buse. “Nobody wants to invest in a refinery as long as he has no security in acquiring sufficient feedstock for his production. But on the other hand, feedstock producers are waiting for someone to come and say, ‘whatever you produce, we will buy it from you.’”

For a global industry, the solutions to sourcing are, so far, surprisingly local.

US and Asian airlines are largely focusing on fuels from crops that can be grown domestically, since the land is available, while Qatar Air has explored using natural gas to fuel aircraft, hoping to exploit the country's vast reserves. Carriers in Europe – where EU regulations have pushed farmers into growing crops for the biodiesel used in surface transport – are looking at a greater variety of feedstocks.

Solena, BA's main biofuel partner, has recently secured both funding and a site in east London for a plant that would turn household waste into synthetic aviation fuel.

Jonathan Counsell, head

of environment at BA, says the flag-carrier's two main requirements were that the source of its biofuel be sustainable – “we kept away from crops” – and commercially viable.

Britain's high volumes of household waste mean the feedstock meets the first requirement, while the UK's high landfill tax helps Solena, and therefore BA – which has signed a 10-year agreement to buy the fuel – tick the latter box.

Mr Counsell says the fuel

‘What they're getting is not important, it's where and how it's produced’

will be cost-competitive with traditional jet fuel at today's oil price – about \$100 a barrel. He expects the plant to fuel BA's City Airport operations, or about 2 per cent of the airline's total fuel demand.

US airlines are also signing offtake agreements with a number of biofuel producers, says Christopher Surgenor, editor of Green Air, a website about avia-

tion and the environment. “But they won't necessarily agree a price in advance.”

In fact, he questions the extent to which airlines should be in the business – via partnerships or even offtake agreements – of integrated biofuel production.

Instead he points to intermediaries such as SkyNRG and Honeywell UOP, which manage the whole supply chain, buying the biomass in bulk, paying production companies to transform it into fuel and selling that on to airlines.

The oil companies could get involved as they have in biodiesel production, but Charles Cameron, head of technology, refining and marketing at BP, warns they would be reluctant to do so as long as margins were lower for biodiesel and traditional jet fuel.

“This is going to require some financial engineering,” he told a green aviation conference late last month.

Dr Woods at Imperial agrees. But while Mr Cameron points to government subsidies and tax structures as the way to bring down the synthetic jet fuel premium, Dr Woods says the solution must be multifari-

ous, including better use of regulation and oversight to spread the burden of monitoring the biofuel supply chain – as well as an acceptance that the supply chain itself needs to draw on a wide range of feedstocks, including controversial sources such as elements of the human food chain.

He believes the industry is at a turning point, where it begins to accept that biofuels are not a simple solution to the problem of emissions.

“The airlines are at the point of understanding that what they're getting is not what's important, it's where it's produced and how it's produced.” He welcomes that embrace of complexity, as well as the industry's expanding focus, from biofuels to turbine efficiency and drag reduction.

Mr Surgenor points to other nearer-term opportunities for greener flying, such as rationalisation of air traffic control and new codes of practice for departure and ground operations.

As for commercialising aviation biofuels, “while there are promising signs from around the world, beware anyone who predicts when that will be and on what scale”, he says.

Compromise proposed on pollution law

Emissions trading

Airbus has idea to defuse row, report **Rose Jacobs and Andrew Parker**

The diplomatic row about the inclusion of airlines in the EU's carbon emissions trading scheme could be defused by limiting its impact to European airspace, according to Airbus.

Fabrice Brégier, the aircraft manufacturer's new chief executive, is keen to see a compromise between the European Commission and its critics, partly because Airbus has become the first company to be hit by retaliatory action to the environmental law.

Foreign airlines must pay for their pollution under the EU's emissions trading scheme if they fly into or out of European airports, and China has strongly objected to how its carriers are affected.

Beijing's objections have meant that Airbus has been unable to finalise orders for aircraft worth an estimated \$14bn with Chinese airlines.

Under the EU scheme, so long as a flight starts or ends at a European airport, an airline's carbon emissions are calculated based on the full length of the route, rather than just the portion inside EU airspace.

China, Russia and the US are among several countries that have protested at the extraterritorial nature of the scheme, claiming it conflicts with international law.

Mr Brégier's idea would reduce the EU scheme's impact on airlines based both inside and outside the bloc by restricting its scope to the portion of a flight that passes through European airspace.

The court declared the EU scheme compatible with international law, rejecting a complaint by US airlines.

A spokesman for Connie Hedegaard, Europe's environment commissioner, said he could “confirm that the EU does not intend to limit the scope of our legislation to the European airspace”.

He added that the EU was supporting efforts to secure a global emissions system under the ICAO.

trading scheme] first to European [airspace], giving a fair chance to ICAO to come up with a negotiated international solution within the next 18 months and then extending it according to the recommendations of ICAO... would be, for me, one possible good solution.”

Some US airlines that object to the EU scheme are understood to be open to Airbus' proposal. They are in a weaker position to negotiate, however, because the Obama administration appears reluctant to register an official complaint about the scheme.

The US House of Representatives last month voted to bar the transportation department or the Federal Aviation Administration from spending federal money on “furtherance of the implementation” of the EU scheme.

But industry insiders said they regarded the lawmakers' move as largely sym-

Several countries have protested at the extraterritorial nature of the EU trading scheme

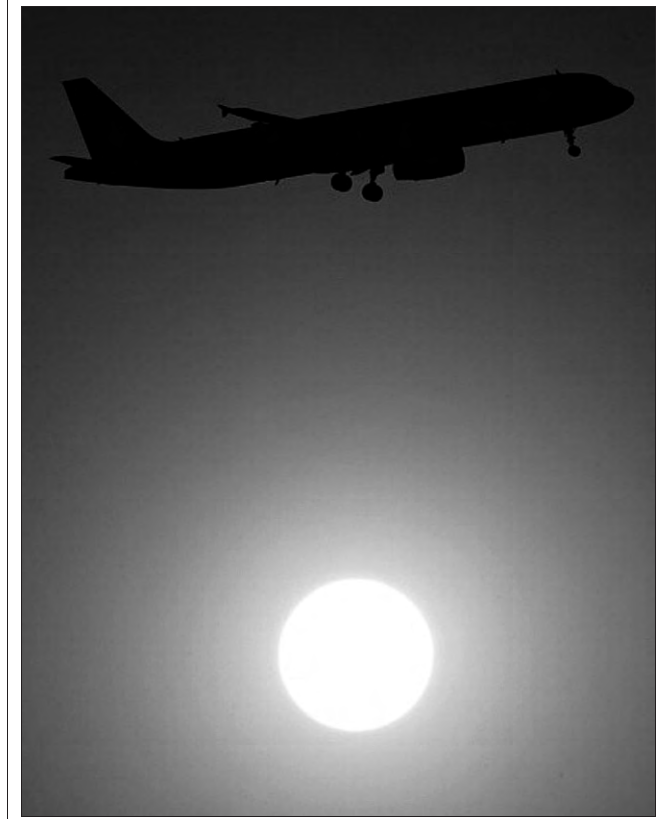
bold, adding there was a limited prospect of Washington passing legislation that would prevent US airlines from complying with the EU scheme – particularly ahead of November's presidential elections.

In December, the European Commission received a boost, when the European Court of Justice ruled that airlines based outside the EU must comply with the bloc's scheme.

The court declared the EU scheme compatible with international law, rejecting a complaint by US airlines.

A spokesman for Connie Hedegaard, Europe's environment commissioner, said he could “confirm that the EU does not intend to limit the scope of our legislation to the European airspace”.

He added that the EU was supporting efforts to secure a global emissions system under the ICAO.



Landing at Beijing: China has objected to new rules

AFP

Aerospace



Pre-flight: the J-20 stealth fighter is readied for its second test flight of 1 hour 20 minutes on April 17 2011

AP

Doing it all yourself has its drawbacks

China

Learning curve has steep trajectory, says **Kathrin Hille**

When, in January 2011, China publicised the first test flight of the stealth fighter it is developing, the fact that the J-20 was advanced enough to get off the ground surprised many in the aviation world.

Since then, the Chengdu-made aircraft has had more practice. According to Chinese state media the first prototype completed its 60th test flight late last year and the second of four prototypes started test flights this year.

In addition, military experts in China say the country is developing a second lighter-weight stealth fighter, the J-60.

Without doubt, these projects are powerful symbols of China's emerging military might.

"It puts China in the company of very few nations that have the wealth and the determination to develop such a programme," says Tim Huxley, head of the International Institute for Strategic Studies (IISS) in Asia.

The only potential rivals for the J-20 are the Lockheed Martin-produced F-22 Raptor and a stealth fighter under joint development by Russia and India.

But, while the January 2011 surprise showed the risk of underestimating China's military development programmes, experts now say they should not be overestimated either.

The Pentagon has said it expects the J-20 to be operational no sooner than 2018 – in line with an estimate given by the Chinese deputy air force chief in 2009.

Tai Ming Cheung, an expert on the Chinese military's technological development at the University of California in San Diego, says: "Whether the Pentagon's estimate that the J-20 will go into service by 2018 is accurate is anyone's guess, but my sense is that is wildly optimistic."

Pointing to the gap of more than a decade between the first flight of the US F-22 fighter and its coming into service, he argues the J-20 will have at least a decade of testing and evaluation before it is ready for production.

"Finding the right engines remains a major obstacle. The [domestically made] WS-10 is still plagued by problems, especially of high quality manufacturing, and there appears to be

no quick fix in sight," he says. "The J-20 is a leading priority in the 12th Five Year defence development plan, so will require plenty of funding and high leadership attention."

Industry sources agree that engine development remains the soft spot in the Chinese military air power.

An executive at a western aerospace company says: "In missile and satellite technology, China has managed greatly to narrow the

The J-20 still has a decade of testing and evaluation before it is ready for production

gap with the US. But aircraft engines are an area where, despite decades of reverse engineering of licensed technology, they are still far behind."

Avic, the state-owned aerospace conglomerate, plans to invest 10bn renminbi over the next five years in the development of the high-end turbofan engines needed in an aircraft of the J-20 type. Meanwhile, the People's Liberation Army Air Force remains dependent on Russian and Ukrainian supplies.

The J-10 and J-11, China's

fourth-generation fighters, are powered by Russian Salyut AL-31 FN engines.

In July 2011, Beijing ordered another 123 of those engines, bringing total orders of this engine model since 2001 to more than 1,000.

Beijing this year requested 48 Sukhoi Su-35 fighters from Russia, a deal still being delayed because of Moscow's concerns that China could copy its technology.

But the request could reflect China's desire to insure itself against the risk of relying only on domestic development.

But, despite the challenges, China's growing air power has already thrown its large shadow ahead.

James Hardy, Asia-Pacific editor at IHS Jane's Defence Weekly, says: "China's military modernisation over the past decade and its more assertive posture, for example in the South China Sea since 2008, has driven south-east Asian countries such as the Philippines to step up fighter procurement."

"US allies in the region, such as, Japan, South Korea, Singapore and Australia are buying – or thinking of buying – F-35s to maintain interoperability with US forces and stay at the cutting edge of combat aircraft technology."

On FT.com Online Debates

The Financial Times's **Andrew Parker** (below left) and **Rohit Jaggi** will lead panel discussions, in conjunction with Flightglobal, with leading figures in the sector on the first two days of the Farnborough show.



The first will focus on what airlines can do to steer a path through the storm clouds of increased regulation, higher taxation and inadequate infrastructure.

The second will look at financing. There are record numbers of airliners on order but how easy will it be in these credit-crunched times for airlines to raise the finance to take delivery?

High Flying

Click on the Financial Times's guide to corporate aviation. The FT microsite has the latest news, views and statistics on the sector. An interactive graphic contains historical and

up-to-date figures on aircraft orders and deliveries, plus charter prices, demand around the world, and hours flown in the US and Europe. ft.com/corporateaviation



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Battle-readiness clinched biggest deal

Sales

Carola Hoyos picks over the lessons from India's recent purchase

There is no better advertisement than war in the multibillion-dollar battle to persuade countries from India to Brazil to buy a certain model of fighter jet.

For Dassault's Rafale and Eurofighter's Typhoon, the conflict to unseat Libyan dictator Colonel Muammer Gaddafi helped to decide the biggest jet fighter tender ever.

But beyond modern conflict, the issues of politics, military history, technology and price all play a role in deciding export deals. These are becoming increasingly important to western defence contractors, as the traditional customers, such as the US and European nations, tighten their purse strings.

In fact the Typhoon and Rafale both performed well over Tripoli, bolstering confidence on both sides that they the better aircraft.

So convinced was David Cameron, UK prime minister, that Typhoon was the superior fighter he said so even after India had chosen Rafale as its preferred bidder. Eurofighter executives cringed at his bravado, fearing it would insult Delhi. Behind the scenes, even those rooting for Typhoon cautioned it was rarely clear that one fighter was better than another when all factors, including price, were considered.

In fact unpicking why India had chosen Rafale over Typhoon is like trying to remove bubblegum from hair. Among deciding factors were: the price and accompanying decades of support; politics; technology, and the companies' willingness to share their knowhow.

Among technology capabilities, the radar and weapons the



Triumphant: the French Dassault Rafale was picked by India over the Eurofighter Typhoon because it was fully equipped and ready to go

AFF/Getty

aircraft carried were particularly important, people close to the sale said. In terms of radar, the most advanced systems are found in US jet fighters such as the F35, but politics had kept US companies from the final rounds of the tender.

Among Eurofighter's partners – the UK's BAE Systems, pan-European EADS and Italy's Finmeccanica – developing the active electronically scanned array, which improves on old systems by being far harder to detect, was the job of the Italians. Finmeccanica was at the mercy of the UK govern-

ment and its decision over how quickly to integrate the critical technology into Typhoon.

In the end, the French were quicker and that, say analysts, helped nudge India's decision towards Dassault's Rafale.

The number of weapons for which the competing fighters had been approved was another key element of the deal. Typhoon may have done well in Libya by hitting its targets accurately, but its remit was limited to big bombs that could only be fired at large, stationary targets in unpopulated areas because it has yet to be

approved for a wider array of weapons.

In contrast, Rafale carried a varied arsenal of air-to-ground weapons that could strike moving targets and fight incoming fire, adding to its attractiveness.

India's \$20bn tender was not the only fighter jet competition of the past 12 months.

Japan chose – as expected – the US-led F-35, the most modern of the group and, crucially, the one being developed by Japan's closest military ally,

Lockheed Martin, the US's biggest defence company and lead contractor developing the

aircraft, says the F-35 is the only fifth generation aircraft on offer and therefore in a league of its own.

"There are fourth generation air forces and there are F-35 air forces. All the world's great air forces are moving to F35," says Lockheed Martin's Steve O'Bryan, who is in charge of selling F-35 internationally, listing, among others, the US, Japan, and the UK.

The F-35 aims to roll into one the capability of whole fleets of international jet fighters, from the UK's Tornados to the US's F-4s. This, Lockheed says, will

allow countries to save money by scrapping their old fighters, some of which were devised as far back as the 1950s and are becoming increasingly costly to maintain.

But others are far less positive about the F-35's value proposition. US lawmakers and the Pentagon have criticised the delays and cost overruns at the 50-year, \$1,000bn dollar programme – the most expensive ever. And, outside the US, many of the world's top air forces have less money to spend and are not only delaying their purchases of F35s but

also reducing the number they buy.

Not all countries want to hitch their wagon to the US star, while others are never offered the chance to buy such sophisticated weaponry because the US Congress restricts defence exports to close allies.

Thus South Korea and Singapore are possible next markets for F35, while others, such as Oman, are looking at Typhoon and Rafale.

But the most exciting imminent decision is that of Brazil, which pits Rafale against Boeing's F/A-18 Super Hornet and Saab's Gripen – "an aircraft that has the unusual habit of coming in on time and on budget," as one analyst put it.

Analysts generally praise the Gripen for doing a solid job at an attractive price.

While one Eurofighter executive quipped disapprovingly after Switzerland chose Gripen over Typhoon: "They test drove a Ferrari and a Fiat Punto and chose the Punto", for Switzerland, it may well make good sense to buy a city car that is cheaper and easier to park.

Ironically, Finmeccanica is in the process of delivering the Gripen's radar, which is still missing from Typhoon.

Europeans are far from the only game in town when it comes to cheap and cheerful jet fighters, at least when compared with other launchers of deadly missiles that cost tens of millions of dollars.

What makes the upgraded variants of Lockheed Martin's F-16 and Boeing's F-18 too old for some adds to the attraction for others, because the fighters have longer records in an arena where faults cause delays, cost huge amounts to fix, kill pilots and lose wars.

And then there are Russian and Chinese competitors, which – in an era when the biggest growth in military spending is coming from countries not necessarily wedded to the west – just adds to the competition.

Fighter of the future has no pilot flying it

Drones

Europe is targeting UAV development, says Carola Hoyos

When BAE Systems unveiled Taranis, its uncrewed fighter jet, at Warton in Lancashire this month, some heralded it as the beginning of the end of US dominance in the future of military aerospace.

The black tetrahedron, with a gaping triangular hole where the cockpit should be, is due to take its maiden flight early next year. But it will have to do so outside the UK, in an undisclosed location with "lots of space", say executives, most likely referring to Australia.

Secrecy surrounds the £140m unmanned aerial vehicle demonstrator programme launched in 2006, bringing together BAE, GE Aviation, Rolls-Royce, Qinetiq and the Ministry of Defence. But the main thrust is clear: to be able to fly undetected on its own when remote operation is not possible, make its own decisions about what constitutes a target and have the ability to act on them.

Nigel Whitehead, group managing director programmes and support at BAE Systems, says the company invested heavily in autonomy, noting the aircraft would be able to send back intelligence on targets rather than simply data.

He says the UK is as advanced as the US in development of UAVs.

Today's UAVs are used for reconnaissance and ground strikes, and are generally easy for enemy radar to spot.

They vary in size and sophistication as well as their ability to stay aloft and to fly at very high altitudes. The US has many types of operational UAVs, several of them active in Afghanistan.

General Atomics' Predator, perhaps the most prominent armed UAV and most controversial because it has killed civilians as well as terrorists, has been used in conflicts since Kosovo.

In fact the US and Israel so dominate the current market for medium altitude long endurance UAVs – or Males – that even Europe's fleets are derivatives of their technology.

When it comes to the far more sophisticated and stealthy, autonomous aircraft, the US has several in various stages of development and secrecy.

Northrop Grumman, which won its contract with the US Navy in 2007, is flight-testing two X-47B aircraft, which will next year demonstrate their ability to launch from aircraft carriers for the first time.

The world got a look at another advanced US drone when Iran showcased it, boasting it had brought down Lockheed Martin's RQ-170 aircraft by cyber warfare. The RQ-170 is an unmanned spy aircraft, whose details are largely classified.

UAVs allow the penetration of hostile airspace without crew being killed or put at risk

In addition, Bill Sweetman, an editor at Aviation Week who has tracked secret US military aerospace development programmes, suspects the US Air Force is working with Northrop Grumman to develop a relatively large drone that blends stealth (the ability to evade radar) and aerodynamics.

But size and expense may undermine its viability, so it might never make it to market – like some other secret programmes.

"In the US there is lots of confusion about how we



BAE Taranis prototype at Warton Aerodrome in July 2010

apply the technology," he says, noting this may give European companies a chance to catch up.

First, however, European governments will need to create the market to justify the investment.

From the point of view of military commanders the attraction of UAVs is clear.

They allow the penetration of hostile territory without the risk of crew members being killed, injured or taken hostage.

But, as Huw Williams, co-ordinating editor at IHS Jane's, puts it, Europe is broke, does not have the need for large numbers of UAVs, has a poor history of working together to build complicated, multinational fighter jets and "neither has the experience nor the established pedigree of the US".

He also cautions that Taranis is far from proven. "It's still a development platform. It hasn't even flown yet," he says.

But BAE and its French rival Dassault, which is also developing experimental drones, in February came a step closer to making a European UAV a reality, when David Cameron, UK prime minister, and Nicolas Sarkozy, the French President, announced the two companies would jointly develop a new armed drone.

Other companies developing drones fumed in the background, especially pan-European EADS, while Germany has announced it has no wish to be left out.

But the bilateral plan appears to remain on track, people involved in the nego-

tiations say. At Farnborough, France and the UK are expected to agree to fund an early phase of the programme.

The monetary commitment is likely to be small – in the tens of millions of pounds – but it would signal a continued willingness by France to co-operate.

Some analysts doubt the new French socialist government is as supportive of the programme as its predecessor and is less comfortable at leaving Germany out.

But people close to the negotiations say the deal will be signed.

If so, it would be another small step towards developing a European drone.

Given current finances, it should be seen a lifeline, rather than a sealed commitment to see its costly development through to mass production.

Meanwhile, as BAE and Dassault Aviation work on their new project, they must also sort out the vexed problem of how to get UAVs approved for use in civil airspace.

At present UAVs are neither certified nor do they have the safety record of manned civil aircraft. Thus they also lack the general freedom to fly through civil air space in the US and UK.

Much is at stake for the European military aerospace industry. UAVs will share hostile skies with crewed military aircraft for decades. But industry insiders believe they are the future, with some even betting the last manned fighter jet is already being built.

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