Hawaii and Climate Change: Action Items for the Aviation sector

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Contribution of Measures for Reducing International Aviation Net CO₂ Emissions

Source: International Civil Aviation Organization (ICAO) 2016 Environmental Report
U.S. Implementation of ICAO/ CORSIA: FAA’s ASCENT

A U.S. Federal Aviation Administration Center of Excellence focused on:

• Emissions reduction
• Noise reduction
• Renewable fuels

Through these lines of effort:

• Air Traffic Control & Airport Operational Improvement
• Aircraft Design and Fuel Efficiency
• Sustainable Alternative Jet Fuels
ASCENT Industry Advisory Committee
Contribution of Measures for Reducing International Aviation Net CO₂ Emissions

Source: International Civil Aviation Organization (ICAO) 2016 Environmental Report
U.S. Sustainable Alternative Jet Fuel
Commercial Purchase Agreements

Legend:  gpy = Gallons Per Year  usg = U.S. Gallons  LAX = Los Angeles International Airport
Completed Year 5 of 5
ICAO Live Feed: Global Biojet Flight Tracker
Bioenergy Production Pathways

In Hawai‘i:

- **SUGARS & STARCHS**
  - Sugar (Sugar cane, Sweet Sorghum, Industrial Sugars)
  - Starch (Corn, Cassava)

- **FIBER**
  - Banagass, Eucalyptus, Guinea Grass, Leacana

- **OIL PLANTS**
  - Pongamia, Jatropha, Micro Agae, Oil Palm, Peanut, Soybean, Sunflower, Safflower, Camelina

- **MUNICIPAL SOLID WASTE**
  - Food waste, Recycled Oils, Fats, MSW Sorted Cellulosic, Waste Water, C&D Debris

- **PLANTING, HARVEST, STORAGE & LOGISTICS**
  - Industrial Sugars

- **PRETREATMENT & PREPARATION**
  - Grinding to Spec.

- **CONVERSION PROCESSING**
  - Enzymatic Hydrolysis
  - Hydrolysis
  - Gasification
  - Fast Pyrolysis
  - Torrefaction/Densification
  - Combustion
  - Anaerobic Digestion
  - Pressing
  - Milling

- **CHEMICAL INTERMEDIATE**
  - Sugar
  - Synthesis Gas
  - Bio-Oil

- **PRODUCT SEPARATION & UPGRADING**
  - Fermentation & Distillation
  - Microbial Transformation
  - Catalytic Synthesis
  - Catalytic Upgrading
  - Hydro-Thermolysis
  - Hydro-Cracking
  - Microbial Transformation

- **FINAL PRODUCTS**
  - RNG (Methane)
  - Ethanol
  - Green Gasoline
  - Bio-Oil
  - Green Diesel
  - Green Jet
  - Hawaii Gas

- **Other Products**
  - Hydrogen, Electricity/Heat, Fuel Oil, Biodiesel, Co-Processing with Crude

Key:
- In Hawaii
- Elsewhere
Big Picture: Integrated Food and Energy System

By Joelle Simonpietri
University of Hawaii 2017
Oahu Island Examples
Hawai‘i Island Examples
The U.S. Federal Renewable Fuel Standard

Renewable Fuel Standard Program

Lifecycle Greenhouse Gas (GHG) Emissions
GHG emissions must take into account direct and significant indirect emissions, including land use change.

- **Renewable Fuels**: 20% GHG reductions *
- **Advanced & Biodiesel Fuels**: 50% GHG reductions *
- **Cellulosic Fuels**: 60% GHG reductions *

* compared to a 2005 petroleum baseline

https://www.epa.gov/renewable-fuel-standard-program
2017 Session: Resolution Urging Hawaii Green Fuels Initiative to Coincide With Local Food Production

S.C.R. NO. 121

SENATE CONCURRENT RESOLUTION

URGING THE DEVELOPMENT OF A HAWAII GREEN FUELS INITIATIVE TO COINCIDE WITH INCREASED LOCAL FOOD PRODUCTION.

WHEREAS, in 2015 Hawaii spent $5,700,000,000 on imported oil, the equivalent of seven percent of the gross state product, with up to seventy percent of each barrel going toward transportation fuels, jet fuel being the greatest share and growing; and

WHEREAS, displacing as little as five percent of imported oil with a proven renewable source of fuel could significantly improve Hawaii's energy security, sustainability, and economy by addressing fuel price volatility; and

WHEREAS, the Hawaii Clean Energy Initiative was focused on achieving the goal of forty percent clean energy by 2030, and the State has since increased this renewable energy mandate to one hundred percent by 2045, including clean transportation energy and biofuels, renewable jet fuel, or renewable gasoline; and

WHEREAS, the Governor has a stated goal of doubling local food production, and increased food production integrated with renewable fuel production would enhance Hawaii's manufacturing sector, which is currently comprised of petroleum and gas refining and represents three percent of the gross state product, by creating food storage, hub/depositing centers, and processing plants; and

WHEREAS, Act 202, Regular Session of 2016, created tax incentives to support the end goal of energy security and sustainability by providing a renewable fuels production income tax credit for fuels including methanol, ethanol, or other alcohols, hydrogen, biodiesel or renewable diesel, other biofuels, renewable jet fuel, or renewable gasoline; and

WHEREAS, the Governor has a stated goal of doubling local food production, and increased food production integrated with renewable fuel production would enhance Hawaii's manufacturing sector, which is currently comprised of petroleum and gas refining and represents three percent of the gross state product, by creating food storage, hub/depositing centers, and processing plants; and
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**Integrated flight planning**
- Allows immediate access to identical weather information through one data source.

**Surface traffic management and operations**
- Data Communications expedite clearances and reduce communication errors. Automation reduces taxi times and enhances safety.

**Streamlined departure management**
- Allows multiple departure paths from each runway, thereby increasing departure capacity.

**Efficient cruise**
- Reduced separation standards and consideration of weather conditions allow aircraft to fly most optimal path.

**Streamlined arrival management**
- Equipped aircraft fly precise paths at reduced power from descent point to final approach. Time, fuel, emissions and holding are reduced.

**Enhanced surface traffic management**
- Detailed taxi route information sent via data communications to pilots prior to approach. Pilot and controller workload reduced and safety improved.

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Source: GAO analysis of FAA information.  |  GAO-17-450
Report: United Airlines to invest $200M in Hawaii’s airports

Sep 4, 2018, 6:02am HST

United Airlines is planning to invest $200 million to upgrade Hawaii’s airports over the next nine years.

The Honolulu-Star Advertiser reported on Tuesday that United will use the money to modernize tools and resources used by company employees at the state’s airports, as well as enhancing its customer experience.

United CEO Oscar Munoz met with Gov. David Ige, tourism officials and some of the airline’s 1,400 local airline employees during his trip to Hawaii last month, the newspaper added.

Munoz said that he supports the creation of an independent airport authority in Hawaii. The state’s airports are currently run and operated by the Hawaii Department of Transportation Airports Division.

Legislative measures to create such an authority stalled for the past two years in the state Legislature.

According to PBN research, the Chicago-based carrier was the second busiest airline serving the Islands in 2017. United transported more than 1.7 million passengers to Hawaii last year.

United Airlines is a unit of United Continental Holdings (NYSE: UAL).

HJ Mai
Web Editor/Energy Reporter
Pacific Business News
Contribution of Measures for Reducing International Aviation Net CO₂ Emissions

Source: International Civil Aviation Organization (ICAO) 2016 Environmental Report
Subsonic Transport Technology Strategy

Prove out transformational, integrated propulsion and airframe technologies

Current Generation

Next Generation - Transitional -

Future Generations - Transformational -

Energy usage reduced by more than 60%
Harmful emissions reduced by more than 90%
Objectionable noise reduced by more than 65%

Create technology pathway for new capabilities

2020
2030
2040

www.nasa.gov
### Policy Initiatives: Cost Reduction and Coordination

<table>
<thead>
<tr>
<th>2019</th>
<th>2020</th>
<th>2025</th>
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</thead>
<tbody>
<tr>
<td><strong>Near Term:</strong></td>
<td><strong>Medium Term:</strong></td>
<td><strong>Long Term:</strong></td>
</tr>
<tr>
<td>• Biodiesel blending $ for airport ground support equipment</td>
<td>• Permitting facilitation for renewable transportation fuel projects</td>
<td>• Facilitate petroleum refinery upgrade to make biojet and renewable fuels</td>
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<tr>
<td>• HTDC matching $ for federal grants and contracts</td>
<td>• ASCENT airport taxi/approach/takeoff paths optimization</td>
<td>• Bioeconomy industry advisory board/ state coordinator across Ag, energy, transport, tourism, environment..</td>
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<td>• Permitting timeline certainty for GHG reduction/ sustainable aviation projects</td>
<td>• Hawai’i-public-private partnership for Sustainable Aviation Tourism system</td>
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2019 2020 2025
Questions?

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Photograph by David A. Simonpietri III
From cockpit of Delta flight 837, Dec 2017