

# Ensuring the environmental sustainability of General and Business Aviation

Although General and Business Aviation produce relatively low levels of CO<sub>2</sub>, they are still trying to reduce this even further. **Pat Malone** reports



While commercial aviation has become the *bête noir* of the green movement, General and Business Aviation (GA and BA) have attracted their share of the attention, although the amount of fuel the sector uses is minuscule by comparison.

Business jets, which comprise almost 8 per cent of European Instrument Flight Rules traffic, produce less than 1 per cent of emissions. Piston-engine aircraft, while outnumbering jets by ten-to-one, are estimated to use less than half of 1 per cent of the fuel that evaporates from car fuel tanks. Today's aircraft are 30 to 40 per cent more efficient than those of a generation ago. Nonetheless, for economic as well as environmental reasons, much effort is being expended to cut emissions further, and to perfect new engines and fuels for GA.

European business aircraft are generally younger than their airline counterparts – an average of eight years old, as opposed to a commercial average of 18 – and are quieter and more fuel-efficient than older jets. They fly less – an average of 500 hours a year, compared to an airliner's 3,000 – and they fly on task rather than on schedule, carrying no 'non-revenue' seats. Unlike the airlines, which overwhelmingly service the leisure industry, they are solely business-orientated, and they are vital to the economy. They take their environmental responsibilities

seriously; the largest operator, NetJets, runs a voluntary carbon offset scheme, as do many smaller companies.

However, BA faces a double blow from increased fuel taxes and mandatory emissions trading. They are uniquely disadvantaged by EU legislation due to be introduced in 2012, which allows commercial business aircraft operators who emit fewer than 10,000 tonnes of emissions to be outside ETS, but requires corporate owners of jets to pay for everything even if they only operate one aircraft. Furthermore, tracking of emissions threatens to be complex and bureaucratic. Brian Humphries, President of the European Business Aircraft Association, says: "We would prefer an alternative means of compliance so that rather than tracking every flight and calculating carbon output for every type of aircraft, we contribute on a simplified basis. We know we must pay our environmental way, and we do, but the system that is proposed will be very costly to administer."

## FUELLING THE DEBATE

Fuel for piston-engine aircraft – called Avgas – is a 'boutique' product that refineries are less and less willing to make. Where a Boeing 747 captain might put in an extra tonne of Jet-A1 fuel just for taxiing to the runway, a training aircraft will use perhaps 20 litres of Avgas an hour. Only three major

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European refineries still make Avgas, and lack of refinery capacity is one of the drivers of change in the GA fuel market.

Piston-engine aircraft are the last major users of leaded fuel and because of its lead content, Avgas is deemed to contaminate everything it touches. Pipelines, ships and road tankers used for Avgas cannot be used for other fuels without prohibitively expensive cleaning. Refineries must have dedicated distillation towers, tanks and jetty pipes for Avgas, or must be taken off-line for cleaning after an Avgas production run. Avgas cannot be taken through the Channel Tunnel or transported on conventional ferries. At airfields, it cannot be stored in tanks used for any other fuel. Yet general aviation cannot run without it. High-performance Lycoming and Continental

engines are manifestly unsafe when run on anything else.

Avgas needs lead because it must have a high octane rating, which reduces the 'detonation' that can damage or destroy an engine. Tetra-ethyl lead (TEL) for Avgas is produced by only one company, Innospec, at a plant in the United Kingdom, and although the company says it will continue to produce TEL "as long as there is a market", it is a vulnerable link in the supply chain. The lead deposits left when TEL is burned are corrosive and damaging and must be scavenged, and in Avgas the agent that does that is ethylene dibromide (EDB), a chemical banned by the Montreal Protocol of 1987, signed by every EU country, largely because of its effect on the ozone layer. Unlike car fuel, Avgas must be proven to

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withstand rapid and extreme temperature and pressure changes and must pass tests of its ability to remain in storage for long periods.

Much research is going into the provision of alternatives, particularly in the United States. Unleaded Avgas is produced in Sweden and can be used in many lower-powered engines. It is even more difficult to make, achieving the required octane rating without resorting to TEL, mainly by using extraordinarily high-quality ingredients and the most stringent quality control methods. Widespread adoption of unleaded Avgas would require duplicated fuel facilities at aerodromes, as leaded fuel would still be needed for higher-performance aircraft.

Diesel engines are being developed to replace Avgas engines – they'd run on jet fuel – but the birth has not been easy. One of the most successful, the Centurion, is produced by the German company Thielert and drives the Diamond DA42 twin. Thielert recently filed for bankruptcy, a reflection in part of the expense of getting new engines through the regulatory process that ensures they are safe. In theory, lower taxes on Jet-A1 make it economically feasible to re-engine with a diesel and recoup the outlay over a period of years, although pending changes in the taxation regime in countries like the UK are likely to remove that incentive.

The move towards biofuels is not attractive in aviation. Fortunately, the EU is rowing back on its insistence that biofuel content be increased. An ethanol derivative called ETBE has some

promise and is being tested in Germany and Sweden.

#### REDUCING NOISE LEVELS

Fuel aside, noise is a major environmental concern for aircraft owners. In General Aviation aircraft, the propeller accounts for about half the noise, the engine somewhat less. The European Aviation Safety Agency (EASA) is smoothing out anomalies that prevented some owners from making aircraft quieter. In Germany, for instance, engine silencers have long been mandatory on aircraft like the Cessna 172. In the UK, however, they were illegal, and German aircraft could not be imported without having their silencers removed. EASA certification means they are now legal in both countries and will be more widely adopted.

New propeller designs are coming to market. The propeller makes most noise when tip speeds approach the transonic zone, so a propeller with more, shorter, blades can be quieter.

Martin Robinson, Senior Vice President of the International Aircraft Owners and Pilots Association, insists: "The industry has an excellent track record of environmental improvement. It is expending a lot of money and effort on better technology and greater efficiency. However, regulators need to be careful not to retard that effort by poorly-targeted taxation and unnecessary stipulation."

GA and Business Aviation may have escaped the general public's attention so far but, like commercial aviation, it has been reducing its negative impact on the environment for decades. ●

