United Airlines

Alternative Fuels

DOE BETO

Demonstration & Deployment Workshop

March 12, 2014

A STAR ALLIANCE MEMBER

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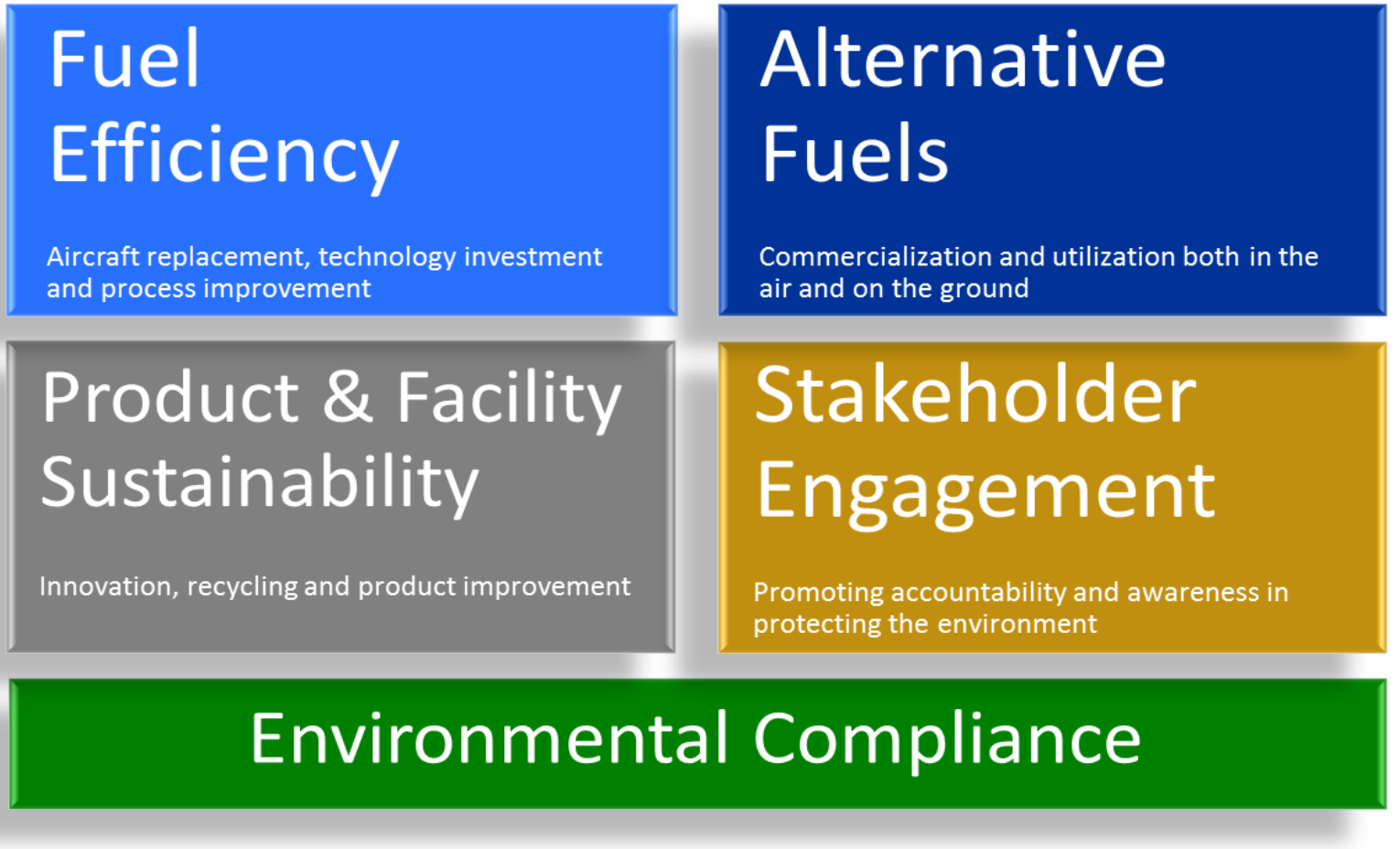
Eco-Skies: United's environmental commitment and sustainability platform



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United is committed to leading commercial aviation as an environmentally responsible company by taking actions today that shape an environmentally sustainable future

32%

improvement in fuel efficiency since 1994

Winglets

Installed on more than 330 aircraft; 5% reduction in emissions; North America launch partner split scimitars

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ATW Eco-Aviation Airline of the Year

85+ million

gallons of fuel saved in 2013

280

new fuel efficient aircraft on order through 2022

Alternative Fuels

U.S. airline to sign definitive fuel supply agreement for sustainable aviation biofuel

New Cup

50% recycled content; recyclable in single-stream; United Clubs & In-Flight

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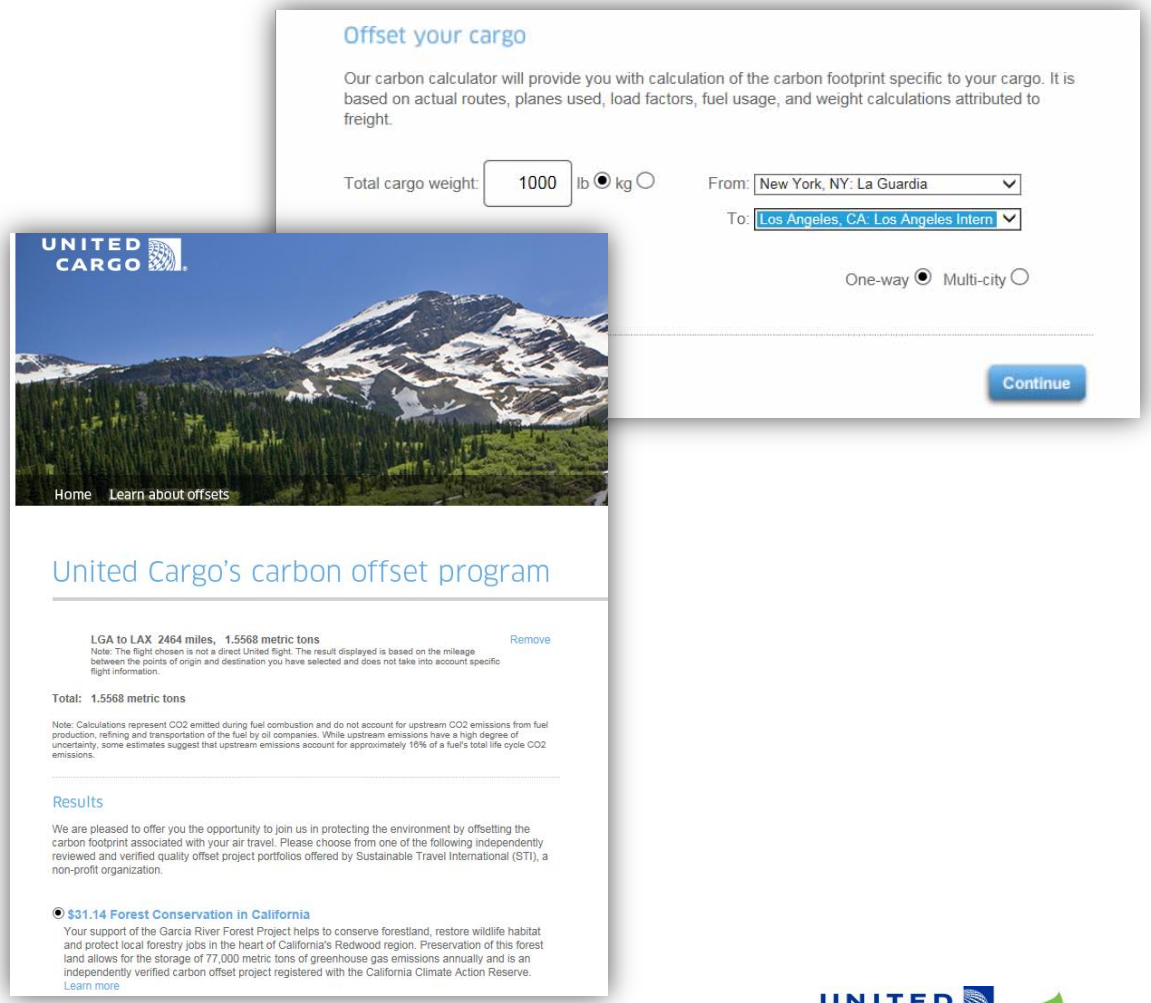
As part of United's commitment to improved communications and stakeholder engagement, we released an enhanced cargo emissions and offset calculator

- Calculates per capita carbon emissions for customers shipping via United Cargo
- Only U.S.-based carrier to offer the calculator to its customers
- Methodology recognizes actual flight data (average payload, fuel burn, and distance) related to aircraft type, routes and seasonality
- Accounts for additional mass associated with passenger infrastructure (e.g., seats, galleys, etc.)



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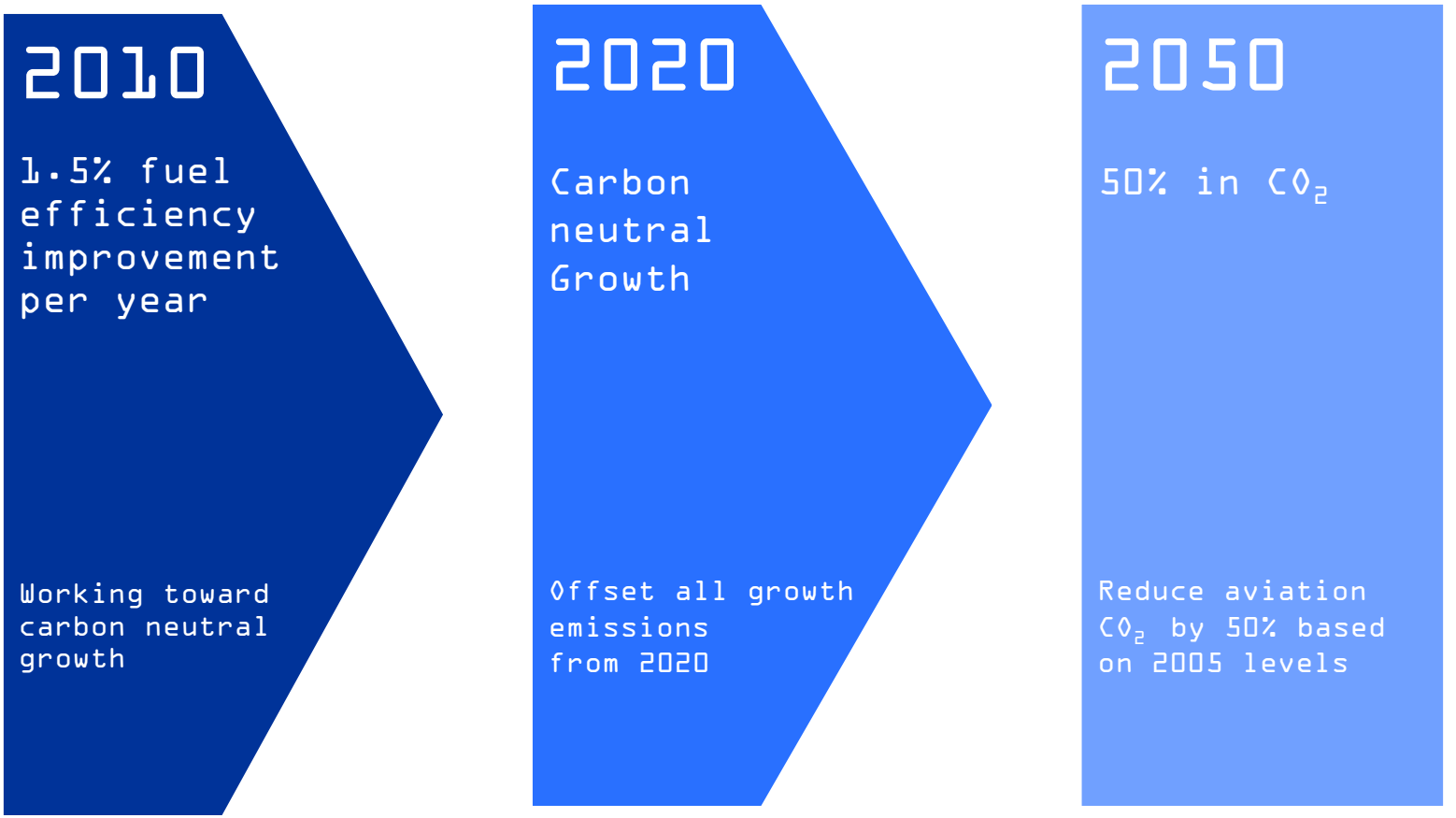
Aviation Industry Seeks Global Approach to reduce emissions, with following commitments



Subject also to government investment in technology, operations & infrastructure improvements

Source: IATA

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Four Pillars for Aviation Industry GHG Emissions Reduction Strategy

Source: IATA

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Alternative fuels present a long-term opportunity to manage risks and continue United's leadership

- Reduction of key environmental impact
- Alignment with stakeholder interests
  - Customers
  - Societal focus on carbon reduction
- Fuel diversification to protect against supply chain risks and manage a significant cost
- Strengthens the economy
- Inability in near-term to modify aircraft engines

United – Engagement in Advancing Alternative Fuels

2009: First North American Biofuel Test Flight

2010: First Demonstration Flight on synthetic fuel

2011: First US Commercial Biofuel Flight - 40% blend algae based renewable jet fuel

2012: Launch of Industry-Leading Collaborative, Midwest Aviation Sustainable Biofuels Initiative, MASBI to help in defining action plan for biofuel development regionally

United joins Sustainable Aviation Fuel Users Group (SAFUG)

2013: First to sign definitive fuel supply agreement with first use by U.S. carrier in on-going flights starting 2014

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Midwest Aviation Sustainable Biofuels Initiative

- In May 2012, United led the development of the of the Midwest Aviation Sustainable Biofuels Initiative (MASBI) to drive integration across the value chain and define a regional roadmap to seek acceleration of commercial development
- Steering Committee Members: United, Boeing, UOP Honeywell, Chicago Department of Aviation, Clean Energy Trust
- Members & Advisory Committee:
  - Representing 40 different public, private, & non-profit org.
  - Including agriculture, industry leaders, technology providers, airport officials, policymakers, academic institutions & national laboratories
  - Advisory Committee led by Argonne National Lab and included as advisors USDA, FAA, World Wildlife Federation
- Report : Recommendations to policymakers, stakeholders and investors

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MASBI Outcomes – Key Recommendations to Further *Accelerate* Commercialization

- Improve feedstock production through agricultural innovation
- Tailor agriculture products such as oil-seed crops for jet-fuel production
- Investigate the impacts of uncertainty on production
- Advance technologies to convert lignocellulosic biomass
- Identify means to expedite approvals by the ASTM International and EPA
- Allow producers to optimize product portfolios
- Pursue deal structures that balance risk and reward for early adopters of technology
- Demonstrate industry demand with aviation jet fuel purchase guidelines
- Create pool of capital to invest in biofuels
- Create longer-term policies that enable investment and production
- Level the policy playing field for advanced biofuels with the conventional petroleum industry
- Fully fund the Defense Production Act Title III for the production of biofuels
- Build regional demonstration facilities supported by municipal and state policies
- Incorporate sustainability standards and advance certification

Full Report at www.masbi.org

Sustainable alternative aviation fuel produced by AltAir Fuels will fuel a portion of United's LAX flights starting this year

Technology	• HEFA Process • Honeywell UOP's Green Jet process • Feedstock flexible including non-edible oils/agricultural waste
Fuel	• 15 million gallons of bio jet and green diesel over 3 years
Location	• United will use the biofuel on flights operating out of its Los Angeles hub (LAX) • Delivery planned for Q3/Q4 2014
Lifecycle Impacts	• 50 percent reduction in CO_2 emissions as compared to traditional jet fuel
Refining	• Repurposed idled portion of a refinery to produce 30 million gallons total of renewable fuel
Logistics	• Fuel will be blended at the refinery near Los Angeles • Finalizing logistics to United operations
Co-Products	• Refinery will produce green diesel, naphtha, and other distillates

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Why AltAir Fuels?

Key Criteria						
Approved Technology for current fleet (or near term)	Management Credibility	Low Environmental Impact	Sufficient Financing	Near Term Commercial Production	Competitive Price Point	Logistics (near hub)
✓	✓	✓	✓	✓	✓	✓

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What's Next?

Seeking greater quantities of alternative fuel

- United issued RFP Fall of 2013 seeking proposals
- Seeking alternative fuels for multiple locations
- Key factors remain: lower carbon, cost-competitive, can deliver

Challenges Remain

- Sufficient low-price feedstocks?
- Sufficient investor interest?
- Sufficient interest in alternative jet fuel production where higher certification requirements and potentially higher production costs than ground transportation fuels?

Alt fuels commercialization requires action today to ensure available in the future

Thank-you for your engagement in Alternative Fuels!