



ICAO | UNITING AVIATION



Amyris-TOTAL Biojet Fuel Breakthrough Solution for Aviation

Fernando Garcia, Amyris, Inc.

Philippe Marchand, TOTAL New Energies

ICAO HQ, Montréal, Canada

9 – 10 SEPTEMBER 2014

Presentation

Amyris-Total Strategic Alliance

Commercial Production

Amyris-Total Renewable Jet Fuel

Amyris-Total Strategic Alliance

A commercial ready *feedstock to wing fueling* strategy



Total is a trusted global aviation fuel supplier with infrastructure and track-record of success in the aviation industry.



Amyris has a breakthrough technology to convert sustainably-produced sugars into high-value hydrocarbon molecules,

Validated Drop-in Properties:

- ✓ ASTM fuel standard for jet fuel permitting 10% blends of our renewable farnesane in as ASTM D1655 Jet A1.
- ✓ Lifecycle analysis indicated our renewable jet fuel can reduce emissions by over 80% when compared with conventional jet fuel.
- ✓ Amyris has jet-grade farnesane validated on commercial engines (GE, CFM, Snecma, P&W) and APU (Honeywell 131-9 APU)

Amyris-Total Strategic Alliance

Feedstock to wing value chain

Synergy: assemble industry-leading technology, industrial and business capabilities

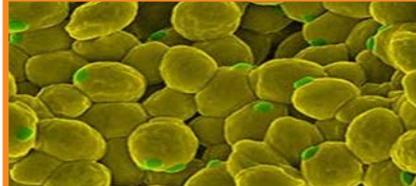


Feedstock sourcing



- > 1st generation in Brazil on sugar cane
- > **Leading to 2nd generation**

Synthetic biology



- > Bio-engineering of micro-organisms
- > R&D network

Fermentation and chemical processes



- > Track record for strain improvement
- > Scale-up and industrial chemistry

Trading & marketing

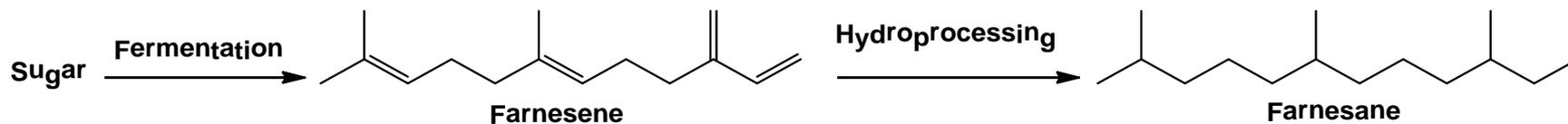


Fuels Special fluids
 Lubricants Chemicals

- > Competitive molecules
- > Access to markets

- Differentiating technology: broad R&D collaboration (~\$100M)
- Lab-to-market development: joint industrialization & commercialization
- Strategic supply chain with AIR TOTAL expertise and industry trust

Production Process Based on Common Industrial Steps



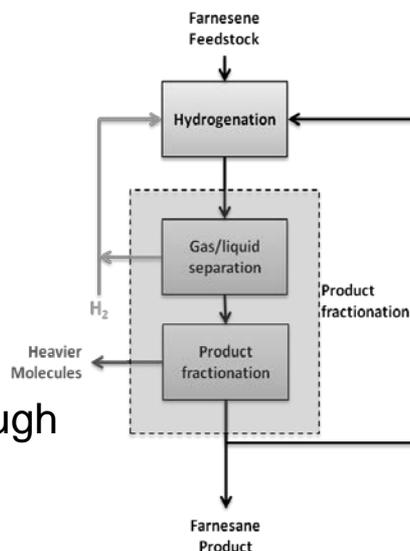
• Fermentation



- **Microbe-catalyzed conversion** of sugar: key is the development of a farnesene producing yeast
- Fermentation process demonstrated on three continents; Europe, North America and South America (Brazil)

• Downstream processing

- Combination of **hydroprocessing and purification** operations
- Process capabilities on a global basis through Contract Manufacturing Organizations



Sustainable Growth in Place

BROTAS – FIRST RSB CERTIFIED PLANT



SÃO MARTINHO IS BONSUCRO CERTIFIED



 **São Martinho**
Amyris Joint Venture



*Prior Contract
Manufacturing*



*Dedicated Industrial
Production Began in Dec. 2012*



*Additional Production
Opportunities Identified in Brazil*

More Sustainable Amyris-Total Biofuels

TODAY



Feedstock Agnostic Technology

- ✓ Our process can use molasses, sugar beet, sweet sorghum, corn dextrose and cellulosic feedstocks
- ✓ Initial focus on Brazilian sugarcane as it is the most abundant, sustainable source of plant sugars at low cost and with relative price stability.

2014-2020



Driving Sustainable Standards

- ✓ Total-Amyris committed to integrate global industry sustainability standards
- ✓ Amyris received first and only RSB certification for Brotas farnesene plant
- ✓ Currently pursuing Bonsucro certification for our feedstock suppliers and downstream operators.

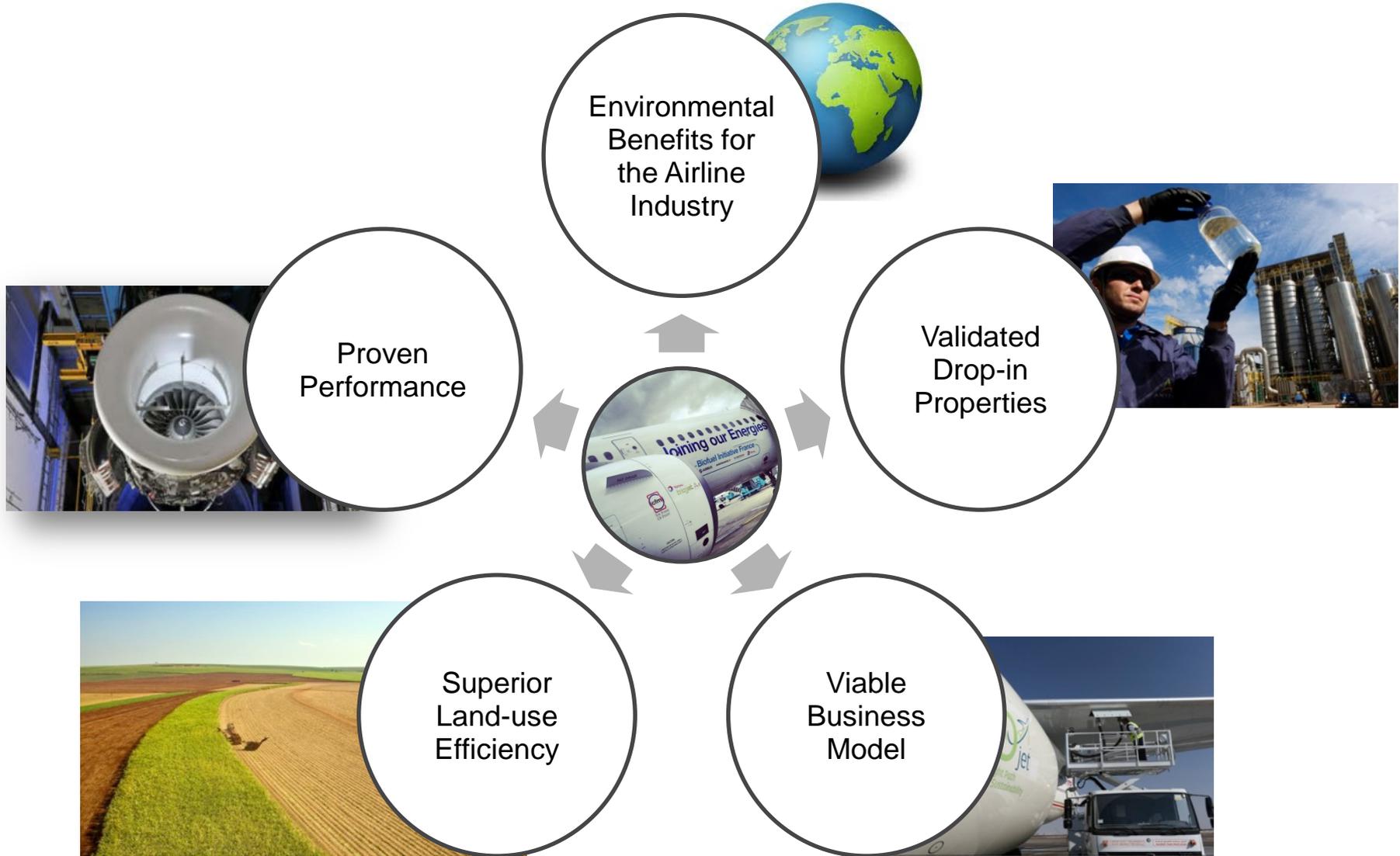
2020 & Beyond



Advanced and Cellulosic Sugars

- ✓ **Amyris has demonstrated the fermentation of cellulosic sugars for farnesane** production under US Dept. of Energy NABC R&D program
- ✓ **Total and Amyris are engaged in advanced sugars R&D** for future use in commercial production.

Amyris-Total Renewable Jet Fuel



The Start of Commercial Flights

GOL Linhas Aéreas Inteligentes demonstrating sustainability leadership.

- First international commercial flight using Amyris-Total jet fuel (July 2014)
- Boeing 737-800 fueled with a 10 % blend
- Route: MCO to GRU

FOLHA DE S. PAULO
Login
Assine a Folha
Atendimento
Versão Impressa

FOLHA DE S. PAULO

★ ★ ★ UM JORNAL A SERVIÇO DO BRASIL
SEGUNDA-FEIRA, 11 DE AGOSTO DE 2014 9:33

Opinião - Política - Mundo - Economia - Cotidiano - Esporte - Cultura - F5 - Tec - Classificados - Blogs

Últimas notícias Mercado reduz previsão para crescimento da economia pela 11ª vez

Senhores Passageiros

sobre aeroportos, aviões e afins

Perfil
Ricardo Gallo e Mariana Barbosa
são repórteres
PERFIL COMPLETO

Gol voa de Orlando para São Paulo com bioquerosene de cana-de-açúcar

OR MARIANA BARBOSA
10/07/14 18:30

Assine nosso feed (RSS)
passageirosblog@gmail.com

buscar
Buscar no blog



SPONSORS:  AMYRIS.

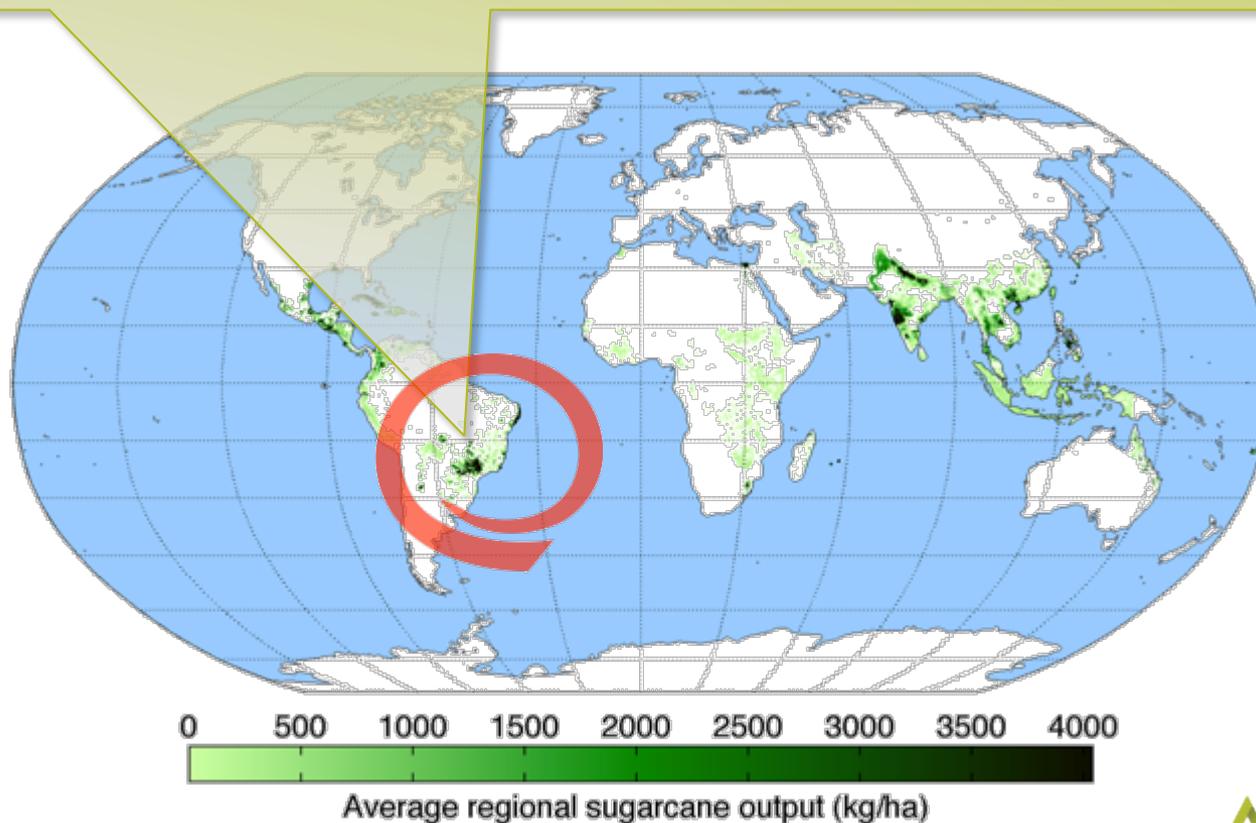


Morgan Stanley



Why launch with Sugarcane in Brazil?

- Brazil is the **world's largest cane producer**, twice #2 India
- Brazil's **South-Central region** accounts for **90%** of country's cane harvest
- Brazil's sugarcane sugar **yields have grown at 3% CAGR** since late 1970s



Amyris RSB Biorefinery Certification

- Amyris's biorefinery is the first RSB-certified facility in Brazil.
- Drivers of RSB Certification for Amyris
 - Answers market demand, primarily abroad
 - Validates the sustainable practices of our industrial production chain
 - Suitable for the range of products produced
 - Complimentary with Bonsucro feedstock process





Merci beaucoup!

Philippe Marchand, TOTAL New Energies

Philippe.marchand@total.com

+33(0)141354401

Fernando Garcia, Amyris, Inc.

garcia@amyris.com

+1 510 387 2243