



**ICAO AVIATION AND SUSTAINABLE  
ALTERNATIVE FUELS  
WORKSHOP**

ICAO Headquarters, Montréal, Canada

18 to 20 October 2011

***INNOVATING RENEWABLE FUELS  
FOR THE FUTURE***

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- Imperium founded in 2004
- Funding of \$255M from 2004-2008
- Focused on innovation and practical commercialization efforts for scale of renewable fuels
- 49 employees
- 100 million gallons (378M Liters) of annual capacity of biodiesel production
- Profitable since Q4-'09
- Strong foundation for growth in revenue, profit and new construction in 2012 and beyond
- Long term stable business relationships with proven track record of high quality fuel and rateable supply for renewable fuels market
- Transitioning to production of “drop-in” fuels in 2012





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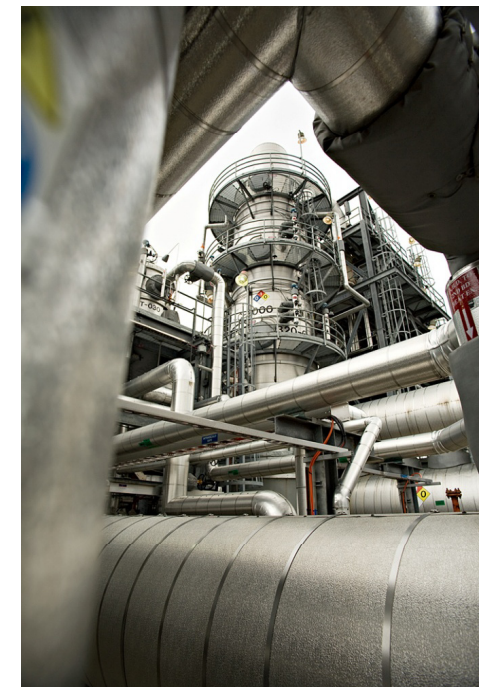
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## **Imperium Aviation Fuels Biorefinery Project**



- **New Facility to be co-located at existing biodiesel asset in Washington State**
- **Will produce Renewable Aviation Fuels**
- **Intend to supply HRJ to US DOD/Global Airline Industry**





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- **100MGY facility/6,500 BBL per day**
- **Output of HRJ = 25 – 40 MGY**
- **No technology risk – EPC contract available for construction**
- **Renewable Jet fuel/HRJ drop-in jet fuel**
- **Renewable Diesel/HRD drop-in diesel fuel**
- **Feedstocks would be current oilseed crops – canola, soy, animal fats, UCO**
- **Future oilseed crops such as camelina, algae, jatropha as available**
- **Financial markets constricted for capital due to overall market restraints**



**Imperium Aviation Fuels  
Biorefinery will produce  
Drop-in Fuels for  
multiple markets  
including DOD/RFS2/EU  
Can export fuels globally  
From facility location**



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**Ongoing R&D efforts at Imperium**

- IRI proprietary development of technology for 3<sup>rd</sup> gen renewable jet fuel
- Research started in July 2010 with joint funding from Imperium and Battelle (PNNL)
- Allows for use of wide range of new feedstocks by using alcohols from biomass such as municipal solid waste, forest residue, agricultural wastes
- Drop in renewable jet fuel replacement that will meet future ASTM ATJ specifications
- Integrated Biorefinery- effort to maximize renewable aviation fuel supplies from renewable sources
- Have received \$4M from DOE for biomass to jet fuel funding opportunity in collaboration with the following organizations and being led by LanzaTech





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**Feedstocks and Sustainability**

- **Feedstocks are key to the success for all renewable fuels from both pricing and environmental concerns**
  - ❖ **Fats/Oils/Lipids**
    - **Current feedstocks that are available in commercial volumes for HRJ production are based on the development of oilseed crops over the last 50 years**
    - **Future oilseed/lipid based feedstocks are on the cusp of development but not available at commercial volumes today**
    - **An educated and commercially viable transition is needed for practical success of renewable jet fuel**
      - **Existing supplies can be used and be done sustainably and without significant effect on food supplies while new crops are transitioned in on a viable basis**
      - **All lipid based biomass feedstocks are going to be difficult to bring pricing down**



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**Feedstocks and Sustainability cont:**

➤ **What feedstocks should we transition to?**

- ❖ **Biomass such as MSW/Woody Residues/Dedicated Energy Crops**
  - **These are current feedstocks that are available in commercial volumes for production of these biomass supplies into drop-in renewable fuels**
  - **These feedstocks are available in sustainable volumes today**
  - **Technology is close to being ready for take-off at commercial scale**
    - **Pace of development could be accelerated**
  - **These feedstocks are more economically viable, can be derived in a more sustainable manner leveraging off already existing efforts to recycle, manage land and water, and not create competition for food acreage**



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**Feedstocks and Sustainability questions:**

- **How can we better understand the facts regarding economics of biofuels and sustainability of feedstocks?**
  - **What is the comparison of fully burdened costs of both petroleum and biofuels to the end user – IE, supporting policy, incentives, environmental affects?**
  - **Are the current discussions surrounding ILUC (Indirect Land Use Change) variability's credible information to base policy?**
  - **Is there real data to correlate the impact of biofuels to food prices? What about the volatility of petroleum and its affects on food prices?**
  - **Should diversification regional distribution of supply have a place in the overall pricing structure of fuels?**





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# Summary



- **Renewable jet fuels have gone from the “Pre-boarding Announcement” in 2007 to “Position and Hold” in 2011 – Amazingly fast progress!**
- **For the industry to get to 30,000’ we need to the following to occur:**
  - **Commercial scale needs to be built in multiple locations to bring competition and regional solutions to the aviation industry**
  - **Continued efforts on understanding the importance of sustainability and economic viability of feedstock supplies are critical**
    - ➔ **We must get this right and we must use science and data, not hype, to determine the best path forward for all fuels including biofuels**
- **The importance of coordinated policy that is focused on success of the industry on a global basis is mandatory – Fragmented and uncoordinated efforts will hinder progress and prevent success**
- **Jet-A is a global fuel and renewable jet fuels must follow the same flight path to be a solution for the aviation industry**



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**Thank you for your attention**



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