Ric Parker, Rolls-Royce Director of Research and Technology, talks about what the Group is doing to tackle the environmental impact of air travel.

Climate change AND AVIATION

Q How is the aviation industry addressing climate change?

A People around the world are rightly concerned about the impact of climate change and global warming caused by increasing amounts of man-made carbon dioxide (CO_2) in the atmosphere. Rolls-Royce products have a role to play in mitigating this trend.

Aviation currently accounts for only about two per cent of man-made CO_2 emissions. By comparison, power for electricity and heat contributes over 30 per cent globally.

World aviation continues to grow at a compound rate of three-four per cent per annum. But aviation empowers the world economy and drives social interaction, facilitating growth, energising world trade and creating wealth. To limit aviation would be to limit opportunity, so it is important that the aviation industry does what it can to reduce the environmental impact of both its products and operations.

Q So what is Rolls-Royce doing about it?

A One of the exciting things about being an engineer is that you can genuinely make a difference to real world problems like climate change.

At Rolls-Royce we spend over £900 million a year on research and development, two thirds of which contributes to the improved environmental performance of our products. We deliver key technologies so we can design and build engines which reduce the amount of CO_2 produced while also reducing other emissions and noise.

Reducing emissions, reducing noise and improving fuel efficiency are the 'big three' environmental priorities we focus on during the initial design stage of any engine. As a result, each generation of engine is cleaner, quieter and more efficient than the last.

Q But what is Rolls-Royce doing right now to make a difference?

A The world's latest and most advanced civil aircraft – the Boeing 787 Dreamliner and the Airbus A350 XWB – have selected Rolls-Royce engines.

The Trent XWB, which will power the Airbus A350 XWB, hasn't entered service yet but it is already promising to be the most advanced large civil aircraft engine on offer in the world. It uses 3-D aerodynamics, a low-emissions combustor, and weight saving technology like the blisk (bladed disc) technology in the compressor and a lightweight titanium fan to reduce fuel consumption. As a result, the Trent XWB will deliver a 16 per cent improvement in fuel efficiency compared to the first Trent engines to enter service.

On the Trent 1000, which powers the Boeing 787 Dreamliner, we have used the latest computer based techniques to design 3-D aerodynamics for fan blades and compressor and turbine aerofoils making them more efficient and less noisy. The Trent 1000 is 12 per cent more efficient than

the Trent 800, which entered service on the Boeing 777 in 1996.

If, overnight, we could replace an entire previous generation of planes, for example the Boeing 767, with the 787 we could save over US$1.5 billion in fuel costs and five million tonnes of CO_2, every year.

Q What does the future hold?

A In March 2011, Rolls-Royce with other European aerospace leaders launched Flightpath 2050. This sets out some very tough, long-term environmental goals for the industry. Compared to a new aircraft in 2000, by 2050 the aim is for new aircraft to reduce CO_2 emissions per passenger kilometre by 75 per cent, emissions of Oxides of Nitrogen (NOx) by 90 per cent and the perceived noise of flying aircraft by 65 per cent.

Rolls-Royce has future research programmes aimed at reducing fuel burn and hence CO_2, reducing emissions of NOx, as well as reducing noise. We are also studying technologies for more radical novel engine architectures, such as the Open Rotor, with much more ambitious targets for reducing fuel consumption.

Q How do you find these 'game changing' technologies?

A Over more than 20 years Rolls-Royce has established a global network of 28 University Technology Centres (UTCs). The network publishes around 400 technical papers each year and contributes to the over 450 patents the company applies for annually.

The company's manufacturing engineers also work with academics and industrial partners, in a network of advanced manufacturing research centres to find ways of turning research breakthroughs into high-tech components which can be mass-produced efficiently and effectively.

Rolls-Royce collaborates in numerous national and international long-term research programmes. In the last few months, the UK Government has announced over £80m of investment into research programmes in product and manufacturing technologies for Rolls-Royce and its partners.

The company was one of the 12 founding partners in the EC-funded, 'Clean Sky' Joint Technology Initiative which has a budget over seven years of €1.6 billion and involves 86 organisations from 16 countries.

Q What is the rest of the aerospace industry doing?

A Advances in airframe technology, such as the use of composite materials in the fuselage and wings of the Boeing 787, are making an important contribution and will continue to do so. When combined with an engine, like the Trent 1000, optimised for that specific airframe, the benefits are even greater. Improved air traffic management and operations also has a role to play by reducing journey times, and so fuel burn.

Never has teamwork been so vital. The entire industry must work together, pooling innovation and applied research in both products and processes. Aviation is vital for society and the world economy so it is important that the aviation industry does what it can to reduce the environmental impact of both its products and its operations.

Author: Simon Kirby is part of the Rolls-Royce communications team in Derby. He has previously worked in communications roles across the public sector.

The Trent 1000 provides efficient power for the Boeing 787.

An artist's impression of how the future of air travel might look.