Bio-overpower

Clean Tech Aviation's Ben Cappelle discusses biofuel blend solutions for general and business aviation

Test pilot Captain Ben Cappelle, CEO of Clean Tech Aviation R&D centre BV, discusses the biofuel blend and aviation engines retrofit solutions under development by CTA together with co-owner Xegasus Aviation Investment and with chemical knowledge from Eric Tierie. CTA's biofuel retrofit innovation is the engine used in co-operation with its partners Hines Canada and Jetwind Brazil to develop the General Aviation (GA) and Business Aviation (BA) innovative nine-seater aircraft that could operate with 20-50% less fuel costs.

Reduce emissions

CTA was founded in 2009 as an R&D centre for innovative developments on the GA and BA aircrafts and engine market. CTA is active in designing and manufacturing retrofits for piston and turboprop engines, executing its ground and flight test retrofitted engines using biofuel blends for the aviation piston Avgas and diesel engines and turboprop jet engines, achieving a new retrofit production and biotechnical servicing industry as well as developing the biofuel blends.

EU law requires commercial aviation to reduce its carbon emissions by 20% in 2020 or face fines. The key element, therefore, is developing cleaner fuels.

The aviation industry, stimulated by the Kyoto Protocol, aims to replace piston aviation fossil fuels such as leaded Avgas 100 LL and jet-engine fuels like Kerosene (a diesel-based fuel) with biofuel blends, thus producing the lower CO_2 footprints. The importance for aviation is that it has been shown the use of a fuel mixture of methanol/ethanol/biobutanoil and Avgas 100 LL or biodiesel and bio-kerosene are scientifically proven safe and can be certified with the aviation authorities.

Three elements are important for the change to happen: the certification of the various aircraft engines are initially required to

give the industry a choice in using these cleaner biofuel blends; secondly it has to be available at the various destinations where the aircrafts will start and land; and thirdly it has to be available at affordable prices, preferably lower, to allow the business case to be closed for the users over time.

Most of the attention focuses on the large commercial jetliners that cross oceans and continents. But the bigger issue may be the fragmented lower end of the market; planes that carry from two up to 20 passengers.

Small is fragmented

The lower end of the market – private owners, flight schools, and companies that fly business personnel on twin-engine propeller aircraft – is very fragmented and difficult to help. A large company like British Airways can help itself. Because such projects are out of reach for smaller flight organisations, we focus our knowledge on the lower end of the market. It's very diverse, but taken together represents large numbers. There are 500,000 to one million of those aircraft worldwide, and about 150,000 of those – of 2,200 different types – are in Europe.

If we take Rotterdam's 40,000 aircraft movements per year, and figure an average of perhaps two and a half hours per flight, the aircraft observed use a minimum 35 litres of fuel an hour. Overall, that's 3.5 million litres of jet fuel annually, just for Rotterdam. The industry is waiting for clean and cheaper fuel, and it's not being delivered by the fuel companies because there's no incentive yet.

In February 2011 a consortium including BA, Airbus, Rolls-Royce, Finnair, Gatwick Airport, IATA, and the UK's Cranfield University announced a project to produce algae-based fuel in commercial

quantities. But no fossil fuel companies were involved. In response, CTA decided to start at the bottom and make the engine available and make the biofuel blends ourselves. Then the change can be made and we believe in sustainable companies and partnerships.

CTA started, in 2009, the static and dynamic tests using a 30/70 blend of M85 Methanol with Avgas 100 LL executed using radial piston engines, which were designed in the past for using the then unstable aviation fuels. This proved successful with a 7% reduction in CO_2 emissions using this blend. Further tests under development require ignition timing adjustments and fuel lines and rubber replacements in the engine and aircraft systems, as well as engine and aircraft manuals adjustments. To address the moisture attraction of the alcohols, further testing is used to seek solutions using enzymes.

Bio-Energy

The extra power the blend alcohol fuels deliver proved ideally useful during starts and climbs using more fuel, but which is compensated for during cruise mode in which bio-power allows lower throttle settings to achieve the same speed/time formula. When tested with ethanol/methanol on piston aircraft engines, the results revealed significantly less wear to the engine than occurs with the use of Avgas. In other words, the life of the overhaul (revision) can lead to significant improvements in maintenance, which in turn benefits the owner, or operator. CTA flew its Bio Bird One rapid prototyping single engine transport aircraft in 2010 across the Atlantic Ocean, flying 5,000 miles, to prove that flying on a blend of Avgas 100 LL with M85 Methanol can be safely executed up to 10,000 feet.

CTA also plans to have the blended biofuels Bengaz and Benoil produced in co-operation with its biomass suppliers and recycled fuel from plastics by Pyroil commercially available in 2015. Further to have the retrofit packages, including a Cyclone fuel reduction ring tested and certified, on the various engines ready to use also by 2015. The biofuel blend solution can bring a reduction of 12-24% of fuel costs and up to 25% of CO_2 reduction to the aviation industry.

Innovative

The innovative nine-seater aircraft that the three parties CTA, Hines and Jetwind plan to build, will contain biofuel innovation from CTA, propeller innovation from Hines and design innovation from Jetwind and could represent a revolution in aviation by its cost reduction and carbon reduced footprint. It shall have a ceiling of 34,000 feet and speed up to 345 knots while reducing fuel needs by 30-50%.

We welcome additional private equity investors and crowd funding initiatives to help CTA and its partners transition the General and Business Aviation industry to develop cheaper and cleaner flights. By doing so we expect we can spread the knowledge worldwide in such a mode that the exchange from fossil fuels to biofuel blends with fossil fuels will help drastically reduce the carbon emission pollutions we see threatening our environment, while simultaneously lowering the operating costs. Aviation schools and SME MROs should sign in and reserve a launching customer place as soon as possible, guaranteeing you are able to serve your clients in saving costs and doing business

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