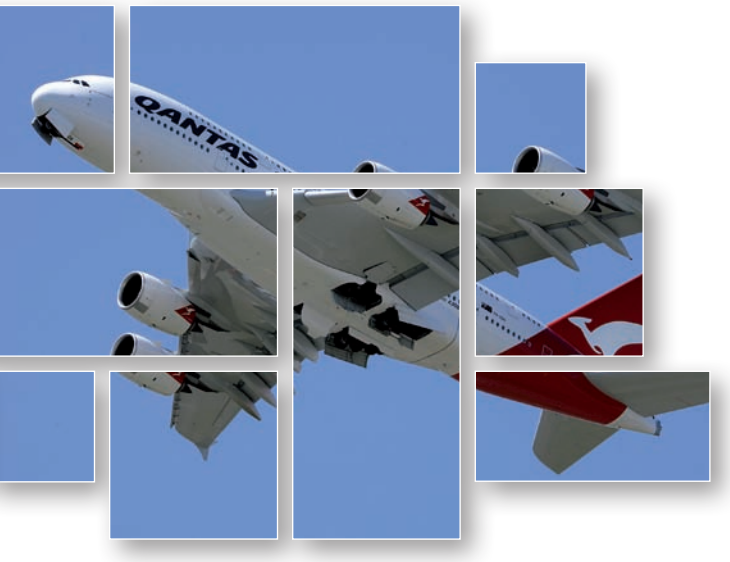
Rolls-Royce

Market Outlook 2009

Forecast 2009 - 2028



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introduction

To say that we live in interesting times is something of an understatement. As this report is being written, we are in the midst of the biggest economic downturn of the last 50 years – and who knows, perhaps of the last 100 years.

Conditions like this always make the forecaster's job somewhat precarious – almost guaranteeing that any forecast in these circumstances can only be at best a baseline around which we can construct scenarios.

We have no way of assessing the length or severity of the current economic downturn but we can be sure that although our industry will survive, it will see changes in both its structure and its players. The industry also may see important changes in the shape of the environment, alternative modes of transport and communication and the promise of new technologies.

This 2009 Market Outlook endeavours to present the current Rolls-Royce baseline scenario as well an overview of some of the other issues around us at this time.

Executive summary

A robust long-term market

Rolls-Royce sees major opportunities for long-term growth in commercial aerospace markets, driven by the continued need for air transportation from businesses and individuals.

Over the next 20 years, the Outlook forecasts demand for 141,000 engines, worth over $800 billion. The demand comes from fast-growing markets in Asia, the Middle East and Latin America, but also from replacing many thousands of older aircraft in the more mature markets of Europe and North America. Additionally, the aftermarket and services opportunity created by these deliveries equates to $600 billion over their service lives.

An important component of the demand is for business jets. Traditionally, this market was overwhelmingly US-focused, but sales to other regions have gradually increased, and the forecast now has almost 50 per cent destined for non-US customers.

As with any long-term forecast, there are many possible outcomes, given differing input assumptions. The Outlook discusses some of these issues, and gives indications of demand sensitivities.

Further tables and information is contained on the Outlook site on the Rolls-Royce website.

Engine delivery summary 2009-2028

Sector	Units	Value ($bn)
Business jets	72,409	103
Regional aircraft	14,384	44
Single-aisle aircraft	34,613	250
Twin-aisle aircraft	17,636	381
Freighters	2,140	44
Total	**141,182**	**822**

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Aircraft delivery summary 2009-2028

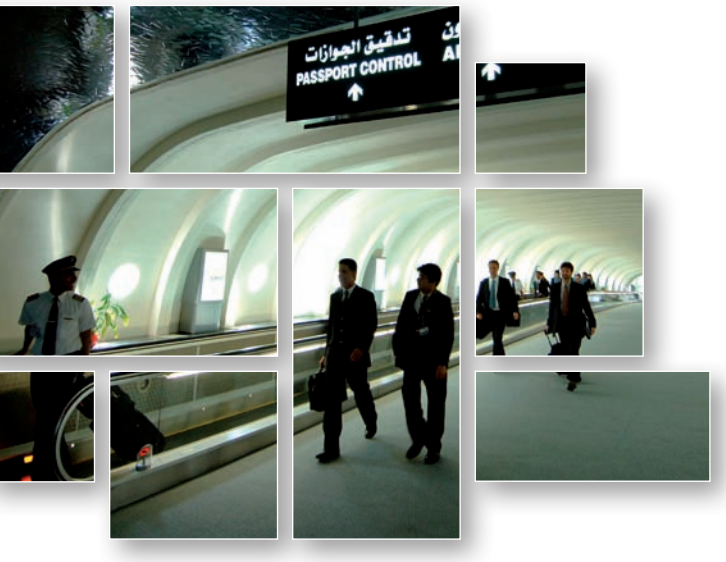
	2009-2018	2019-2028	Total
Very light jets	2,616	3,525	**6,140**
Small business jets	3,490	4,696	**8,187**
Medium business jets	4,045	6,913	**10,958**
Large business jets	3,418	5,787	**9,205**
Business jet total	**13,568**	**20,921**	**34,490**
30-50 seats	399	1,296	**1,695**
70-90 seats	2,563	2,280	**4,843**
Regional aircraft total	**2,962**	**3,576**	**6,538**
110 seats	629	678	**1,307**
130 to 180 seats	6,680	7,746	**14,426**
200 and 250 seats	1,519	1,843	**3,362**
300 and 350 seats	1,184	1,925	**3,109**
400+ seats	371	564	**935**
Freighters	419	378	**797**
Mainline aircraft total	**10,802**	**13,134**	**23,936**
Grand total	**27,332**	**37,631**	**64,964**

Market developments

Global business cycle

The two years since the last Outlook has seen tremendous upheavals in the finance industry, leading to a severe global recession.

The airline industry has always been a late-cycle industry, orders often being placed after a period of profitability, but just as economies enter a downturn. At the time of writing, in mid-2009, there are signs of improvements in the economy ahead, but the airline industry itself is still in financial difficulties.



Despite the current economic conditions, there is little reason to question the underlying fundamentals of air transport demand. There is currently a move away from first and business class travel towards economy and premium economy, and also some diversion from air cargo to surface cargo. Some of this is likely to be reversed when recovery occurs, and any permanent loss of traffic in down cycles is usually small. The traffic forecast underpinning this Outlook shows some reductions, but the overall long-term impact is small.

The traffic forecast is compiled from analysis of 21 different markets (traffic flows), each of which is at differing stages of maturity, and is subject to different market forces. Thus the average annual growth rate of 4.8 per cent per year is built up from many assumptions. There are many valid alternative demand scenarios, some of which are discussed overleaf.

Product developments

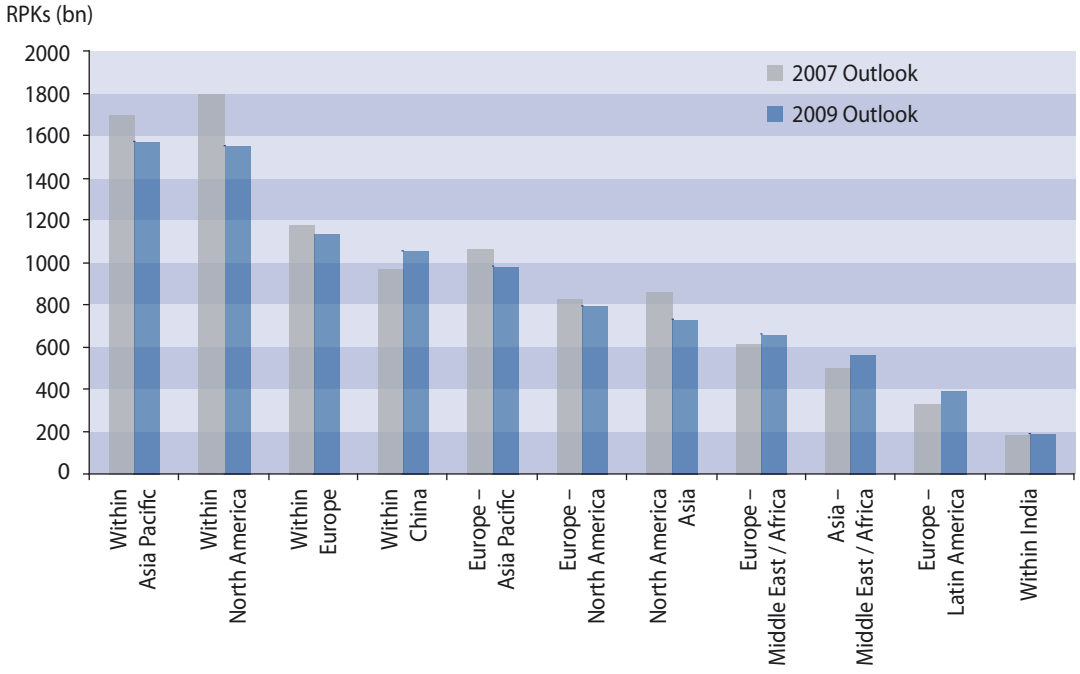
The A380 entered service in October 2007 and, despite delays, is now serving 14 cities. 2008 and 2009 have seen the launch of the Bombardier CSeries and Mitsubishi MRJ, and the first flights of the Sukhoi Superjet 100 and Avic ARJ-21, dramatically increasing competition in the 80-130 seat market.

Orders and deliveries

The last two years have seen order intake decrease from record levels in 2007 to a trickle this year. However, the airframers have over 7,000 jet airliners on backlog, equivalent to five or six years of production, giving considerable ability to accommodate customer requests for deferrals and pull forwards. The backlog includes 2,400 widebody aircraft, including large numbers of new generation 787 and A350 aircraft.

2009 will see over 900 Airbus and Boeing aircraft delivered, despite the concerns over financing. With traffic declining over 2008, there has been much debate about overcapacity and how the airline industry will adjust to this. Whilst increases in the stored fleet and some deferrals are inevitable, the combination of high fuel prices, aging fleets and intense competition are underpinning strong global demand for the more popular types such as A330s, 777s, A320s and 737s. By the time the 787 and A350 enter volume production, the global economy is once again likely to be in an upturn.

Forecast of passenger traffic in 2026 in major markets



The dynamics of growth

The numbers game

Over the past half century, civil aviation has grown steadily with only the very occasional hiccup, such as after September 11, 2001. Broadly, the industry growth, in terms of passenger-kilometres, has been around 5 per cent per annum over the last 20 years.

Some non-industry predictions erroneously state that it is reasonable to assume that this rate of traffic growth will continue indefinitely into the future. But the rate of growth is not uniform, in Europe and North America the growth rate is only around 3 per cent due to the maturity of air travel in these regions. In emerging economies the rate is currently much higher, but even these regions will gradually see air travel maturing, and their growth will tend toward the level in Europe or North America. So by 2050, the world growth rate of passenger-kilometres will fall to between 3.5 per cent and 4 per cent.

Interestingly, if we look at the growth rate of flights, the growth is much lower at around 2 per cent per annum indicating that aircraft are becoming larger and the flights are becoming longer.

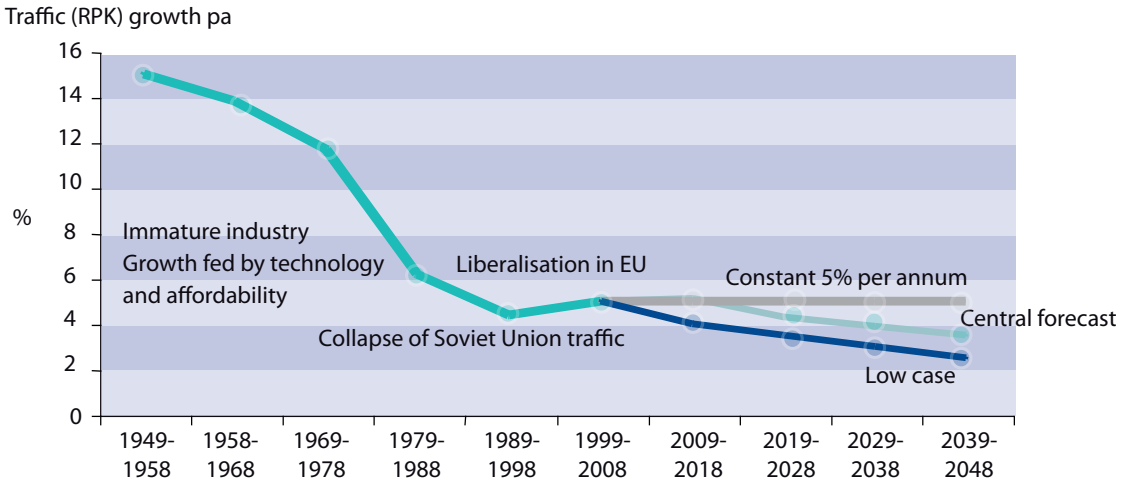
A further impact upon growth is the elasticity of ticket price – the assumption being that as fares increase in real terms then travel will reduce, and vice versa. There is clear evidence of this on a competitive basis where one airline offers lower prices to attract more passengers. However the evidence is less clear when this issue is 'to fly or not to fly'. Individuals, and the world in general, have benefited from improved communication and understanding of other cultures and travel is an important part of many people's lives and businesses.

If we assumed a steady 3.5 per cent growth over the next 30 years to 2039 then airline traffic will have almost trebled, and the number of flights will have doubled. This means that by 2039 we will require double the number of airports – or perhaps have 40 per cent more airports, with each one operating 40 per cent more efficiently than today. This represents a huge increase in infrastructure in terms of airports, Air traffic Management etc. Again, it must be remembered that growth varies widely between regions.

The baseline forecast contained in the Outlook predicts that by 2029, regional and mainline aircraft manufacturers will be delivering about 1,750 aircraft a year, compared to 1,180 in 2008. This includes assumptions on increased aircraft size, and improved aircraft productivity, and higher load factors. Taking this trend out to 2050 implies well over 2,000 deliveries a year. However, changing any of the growth and productivity trend assumptions can radically change the outcome this far out into the future.

Whatever the assumption we make, it is clear that commercial aviation is well set for future growth, but not necessarily at a constant rate.

Traffic growth reducing over time



Airline fleet choices

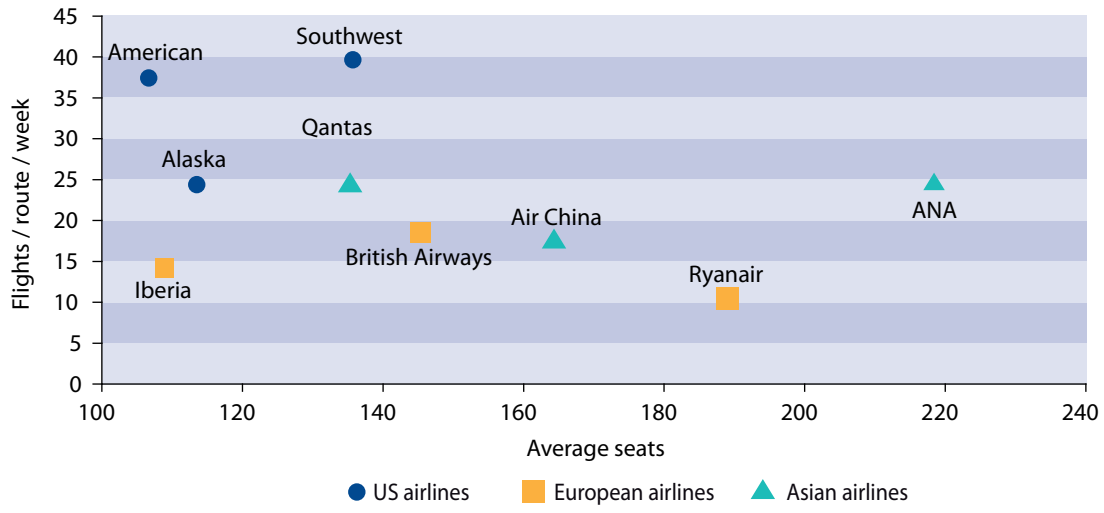
Growth will return

When growth resumes, airlines are faced with choices of how to accommodate fleet expansion. At present, many airlines are simply focused on surviving the downturn.

Ironically, it may be that those who had very limited growth plans are best placed, since they are not committed to large cash expenditures, nor do they have additional capacity entering service. However, eventually demand will return, and airlines have differing capacity options to assess.

The chart shows that there is a vast difference between how airlines serve markets in terms of frequency of service and size of aircraft used. For example, Ryanair typically flies each route around 1.5 times per day, using aircraft with 189 seats, in contrast to American Airlines who offer five flights / day with only 105 seats per aircraft.

Airline segmentation by level of service and aircraft size



This data highlights alternative airline strategies, which can be summarised simply as follows:

	High frequency / Smaller aircraft	**Low frequency / Larger aircraft**
Type of passenger	Business	Leisure, VFR
Airline business model	Network carrier	Low cost, charter
Network	Hub-and-spoke	Point-to-point
Regional aircraft	Yes	No
Direct competition	High	Low

Thus, changes in market conditions, such as capacity constraints, changes in fuel price etc, have differing effects on different airlines. The current downturn has significantly impacted business-focused carriers. Many have reacted by increasing economy seating and reducing use of regional jets.

Cost pressures

Is 'upguaging' the answer?

The oil price 'spike' in 2008 once again raised the issue of using larger aircraft to help offset cost pressures.

The first 60 years of the commercial airline industry saw a continuous trend towards larger and longer range aircraft, culminating in the development of widebody aircraft in the 1970s. Since US deregulation in 1978 the perception is that average seat count of aircraft has remained fairly static. Competitive pressures and the emergence of regional jets have put downward pressure on aircraft size, with airport constraints and the development of long-haul markets and mega-hub airports pushing size upwards.

Average seat counts on new aircraft delivered

	1988	1998	2008
Regional aircraft	35	44	77
Single-aisle	143	143	147
Twin-aisle	236	303	317
Total	111	146	151

The table, on page 10, shows that within each sector, the average seat count per aircraft delivered has shown an increase since 1988. This is based on generic aircraft sizes, and does not take into account changes in seating configurations. Based on a sample of the largest fleets, typical configurations have shown a small increase in single aisle fleets, driven by move towards single class layouts, and a small decrease in twin-aisle layouts, driven by the move towards improved comfort on long-haul services.

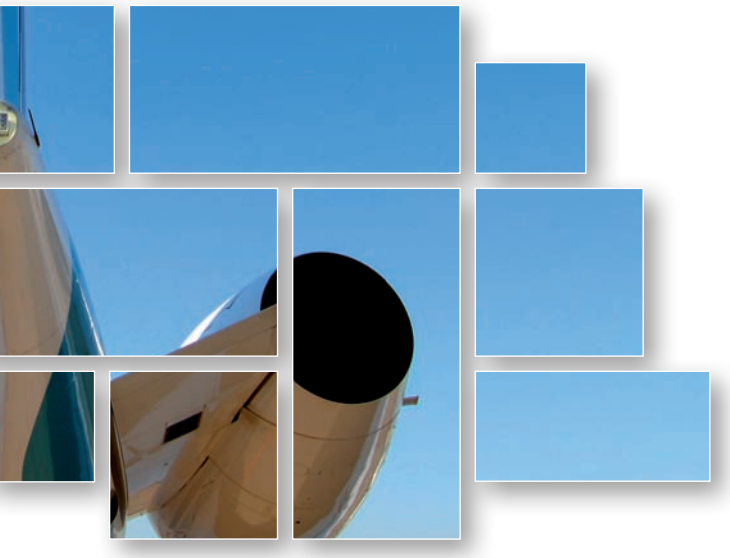
In the search for reduced unit costs, an obvious answer would appear to be larger aircraft. Airlines have been buying larger regional jets. Also, average seat counts on A320 and 737s have been increasing. Larger types are replacing most 767s. However, there are some 'break points'. Scope clauses put limits on many airlines regional fleets. The 200-seater market presents challenges for both narrowbody and widebody designs, and aircraft above 400 seats face the dilemma of single deck versus double deck designs.

The baseline delivery forecast in this Outlook assumes a 0.4 per cent increase per year in average seat counts over the next 20 years. However, this does not necessarily mean much larger aircraft. Changing the mix of aircraft types, or simply moving to higher density seating can accommodate such growth. If external factors did drive airlines to larger aircraft, the most likely outcome is perhaps to move short-haul operations towards the larger variants of narrowbody families, rather than a wholesale move towards widebody operation on short-haul routes.

Aviation and the environment

A key role to play

Rolls-Royce is a supplier in four distinct power markets of Civil and Defence Aerospace, Marine and Energy. This gives the Group a unique perspective on the greenhouse gas (GHG) implications of power.



The biggest non-agricultural contributor to global GHGs is through the production of power for use in homes and businesses, followed closely by surface transportation. Many people, including Rolls-Royce believe that technology and resources should be prioritised on these high CO_2 producing areas to achieve the greatest possible reductions in GHG production in the shortest time.

Rolls-Royce has taken significant steps in the development of low-carbon initiatives such as Fuel Cells, Civil Nuclear technologies and Tidal Power Generation. These, and other technologies, will contribute strongly to the potential for carbon-free electricity and hence electrically powered ground transportation, but will take time and investment to realise their full potential. Innovation in Civil Aerospace, such as the Open Rotor, will contribute significantly to reducing CO_2 emission from aviation.

It is crucial that any biofuels must be truly sustainable in terms of total lifecycle CO_2 and that competition with natural forest, foodstocks or water are understood before they are deployed.

Aviation has a proven record of reduction in fuel consumption through the application of technologies that have achieved a 70 per cent improvement in fuel burn over the past five decades. In the short to medium term, aviation will continue to concentrate on the development of new technologies to maintain this level of improvement in fuel efficiency.

Aviation has a notable requirement to defy gravity. This inevitably leads to a smaller design space for an aero-engine than for a similar product in a surface-based application. Of crucial environmental importance is the design trade between noise and CO_2. Physics tells us that a gas turbine designed for lowest noise will have a higher fuel burn than one where this requirement is relaxed. As an industry, we must decide where we should prioritise improvements from today; noise or CO_2, and then design our products accordingly.

The advent of Emissions Trading Schemes (ETS) and the volatility of fuel prices mean that the underlying environmental pressure to reduce CO_2 is enhanced by the increasing requirement to reduce operational costs. If the price of fuel plus fuel related taxes rises to $3 per gallon, then even in the 150-seat sector, fuel will represent 40 per cent to 60 per cent of an airline's operating cost. This potential for higher fuel related costs will encourage new and innovative technologies into the market, such as the Open Rotor.

Concern for the environment will play a key role in future industry developments of products and sevices. The Rolls-Royce Outlook assumes that growth within Europe will be constrained due to public and government concerns and this has been included in the baseline scenario.

Alternative modes of transport

Can trains take the strain?

Since aviation became widely affordable as a means of mass transportation, it has been the main provider of travel for routes over 350km. However, there has recently been large-scale investment in the use of the High Speed Train (HST), especially in mainland Europe.

Within Europe there is 5,000km of HST network already in use, which is predicted to treble by 2020. France provides an excellent case study on the effect of HST on aviation.

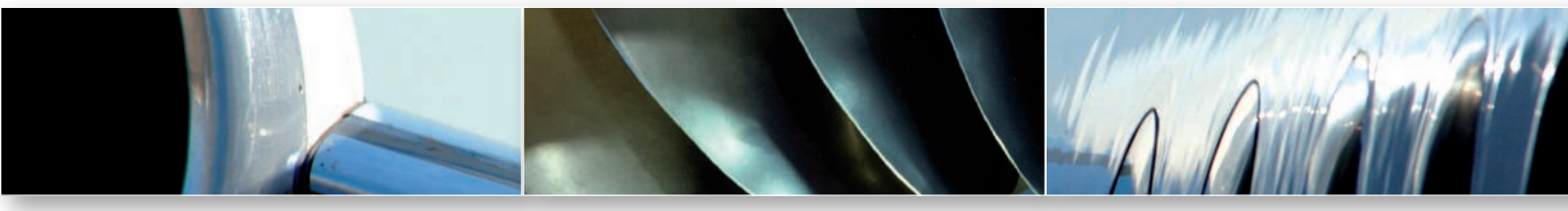
For example, Toulouse and Bordeaux are roughly the same distance from Paris but Toulouse, a slightly smaller city, has twice as many flights to Paris as Bordeaux. The main transport difference between the two is that Bordeaux has HST and Toulouse does not.

For markets where HST exists in France, it has captured 90 per cent of journeys less than 450km. In France it is estimated that the HST has captured 15 per cent to 20 per cent of all intra-France flights.

About 20 per cent of all flights originating in Europe are under 450km. In general, the aircraft that currently fly these shorter routes are in the Regional and Turboprop categories. However, HST lines require large passenger volumes to be cost-effective, so are mainly focused on linking large cities. Therefore they also compete with mainline jets, both Low Cost Carriers (LCCs) and hub-feed. Ultimately, a broadly successful HST could capture up to 20 per cent of the European market – driving up the median range of the remaining flights and increasing the average seat size in European operations.

Clearly a successful HST network will require very substantial investment and a considerable amount of time. This means that the year-on-year impact of HST may become lost in the variability of growth in the industry, but it will be visible in the spread of tracks across Europe.

Elsewhere in the world, there are already pockets of HST use (Japan, Korea) and plans for its construction in other countries, but it is difficult to see any substantial impact elsewhere for some considerable time.



Business aircraft

Long-term growth will return

Fundamental market drivers will continue to make this a growth market.

The business jet market has not been immune from the steepest economic decline in over 70 years. Expected aircraft deliveries in 2009 at 850 will be down a third on the record year of 2008. This reduction is driven by the weakness in the key market driver of corporate profits. But this slow down has also been impacted by a perfect storm of issues including frozen financing markets, reduced wealth of high net worth individuals (HNWI), poor public image of some operators and the large demand overhang from a record high pre-owned inventory of aircraft.

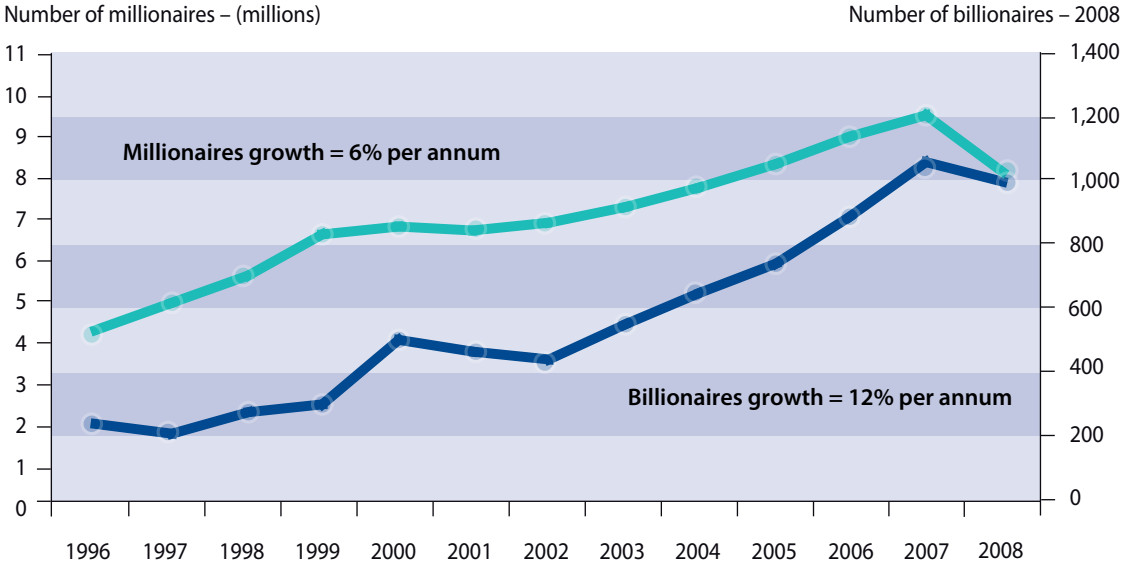
In the context of a 20-year forecast the current market realities need to be assessed on their impact on total long-term demand. Overall, the assessment is that we will see a reduction of one or two year's worth of growth that we would otherwise have seen without the recession. At time of writing (August 2009) the market has stabilised at a low level. Financing is becoming available, order cancellations have slowed, the pre-owned market is seeing increased transactions, and the stock market indices (an indication of future corporate profits) are increasing. There is therefore increasing confidence in the aircraft manufacturing industry that the market will recover with deliveries ramping up by the 2013 timeframe.

The long-term trends will continue. A shift away from the North American market will persist as the numbers of High Net Worth Individuals (HNWIs) in Europe, Asia and the Middle East continues to grow (see chart). A similar development in company aircraft purchasing will be observed as more non-US companies recognise the management productivity benefits of business aircraft use.

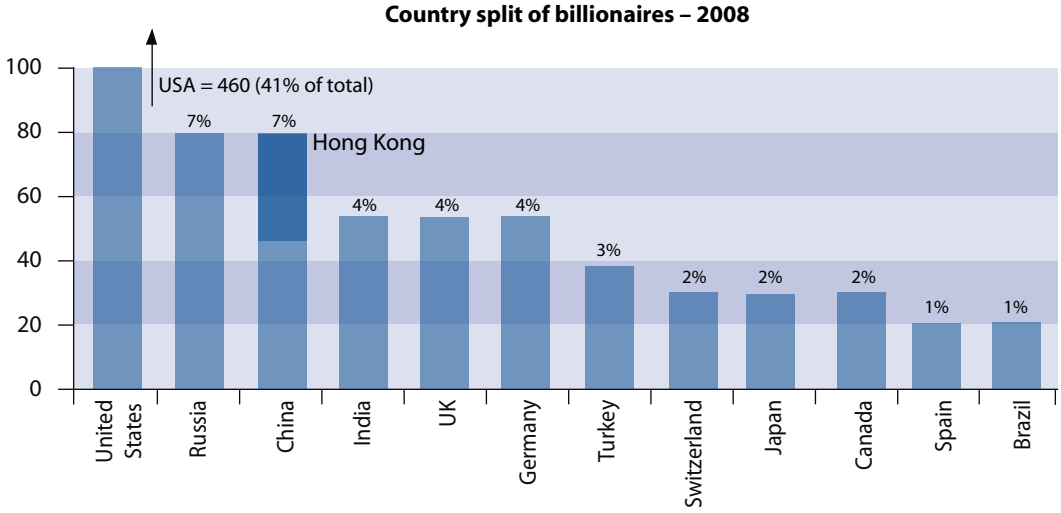
New products will continue to be brought to the market and the good track record of the introduction of fuel efficient aircraft will continue for economic and environmental reasons. Aircraft manufacturers and fractional providers recognise the importance of being environmental good citizens and are introducing innovative solutions to minimise operator carbon footprints.

The next few years may well be difficult but the market will return to this cyclic business and over the long term will lead to a healthy opportunity of $650 billion worth of aircraft over the next 20 years.

Growth in HNWI's



Country split of billionaires – 2008



Traffic forecast

Growth forecast moderated only slightly

2009 is likely to see world passenger traffic (as measured in revenue passenger kilometres) decline by at least 3 per cent. This is similar to the fall seen in 2001. Strong growth in developing markets is predicted to help offset lower forecasts in Europe and North America.

In constructing the detailed traffic forecasts, the North America – Asia Pacific, and Europe – Asia Pacific markets are broken down into smaller flows to give greater precision. Once again, two of the markets are based on airline domicile or classification. These are the CIS domiciled airlines, and the European airlines that are primarily non-scheduled leisure carriers.

Domicile	2008 RPKs (bn)	2028 RPKs (bn)	Average annual growth rate
Europe (excl CIS)	1,330	2,823	3.8%
North America	1,402	2,662	3.3%
Asia Pacific	1,242	4,308	6.4%
Africa and Middle East	383	1,208	5.9%
Latin America	221	599	5.1%

Market	2008 RPKs (bn)	2028 RPKs (bn)	Average annual growth rate
Within North America	969	1,642	2.7%
Within Europe	527	947	3.0%
Europe Leisure Airlines	166	247	2.0%
Within Asia Pacific	582	1,713	5.5%
Within China	241	1,186	8.8%
Within India	39	213	9.4%
Within Africa and Middle East	111	313	5.3%
Within Latin America	126	361	5.4%
North America – Europe	441	841	3.3%
North America – Asia Pacific	271	797	5.5%
North America – Latin America	155	378	4.6%
Europe – Asia Pacific	331	1,075	6.1%
Europe – Africa and Middle East	251	720	5.4%
Europe – Latin America	171	423	4.6%
Asia Pacific – Africa and Middle East	150	560	6.8%
CIS Airlines	144	414	5.4%
Others	47	180	7.0%
World Total	**4,722**	**12,013**	**4.8%**

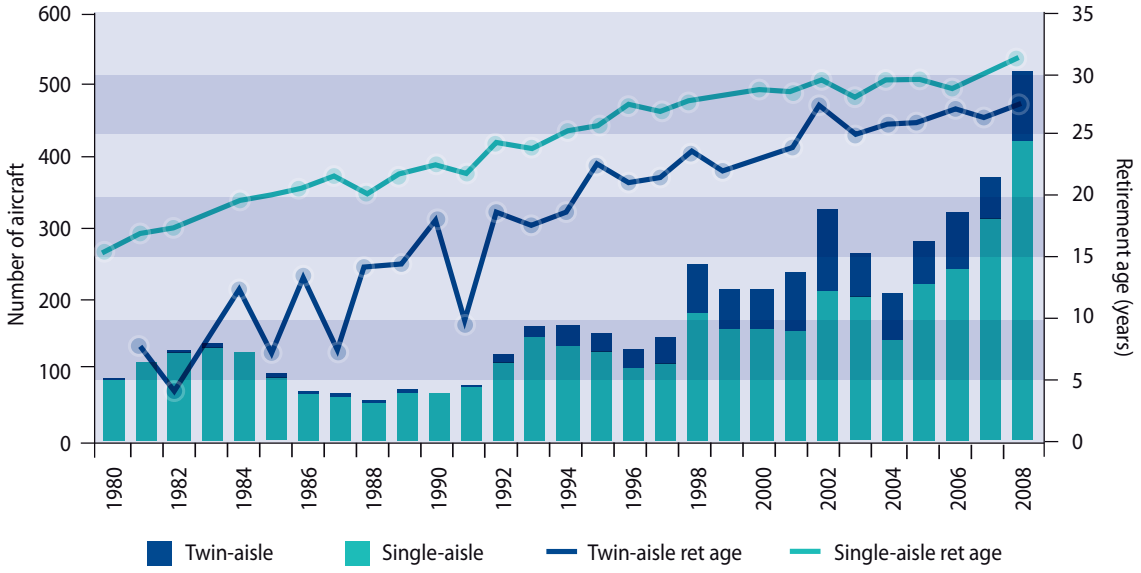
Fleet development

Influence of retirements

Replacing older aircraft is becoming a more important element in driving new aircraft deliveries. Forty-six per cent of the mainline aircraft deliveries, and 55 per cent of the regional deliveries are to replace older aircraft retired over the next 20 years.

The age at which aircraft are retired appears to be levelling out, although it is not decreasing. Factors such as higher fuel prices, increased aircraft utilisation, and the desire of airlines in developing countries to purchase new aircraft have influenced this trend. 2008 saw 530 jet airliners retired, beating the previous highest of 400 in 2007.

Jet airliner retirements 1980-2008



	2008 fleet	Retirements	Deliveries	2028 fleet
Very light jets	417	39	6,140	6,518
Small business jets	7,694	4,869	8,187	11,012
Medium business jets	6,516	5,031	10,958	12,443
Large business jets	2,151	1,475	9,205	9,881
Business jet total	**16,779**	**11,415**	**34,490**	**39,854**
30-50 seats	3,689	2,785	1,695	2,599
70-90 seats	1,769	810	4,843	5,802
Regional aircraft total	**5,458**	**3,595**	**6,538**	**8,401**
110 seats	1,428	1,232	1,307	1,503
130 to 180 seats	9,283	5,762	14,426	17,947
200 and 250 seats	1,397	976	3,362	3,783
300 and 350 seats	1,340	1,063	3,109	3,386
400+ seats	528	506	935	957
Freighters	1,639	1,358	797	1,078
Mainline aircraft total	**15,615**	**10,897**	**23,936**	**28,654**
Grand total	**37,852**	**25,907**	**64,964**	**76,909**

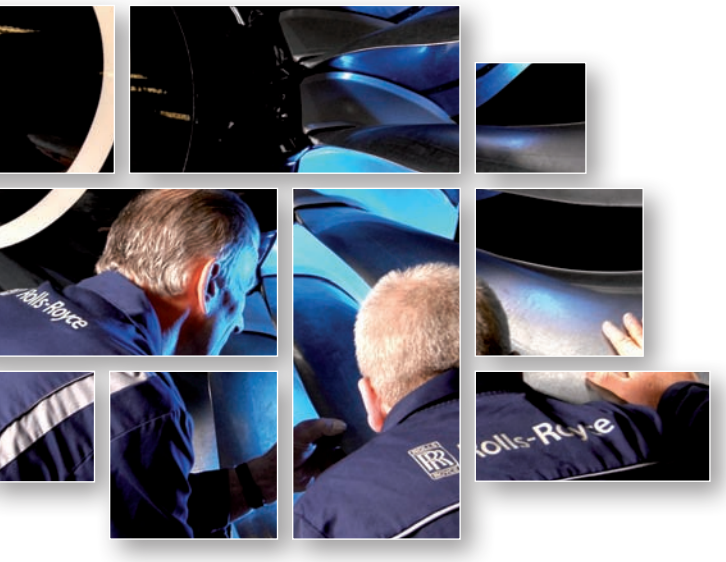
Note that the totals for freighters are only for western-built jet types. The 2028 freighter fleet includes deliveries of converted aircraft.

Engine deliveries

Performance is valued

Airlines continue to place value on performance and flexibility. Within each market sector, it is clear that there has been a trend towards higher performance aircraft and engines.

Business jets have seen range and size increases, turboprops have been made faster, and single-aisle aircraft now have US Transcontinental range. Engines for twin-aisle aircraft have been developed that have improved 'hot-and-high' performance, and the aircraft themselves have increased in range capability. The growing importance to airlines of the incremental revenues derived from belly hold cargo has further driven twin-aisle range capabilities.



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Engine delivery value ($bn)

Category	2009-2018	2019-2028	Total
Turboprops	3	3	**6**
<3,000lb	4	3	**7**
3,000 – 6,000lb	5	8	**13**
6,000 –10,000lb	17	29	**46**
10,000 – 22,000lb	35	47	**82**
22,000 – 45,000lb	112	131	**243**
45,000 – 75,000lb	80	62	**141**
>75,000lb	98	186	**283**
Total	**354**	**468**	**822**

Engine delivery units

Category	2009-2018	2019-2028	Total
Turboprops	1,666	1,426	**3,092**
<3,000lb	7,950	8,103	**16,053**
3,000 – 6,000lb	5,234	9,161	**14,395**
6,000 –10,000lb	10,280	17,371	**27,651**
10,000 – 22,000lb	10,633	16,515	**27,148**
22,000 – 45,000lb	15,307	17,760	**33,067**
45,000 – 75,000lb	4,507	3,364	**7,871**
>75,000lb	4,310	7,595	**11,905**
Total	**59,887**	**81,295**	**141,182**

Acknowledgments and further information

The forecast includes Russia, and includes commercial airliners in passenger, cargo and combination / quick change roles, plus business jets in VIP and corporate use. The regional aircraft forecast includes turboprops with more than 20 seats. Further presentations and reference material is available on the Rolls-Royce website.

Data sources

Fleet data: Ascend Worldwide fleets database

Schedules data: OAG Airline Schedules

Traffic data: IATA, ICAO, AEA, ATA, AAPA, CAA, ALTA, CAAC

Business jet market: Forbes, Capgemini, Merrill Lynch

Rolls-Royce analysis

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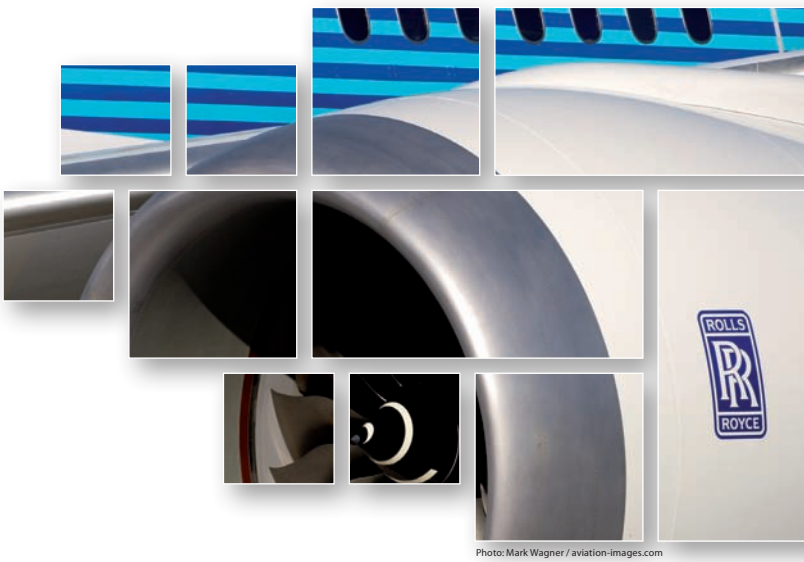
reliability integrity innovation



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