

Environment

Worldwide race for best bio- aviation fuel is heating up Special

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Adriana Stuijt | May 11, 2009
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The US aviation industry is leading the world's urgent race to find the best bio-fuel. Boeing, the World Wildlife Fund and leading airlines are funding Yale researchers who have been hard at work to develop a commercially-viable bio-aviation fuel.

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The increasingly urgent quest in the United States to green all the world's aviation fuel is funded by *Boeing Commercial Airplanes*, top airlines and the *World Wildlife Fund*. Its first research focus falls on two promising resources: the lowly jatropha bean and microalgae-derived biofuels. And some innovative private pilots aren't waiting for these results: with one company undertaking a successful, albeit somewhat smoky test-flight with a refitted Russian MIG across the U.S. fuelled only with recycled cooking oil last year.

It's logical that the search for the best bio-aviation fuel would be centered in the United States, as the world's largest airlines are primarily headquartered in North America: American Airlines has 615 commercial aircraft, Southwest Airlines 539, Delta Air Lines 443, United Airlines 395, Continental Airlines 380, US Airways 353, Lufthansa 350, Northwest/Delta Airlines 336, Air Canada 334, China Southern Airlines 299, SkyWest Airlines 280, Air France/KLM 620, British Airways 245, ExpressJet Airlines 244, Air China 222, and the two freight carriers FedEx Express have 672 airplanes and UPS Airlines 262...



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The average United States' usage of jet fuel was 21 billion gallons (80

billion litres in 2006).see

And that does not even include military aviation fuel.

The world's airplanes not only slurp up a lot of increasingly expensive aviation fuel, but also are major pollutants of the high-altitude jet streams, spreading their fuel-additives of alkylated phenols, dinonylnaphthylsulfonic acid, Corrosion inhibitors such as DCI-4A used for civilian and military fuels'; fuel system icing inhibitor agents and biocide - *added against bacterial colonies inside the fuel systems.*

It is claimed that the airline industry is responsible for about 11 percent of greenhouse gases emitted by the U.S. transportation sector, says Wikipedia without any citations however - while the airline industry also is said to emit 2 percent of the greenhouse gases.

Boeing estimates that the new biofuels could reduce flight-related greenhouse-gas emissions by 60 to 80 percent.

One solution: to blend microalgae-produced fuels with existing jet fuel:

see

Test flights are positive:

And test-flights are showing hopeful results: in December 2008, Air New Zealand ran a test flight with bio-aviation fuel made from a 50-50 mixture of jatropha plant oil and standard A1 jet fuel, from Tanzania to New Zealand. It says its first results were very encouraging especially at the high-altitude freezing temperatures: so they are going ahead with their programme to develop the inedible jatropha bean into a viable biofuel for the aviation industry. Digital Journal reported about this flight: [here](#)

Virgin Atlantic flew a Boeing 747-400 in early 2008 with one engine operating on a 20% biofuel mix of **babassu oil and coconut oil**.

And Continental Airlines completed the first test flight of a Boeing 737-800 partly powered by biofuel derived from **jatropha plant oil** (47.5%) and algae (2.5%) in January 2009.

On November 1, 2008, *Green Flight International* president and CEO Douglas Rodante and chief pilot Carol Sugars became the first flight crew to successfully cross the U.S. in a Mig jet powered predominantly on

environmentally-friendly Biofuel. "These flights prove that we have the capability of supplementing our energy requirements with safe, environmentally-friendly alternatives to petroleum," said Rodante. "And the Biofuel is produced in the U.S., which essentially negates our dependency on foreign fuel supplies."

Also, see [algae as biofuel](#):

This week Air New Zealand's chief pilot and general manager of airline operations Captain David Morgan, who undertook their first test-flight from Tanzania to New Zealand, said they are expecting the first results of these research programmes launched by Boeing Commercial Airplanes company and Yale university by the end of this year.

Boeing Commercial Airplanes company is funding the research programme on the desirability of jatropha oil as a bio-fuel by a team headed by [Assistant-Prof Robert Bailis](#) of Yale School of Forestry and Environmental Studies to analyse the carbon life-cycle properties of jatropha for aviation use.

And turning microalgae as a bio-fuel is also part of this research two-pronged programme. This highly

innovative research is moreover, backed up by the world's leading airlines.

Prof Bailis is well-qualified: for his dissertation research for instance, he explored the social-ecology of Kenya's wood-fuel commodity chain and teamed with colleagues at Berkeley and Harvard to develop quantitative models of public health and environmental impacts of residential energy across sub-Saharan Africa.

And he's worked with grassroots efforts in Africa, India, and Latin America to design and disseminate household stoves to try and reduce fuelwood consumption and human exposure to combustion emissions.

Quest for a certified bio-aviation fuel:

Captain Morgan of Air New Zealand told Digital Journal that the data from their biofuel test flight (in December) 'will be a critical component toward helping jatropha become a certified aviation fuel.'

The airline also is proud of the leading role it is playing: "We stand at the earliest stages of sustainable fuel development. Air New Zealand has

an active commitment to the development of biofuels and is proud to be playing its role in that journey by being the first to prove the viability of a second generation biofuel such as jatropha. "

At the first *Eco-Aviation conference* in Washington D.C. in June 2008, the Chairman of Air New Zealand stood before an assembled crowd of representatives from the aviation and aerospace industries and proclaimed that now was the time to tackle climate change.

He said that the sector should take up serious efforts to address what was becoming the issue of our day - global climate change. Virgin Atlantic Airways (VAA), in partnership with Boeing's Commercial Aviation division, had much the same message.

However there's still a lot of work ahead before the aviation industry can adopt this promising biofuel. "Air New Zealand remains committed to our ambition of having 10% of our fuel needs met by alternative fuels," said captain Morgan. "It's very early days as yet: 'There are many more steps to be taken by experts in other areas to deliver biofuel as a

commercial aviation fuel source," he said.



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Boeing, together with the world's leading airlines and the World Wildlife Fund is indeed hard at work to make the development of bio-aviation fuel a reality. They have set up the Sustainable Aviation Fuel Users Research group to accelerate the development and commercialization of biofuels, together with Honeywell's fuel-refiner technology company UOP.

Their research is enthusiastically supported and being advised by the World Wildlife Fund (WWF) and the Natural Resources Defense Council (NRDC).

Boeing 's goal is to make commercial aviation the first global transport

sector to ' voluntarily drive sustainability practices into its fuel supply chain.'

Of course they want to develop renewable, cleaner commercial aviation fuel that can reduce greenhouse gas emissions. But another primary motive is to reduce the world's commercial aviation industry's total dependence on fossil fuels and the vagaries of oil prices.

Boeing says the interest and support from the aviation industry is excellent: with support from Air France, Air New Zealand, ANA (All Nippon Airways), Cargolux, Gulf Air, Japan Airlines, KLM, SAS and Virgin Atlantic Airways. "Collectively, they account for approximately 15 percent of commercial jet fuel use.'

The World Wildlife Fund Jean-Philippe Denruyter said in a statement published late last year that the WWF welcomed the aviation sector's initiative to green its industry. "We appreciate their efforts to ensure the sustainability of their biofuels sourcing."

Denruyter is its global bioenergy coordinator and on the steering board for the *Roundtable on Sustainable Biofuels*. see The

Roundtable has pledged that 'any sustainable biofuel must perform as well as, or better than, kerosene-based fuel, but with a smaller carbon lifecycle," he said.

Biofuel must not compete with food- or freshwater resources:

The biofuel also also require "minimal land, water and energy to produce, and must not compete with food or fresh water resource," he said."And cultivation and harvest of plant stocks must provide socioeconomic value to the local communities."

Billy Glover, Boeing Commercial Airplanes' MD of environmental strategy, said: "It's a tremendous opportunity for the world's leading airlines and well-respected energy and environmental organizations, to help commercial aviation take control of its future fuel supply.

Two initial research projects have been launched which both show test flights with promising results: Boeing is funding a project by assistant-professor Rob Bailis of Yale University's School of Forestry & Environmental Studies to conduct the first peer-reviewed, comprehensive sustainability assessment of jatropha

curcas. This study includes lifecycle CO2 emissions and the socio-economic impacts to farmers in developing nations.

Algae as biofuel

And a second research project at NRDC will also assess algae as a biofuel.

Liz Barratt-Brown, NRDC's senior attorney, said "what is fundamentally at stake is a race for our energy future.

"There are two paths ahead of us - ever dirtier high-carbon fuels such as tar sands oil and liquid coal or developing new, lower carbon fuels that don't harm the environment."

The group will focus on two potential new low carbon fuels - *jatropha* and *algae* - which are considered "next generation" biofuels because their production is intended not to compete for food or water resources or for land important for conserving nature or carbon. It is also committed to developing fuels that will benefit small scale farmers and local communities.

Barratt-Brown said this *Roundtable task force* 'comes at just the right

time to help airlines cut costs and decrease their greenhouse gas emissions."

"If done right, sustainable biofuels could lower the airlines' carbon footprint at a time when all industries need to be moving away from fuels with high levels of greenhouse gas emissions, especially high carbon tar sands and liquid coal."

Biofuels conference in Singapore May 12-13

A biofuels conference is being held on May 12-13, 2009 which will deal with the impact of palm oil, but also algae and jatropha oil as biofuels, at Singapore University's Center for Life Sciences Auditorium.

This includes a panel discussion on the potential of "second-generation biofuel feedstocks, such as jatropha and microalgae-derived biofuels, to reduce negative environmental impacts associated with oil palm."

The moderator is Dr. David Bickford of the National University of Singapore

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May 11, 2009 [Michael Cosgrove](#) #1

Yes, we can only wish them all the best in this research.

I seem to remember that Air France has also tested a plane with one of it's four engines fueled by biofuel, although I can't remember which biofuel, or if it was of French or other origin...

May 11, 2009 [Debra Myers](#) #2

Can you imagine the oil that would be saved if these planes were sucessfully

converted to biofuels? My only hope is that these biofuels will burn so much cleaner than oil products...with all their additives and what not that gets emitted into the air. Seems like it's still a bit away yet before it becomes a viable alternative.

May 11, 2009 [Debra Myers](#) #3

I agree, Adriana. I think that many of the answers we need to continue on this planet will be derived from nature with the help of science. I am all for finding ways to use what's available, and if this helps those people to survive in the process...what a wonderful thing!

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