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ALTERNATIVE FUELS 2017  
ICAO Headquarters, Montréal, 8-9 February 2017



# United Airlines Alternative Fuels

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Environmental Affairs & Sustainability

[United.com/ecoskies](http://United.com/ecoskies)





# Four-pillar environmental commitment

Fuel efficiency and  
emissions  
reduction



Sustainable  
products and  
waste management



Sustainable  
fuel sources



Stakeholder and  
customer  
engagement





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# United's leadership in aviation biofuels



- Largest biofuels investment
- 1<sup>st</sup> Commercial scale in U.S.

UNITED   
eco-skies 



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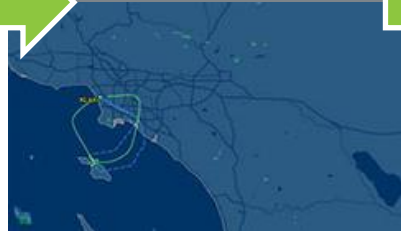


# Alt Air Fuels Moves United from Biofuels Demonstration to Commercial Operations

ASTM certification



Alt Air Fuel Testing and test flight



Drop-in deliveries to the LAX Fuels hydrant system



Customer launch and ongoing operations







# In March 2016 United Airlines became the first U.S. airline to use sustainable aviation biofuel on an ongoing basis



## 15 million gallons

- United can purchase up to 15 million gallons of sustainable aviation biofuel from AltAir over a three-year period.



## 65 new jobs

- This project created 65 new jobs at the AltAir refinery in Paramount, California, which had been largely idle.

## LAX March 2016

- United began flying AltAir's biofuel from its Los Angeles hub in March 2016.



## 30/70 blend ratio

- AltAir's biofuel is mixed at a ratio of 30% biofuel and 70% traditional fuel.



## 60% CO<sub>2</sub> reduction

- AltAir's biofuel provides a greater than 60% reduction in CO<sub>2</sub> emissions on a lifecycle basis when compared to traditional jet fuel



## Sustainability Criteria

- AltAir is applying for RSB Certification
- Agricultural wastes as feedstocks



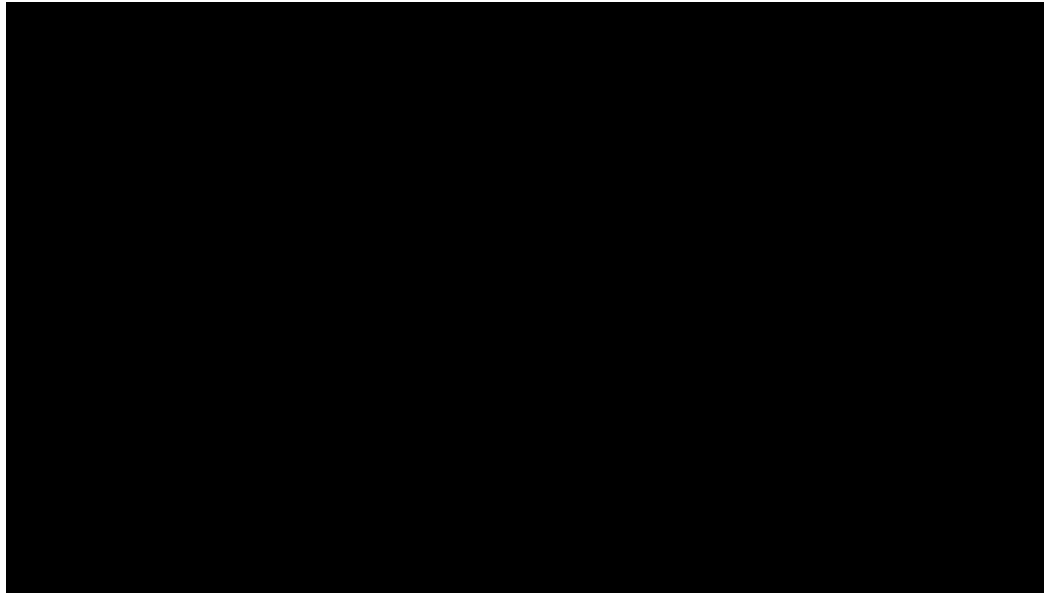
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# United biofuel initiative at LAX



- <https://www.youtube.com/watch?v=CUWkxZh42bQ>



# United made a \$30 million investment in Fulcrum BioEnergy

- Diverts Landfill waste; capture recyclables; produce jet fuel
- > 80% reduction in CO<sub>2</sub> lifecycle emissions
- Co-develop up to five facilities; 90 million gallons per year

**From trash to take off**

Instead of household waste going to a landfill, it will now be delivered to a Fulcrum facility and converted into sustainable aviation biofuel.

**UNITED eco-skies**

Trash is collected and delivered to a Fulcrum facility.

Fulcrum's thermochemical process reduces greenhouse gas emissions by 80% compared to traditional jet fuel.

The drop-in fuel meets United's technical requirements.

**Clean >> Scalable >> Efficient >> Reliable**

Total trash placed in U.S. landfills in one year = Energy equivalent of 10 billion gallons of oil (3 times United's total annual fuel use)

The average American produces nearly 1 ton of garbage a year = That's 65 gallons of biofuels processed by Fulcrum

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# Governmental Support for Scale Up

- Policies & incentives
  - U.S.: Renewable Fuel Standard; California Low Carbon Fuel Standard  
*Should promote biofuels for aviation as preference over ground use*
  - CORSIA's incentive for biofuels
- Resources/Funding - research, demo, & commercial-scale (DPA Title III)
- Government Engagement & Leading by Example







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