AIR TRAVEL AND THE ENVIRONMENT: FINDING A BALANCE

1. Introduction

Travel by air is becoming almost as commonplace in the 21st century as walking was for our ancestors. Whether on business or for pleasure we fly, at the click of a mouse, to the four corners of the earth. Furthermore, thanks to travel search engines and low cost airlines, we even decide to go, not to a **place of choice**, but **to where the cost is least**. These are extraordinary freedoms. Air travel and airfreight are, at the same time, sinews of a growing, internet-linked, just-in-time, global economy. The growth is explosive. Since 1949, the birth year of the first passenger jet, air travel has grown seventy-fold.

Britain has always been a world leader in aviation. Today through its airlines, aerospace industries, its role in new thinking about air safety and security, and the great international hub of Heathrow, the country is a global player. But this position has not been won without cost to the environment. Britain's skies are noisy, its airports are hotspots of pollutants emitted by both planes and surface vehicles and as the number of flights increases, so do the acres dedicated to and blighted by aircraft operations. Yet compared with many of our Continental neighbours, where airports have been built or expanded to match demand, we have used operational efficiency to squeeze more and more use from existing runways. Since the end of the Second World War, the only completely new runway to have been built is Manchester's number two. The London airport system is, as a result, one of the most constrained in the world.

Constraint means congestion and with it delays, unreliable services, reduced efficiency, increased pollution and waste. Airlines lose revenue and costs rise for travellers, airports and all involved in flying. Such a situation is dangerous. Unless congestion is met by investment in new airport capacity there is a risk that Britain's air transport industry will become less competitive leading to damage to the economy.

The forthcoming aviation White Paper will provide Government with an opportunity, for the first time in twenty years, to set out a new direction for air transport policy and to make long-term provision for airport capacity. There are political problems. Let no one doubt that growth of air travel conflicts with protecting the environment so development must be sustainable in the broadest sense.

This paper seeks to show the economic and environmental costs and benefits of airport expansion. It also reviews developments in technology and regulation that have potential to cut environmental costs. The heat and light generated by this paper will, in turn, be fed by the Institute into an aviation review and conference to be run in 2004 with QinetiQ, Europe's largest research and technology solutions provider, formerly part of the UK government's Defence Establishment Research Agency.

Summary – the scope of the aviation review

Looking ahead 20 years, but identifying actions needed now:

Air traffic forecasts. Often wrong in the past, we aim to find ways to get them right. How will travel grow and change? What balance will emerge between flying point to point and via a hub? What are the relative prospects for London and provincial airports? Answers to these and other questions will provide evidence on which to base conclusions about the future.

Environmental damage and technical fixes. What are the prospects for noise and jet emissions? How will environmental damage be offset by new fuels, new engines and new control technologies? How big will be the gap?

Airport futures. Which passenger and freight airports are set to dominate the future? How will people get to and from them? Who will pay for access infrastructure? Will security problems persist?

Regulation. What future for regulation? Will power shift from the European capitals to Brussels? Will economic instruments predominate?

The review, which will aim at a holistic view of air transport, will be steered by experts from airport management and support services, air traffic control, inter-modal surface access, aerospace, the airlines and representatives of commercial and leisure travel.

2. Aviation and the British economy

Aviation contributes to the British economy via air transport industries that employ over 500,000 and through firms, ranging from exporters of medical technology to travelling businessmen, which make use of their services. Aviation's growth has been the result, in turn, of the expansion of national and global economies which has led first to the movement of more goods and people, and, second to a fall, in real terms, of freight tariffs and travel costs. The emergence in Britain of Europe's largest set of air charter firms is just one reflection of this growth. Wider benefits include stronger international trade links, wider transfer of research findings and speedier responses to natural disasters.

A more detailed examination of how aviation affects the national economy reveals that airlines, airports and their supporting services make *direct* contributions; *indirect* contributions are made by off-airport activities such as hotels and tour operators; while decisions, for instance, to place investment in Britain because of its air links, count as contributions that are *induced*. It is particularly noteworthy that "knowledge-based" jobs – a highly significant component in the new economy – tend to be those that can locate anywhere and are thus highly responsive to the availability of a good air transport hub. It should, furthermore, be noted that growth in air transport in the UK has taken place in a more open market than on the Continent.

Aviation jobs.   Reference has already been made to the 500,000 jobs that depend directly or indirectly on aviation. Expansion in air transport can be expected to cause this total to increase or, at least, to remain stable. But should Britain lose ground to France, Holland or Germany then a decline in such jobs must be a possibility.

Aviation Passengers. The Government forecasts that demand for air travel in southeast England will rise from 117 million passengers in 2000 to about 200 million in 2015 and 300 million in 2030. Despite larger aircraft and developments in air and ground traffic control, it is not expected that this growth could be handled on existing runways. Additional capacity at Heathrow, Gatwick and Stansted, or even a new airport in the Thames Estuary, are therefore under consideration.

Britain, as a gateway to Europe for the Americas, India and elsewhere, handles multitudes of transit passengers who in turn help raise the occupancy (and profitability) of connecting European and domestic flights. Nearly 200 million passengers transited in 2002 and over a third passed through Heathrow. London's hub airport, and the operating base of British Airways, accordingly handles more international passengers than any other airport in the world. Paris, Amsterdam and Frankfurt, all of which have recently seen heavy investment, eye this business jealously.

Aviation and Commerce. About a third of Britain's exports, worth some £60 billion, are air freighted every year while businessmen and women make about 6 million flights. Both activities contribute to the country's gross domestic product. Reliance on air transport has, furthermore, increased steadily over the years and there is little reason to expect this trend to turn. It follows that Britain's interests are best served by a prosperous aviation sector that seeks to meet demand for its services. To what extent the White Paper will enable this growth to be met and how its environmental impacts will be abated, will therefore be central to the long-term health of the British economy.

3. Environmental impacts and technical solutions

Everyone accepts that aviation's environmental damage must be minimised and its further growth made 'sustainable'. Emissions trading within and between industries is, meanwhile, increasingly seen as the best way to internalise the external costs of air transport all other activities. Trading promises to reduce pollution overall by eliminating first those sources that can be most inexpensively terminated while leaving those responsible for hard-to-treat emitters, such as aircraft, with time to develop the means to do so.

Environmental issues are, however, becoming ever more pressing. Not only is aircraft noise at airports generating increased opposition but pressure on governments and industry to cut greenhouse gasses mounts apace. Today's jet engines may be less noisy and more fuel efficient than their predecessors but, because there are so many more of them, fuel consumption and the noise affecting people living near airports are greater. It is thus far from true to say that technical progress has cut the overall environmental impact of aviation.

Reducing noise. The most contentious aspect of airport expansion is noise. Airports both attract and repel. Over time people are attracted by the prospect of jobs to live nearby. Meanwhile flight numbers grow and airport owners, in order to maximise the use of their costly assets, push as far as they can for 24 hour operation. None of this makes them good neighbours as demonstrated by recent legal actions against night noise in London.

Engines themselves are one source of aircraft noise but, as an airliner comes in to land, so is the roar of turbulent air over flaps and, above all, landing gear. The International Air Transport Association can claim that the average aircraft is now 20 decibels quieter than 30 years ago but if, on landing, the interval between successive flights shrinks, the exposure to noise of those underneath remains at best constant and at worst it is increased.

Containing noise is a major challenge for air transport. Three kinds of action are possible.

> Land use planning may be used to put distance between people and flight paths.

> Air traffic control can be used to route aircraft via the least populated flight paths – though this can increase fuel consumption and carbon emissions.

> Noise can be reduced at source by changes in engine design and aircraft aerodynamics.

Noise prospects. Future aircraft are forecast to be substantially quieter than the quietest models of today. NASA's 'Quiet Aircraft Technology' programme, for instance, aims to reduce the perceived noise of future subsonic aircraft by 50 per cent in ten years and 75 per cent in 25. But noise could be cut more quickly by reducing the age of the aircraft fleet. Given that the 'noise footprint' of today's new jets is less than 15 per cent of the oldest in use, updating the fleet would be highly effective. However this would cost money and is not happening. Although the world aircraft fleet has tripled in size over the past 25 years its average age has remained at about 11 years.

Noise from aircraft is regulated by the International Civil Aviation Organisation that requires all new aircraft models to undergo 'certification'. Since 1971 this process has required Boeing, Airbus and others to meet steadily higher standards and from 1st January 2006, Chapter 4 certification will require aircraft to be 10 decibels quieter than those built to comply with Chapter 3.

Reducing fuel consumption and emissions. Modern jets burn kerosene and together consume 3 to 4 per cent of fossil fuel production. When burnt in a jet engine kerosene produces carbon particles, water vapour (which create condensation trails) and nitrogen oxides. These pollutants help to turn airports, and any communities adjacent to them, into hotspots of emissions. Aero engine pollutants are an added concern because, emitted at high altitude, they make a particularly powerful contribution to climate change.

Fuel consumption per passenger mile has been cut by 70 per cent since the dawn of the jet age thanks to larger and sleeker aircraft and to less thirsty engines. More economical turbines account for half this gain. Airlines welcome such efficiency, as much because it saves them money and reduces their exposure to oil price fluctuations, as for its green contribution but is an illustration of how profits and environmental protection can go hand in hand. However there is no gainsaying the statement that, given continuing growth in air travel, reducing the local and global environmental risks of aircraft emissions is a profound challenge.

Economy and pollution prospects. New technologies are in train that offer some prospect that carbon and water vapour emissions can be reduced. Three developments in particular are worth mentioning.

> New communications, navigation and traffic management technologies could enable aircraft to take more direct routes, avoid the waste of stacking and time spent with engines running on the ground.

> New lightweight materials promise both to cut aircraft weight and allow the forming of more aerodynamic wings and fuselages. Modifications such as wing tip extensions can also contribute to economy.

> Replacing fossil fuel is the third possibility. In the longer term hydrogen engines may power radically different aircraft from those of today – an event that America's desire to free itself from dependency on foreign oil may hasten. In the meantime there is scope for using electric fuel cells, already used in unmanned military aircraft, as auxiliary power sources for, say, aircraft equipment and lighting,

Meanwhile the International Civil Aviation Organisation is looking at emissions trading, environmental taxes and other economic instruments because of their promise to more effective in the near future than other forms of regulation or new technologies.

Congestion. Congestion in the air and on the tarmac, because it prolongs engine running, adds to noise and gas emissions and to inefficiency in general. Delays to aircraft can result from:

Restrictions as ordered by traffic managers on the use of air space

Lack of runway space and taxiways, or other constraints, on the ground.

Security controls at aircraft terminals.

Government agencies and aviation regulators are increasingly aware that they, as managers of airports and their associated traffic management systems, have a role in reducing congestion and, with it, environmental impacts. This is leading to the design of air traffic control systems that allow aircraft to fly safely at closer intervals and traverse inhospitable terrain. On the ground better surface radar, mixed-mode operation of parallel runways and techniques that replace the downtime needed to keep runways clear of debris, can all increase the efficiency of operations. Another useful innovation is the use of Lidar to plot the atmospheric vortices created by large jet engines. This enables the distance between successive aircraft to be reduced.

Delays at terminals due to security checks can, likewise, be reduced by technologies that enable passengers to be scanned for hidden weapons while they are walking. Another antidote to the delay of queuing is automatic check-ins. The equipment needed for such procedures is, of course, expensive, but, to the extent that it can get more use from existing terminals may, by postponing the need for airport expansion, bring environmental benefits.

4. Emerging options

No case for inaction. The Government has made clear that, when considering Britain's lack of airport capacity, 'doing nothing is not an option'. Meanwhile growth in air travel is putting increasing pressure on existing airports and creating demand for additional runways – particularly in southeast England. If, as seems likely, the idea of a new airport on the north Kent coast is rejected, Ministers will have to reconcile elsewhere conflict between demand for travel and protection of the environment.

Responding to demand. While new airports, runways and their associated technologies all expand the supply of air travel, the demand side is the best place to tackle their environmental impacts. The growth of low cost airlines, for instance, has led to a boom in flying. Why not use pricing to internalise its environmental damage? Putting the growth of air travel into a market context that includes the cost of environment damage is the fairest way of responding to demand. The frequent suggestion that take-off and landing slots be auctioned however needs to be treated with caution: if the UK acted alone there would be an asymmetry in its impacts on airline costs using UK airports.

More runways? BAA, the owner and operator of Heathrow, Gatwick and Stansted, has proposed the construction of three new runways (from a choice of four) and rejected, on economic and environmental grounds, the idea of a new airport at Cliffe on the Thames Estuary. Whether this would meet demand for travel and enable Britain to compete in the long term with Paris, Charles de Gaulle and Schipol at Amsterdam is unclear but it is hard to see why not.

Airport to city links. Airports have to be linked by roads and railways to the places they serve. If Cliffe is rejected in favour of expanding some or all of London's existing airports, some existing railway and motorway links will have to be expanded and upgraded. Whichever airports are chosen for expansion, it will be important to set their added capacity in the context of policies for multi-modal surface access.

The growing environmental impact of air transport has, in recent decades, been minimised by means of new aircraft technologies and operating procedures. The industry has, at the same time, recognised that actions which reduce the waste and costs associated with congestion in the air and on the ground are not only commercially beneficial but, by increasing the use of existing airports, reduce the need for new sites that would further spread the nuisances of noise and air pollution.

Further technological innovation is thus a key to meeting demand for air travel. Britain, as exemplified by its pioneering role in radar and commercial jet aircraft, has a good track record in this field. No opportunity should therefore be lost to promote research that will lead to the development of other technologies. Only by technical leadership can commercial leadership be assured.

5. The way forward

Britain needs a prosperous aviation industry but if it is to have a promising future certain requirements need to be met.

> Safety must be the first priority. Initiatives designed to reduce noise, pollution and congestion should at least maintain, and if possible enhance, current standards of safety for passengers and those living near airports.
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> Environmental damage must be reduced. Every available opportunity should be taken to promote new aircraft and communications technologies that can reduce noise and gas emissions through raising fuel efficiency and reducing drag.
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> Demand for travel should be acknowledged. Runway and airport capacity must be increased to meet demand and avoid the commercial and environmental costs of congestion.

Jet airliners made flight safer, faster and less costly and enabled increasing numbers of people to go abroad. Radar made a corresponding contribution to the management of airspace by combining safer operations with increased capacity along the air lanes and on runways. These examples show how improvements in economics can go hand in hand with added safety. The next generation of technological developments must make comparable contributions to protecting the environment.

The key to sustainable aviation is investment designed to release the benefits of new technology and infrastructure. Investment is needed in research, new equipment and well-founded planning. The aim must be for Britain to maintain the position it has established in air transport over the past 50 years. The role of the forthcoming White Paper on aviation will be to lay the foundations of such a future.

Reconciling growing demand for passenger and freight movement with protection of the environment is the great challenge. The Adam Smith Institute believes that, thanks to its capacity for new thinking on political and regulatory issues, it can, in conjunction with QinetiQ, a leader in aviation technology, make a contribution to finding a sustainable balance.

Over the coming year the Institute will mount a series of events designed to stimulate this search and to bring to the attention of Government, industry and the public, practical solutions to this and other problems highlighted by the White Paper.