Lufthansa is pursuing projects aimed at integration of biofuels into its airline operations without any negative impact on performance or the bottom line.

**Michael Gubisch London**

Lufthansa was not among the first airlines that conducted biofuel test flights over the past few years. But being in the front row is not important, says Joachim Buse, vice-president of aviation biofuel at the German carrier. “We rather stay a bit more in the background... but have everything carefully worked out, with scientific support and, in the end, economically sensible results.” Last year, however, the Germans eventually taxied to the runway for their first partly biofuel-powered take-off – and nearly 1,200 departures followed as part of the airline’s “burnFAIR” long-term trial, with support from the German Aerospace Center (DLR) and federal ministry of economics and technology.

Between 15 July and 27 December 2011, Lufthansa deployed a newly delivered Airbus A321 (registration D-AIDG) on the route between Hamburg and Frankfurt, with one of the two International Aero Engines V2500 powerplants running exclusively on a 50:50 synthetic biofuel-kerosene blend and the other using conventional Jet A1. The aircraft made the approximately one-hour journey up to eight times per day and consumed 1,556t of biofuel in total.

The point was not to see whether the alternative fuel burns in gas turbine engines – that had been demonstrated before – but to evaluate its long-term impact on performance as well as powerplant and fuel system health. “We wanted to make sure that we can safely fly on biofuel without problems,” says Buse. “It makes no sense to plan further steps if biofuel leads, for example, to higher maintenance.”

The test not only confirmed that the jatropha, camelina and animal fat-based mixture has no negative side effects on equipment and operations – it even showed a 1% lead in specific fuel consumption because of its higher...
energy density over Jet A1. Biofuel is among the most promising means to cut aviation carbon dioxide emissions, with a potential to improve the CO2 balance by up to 60%, says Buse. But it also offers an opportunity to reduce the industry’s dependence on fossil fuels and global oil-price fluctuations in the long term. The challenge is finding a way to supply the future fuel in sufficient quantity.

OPEN FIELDS
A member of Buse’s team, which has been working on Lufthansa’s biofuel strategy since three years ago, travelled to Russia in early June to inspect camelina fields in the Volga region, where the oil plant is being tested as a potential future crop. Local farmers tried to grow different sorts of wheat in the region, but abandoned a huge area of farmland over the past 10-15 years after numerous crop failures. While oil mills have yet to be built to process the crops, he says that the area looks “very promising”. The plants oil yield would also need to be enhanced through modern growing techniques. But given that camelina is a well-understood traditional European agricultural plant, Buse sees no technical difficulties in employing the species.

Aside from providing local farming communities with a more stable economic source and the opportunity to establish a new industrial infrastructure, another advantage of re-utilising former agricultural land is that no compensation areas for biodiversity would need to be established. This would be required if untouched natural areas were to be converted to grow biofuel crops. Buse says that biofuel production should not lead to large monocultures.

Lufthansa is also looking elsewhere for potential areas to grow oil plants. “We believe we should combine a portfolio of different [growing] methods and raw materials to achieve a more stable supply situation,” says Buse. “Africa still offers very good field availability in the semi-arid, subtropical zone.” Such areas would be suited to grow jatropha as the climate is too warm for camelina.

The airline is partnering with universities and associations around Germany’s ministry for economic cooperation and development to combine its biofuel objectives with policies to establish viable and beneficial agricultural infrastructures for the local communities.

Buse has no illusions that biofuel will replace fossil-based kerosene anytime soon. He thinks that employing 5% biofuel within five to seven years is feasible, while conventional Jet A1 will remain the main power source over the next 20 years. The main hurdles are locating enough agricultural land that is not suitable for growing food crops and establishing an integrated supply chain for biofuels.

“We should combine a portfolio of different growing methods and raw materials to achieve a more stable supply”
JOACHIM BUSE
Vice-president of aviation biofuel, Lufthansa

While the fossil oil industry has a long-established integrated infrastructure – covering all stages from exploration to distribution – the biofuel sector is fragmented. Oil plant growers are not linked up with biofuel refiners, who in turn have little contact with consumers. The existing bio-diesel business for ground vehicles is largely determined by intermediate traders who deal with raw materials in spot markets, says Buse. “Today, the end user is the only one [in the aviation biofuel supply chain] who is able to provide security that the final product will be taken up by the market.”

FLOWERING FINANCES
While airlines will have to play a new role as their own fuel suppliers, Buse is confident that the necessary capital to establish such activities can be secured. Given Europe’s economic woes and the fact that government bonds have somewhat gone out of fashion recently, financiers are looking for new investment opportunities – and the agricultural sector has not been fully exploited yet. “We are in the comfortable position that the required funding is available from investors who are seeking long-term opportunities with average but safe returns.”

Fuel additives are being developed, which should simplify the use of synthetic bio-kerosene in future. The mixture ratio with Jet A1 – currently limited by the standards authority ASTM International to a maximum 50:50 blend – depends on the fossil fuel’s conditioning. If, for example, the Jet A1 sulphur content is low, it may not be mixed half and half with biofuel. Buse expects, however, that additives will become available in the next three to four years, which will allow using 100% bio-kerosene in aircraft. This will not only make the current safety-critical blending step obsolete, but also facilitate combined storage and distribution with conventional Jet A1.

CUSTOMER BEHAVIOUR
Changing customer behaviour is one of two main factors driving Lufthansa’s biofuel strategy. Pressure to make air transport more environmentally friendly has grown most strongly in the airline’s cargo division, because commercial customers want to improve the green credentials of their goods and services. But the trend is set to continue in the passenger business, not only from private travellers, who demand more responsibility toward the natural world, but also corporate clients who want more sustainable flights for employees, says Buse. “Today we can still put this off for a bit and claim that we would like to become more environmentally friendly, but the [biofuel] supply is not yet available. But pressure to become more engaged is unquestionably in the market. And I believe a customer-oriented company is best advised to respond to customer expectations.”

The other main driver is the desire to secure a long-term alternative fuel supply to become less subjected to the volatile oil market. Buse expects the price for Jet A1 to rise no matter how demand develops, firstly because exploration of new oil fields is set to become more expensive while the individual sources yield less return. The second reason is that kerosene competes with other kinds of fuel, such as vehicle or domestic heating fuels, in terms of refinery capacity. With living standards rising around the globe, Buse expects petrochemical products such as car fuel to become more profitable than kerosene for refineries. So the price of Jet A1 will need to go up for it to remain lucrative. “I don’t see that we cannot realise [the projected] aviation growth over the next 10 or 20 years because of a lack of fossil oil,” says Buse. “The question is more: will we still be able to afford it?”

Michael Gubisch tweets as @MR0eporter and writes news stories for our premium MRO channel: flightglobal.com/mro