Fostering the Development & Commercialization of SAJF: for Business Aviation

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8th March, 2019
General Dynamics Overview

Information Technology
$8.27 Billion
Large-scale, secure IT networks and systems

Mission Systems
$4.73 Billion
Secure communications, command-and-control systems, sensors and cyber products

Combat Systems
$6.24 Billion
Land Systems
European Land Systems
Ordnance and Tactical Systems

Marine Systems
$8.50 Billion
Bath Iron Works
Electric Boat
NASSCO

Aerospace
$8.46 Billion
Gulfstream
Jet Aviation
Gulfstream Today:

- More than 2,700 Gulfstream business aircraft in service
- Five aircraft models in production and one in development
- Nearly 18,000 people around the world
- Continuous investment in R&D
- Disciplined operations
- Financially strong
Gulfstream’s Beginning in Savannah

- Savannah facility built in 1967
  - Manufacturing site of GII and subsequent large-cabin aircraft
  - Number of employees grew from 100 to nearly 2,000 within a few years
Gulfstream Product Line

G650ER 7,500 nm at Mach 0.85

G650 7,000 nm at Mach 0.85

G550 6,750 nm at Mach 0.80

G600 6,500 nm at Mach 0.85

G500 5,200 nm at Mach 0.85

G280 3,600 nm at Mach 0.80

G280 Range with 4 Passengers – G550 to G650ER Range with 8 Passengers
Aviation Week’s 60th Laureate Award

“In BCA’s opinion, they provide a significant improvement in situational awareness from older passive sidesticks.”

Fred George, Business & Commercial Aviation
Government / Special Missions

- 207 aircraft in government / special mission applications
- Head of state and VIP transport / special missions
- Operating in 39 countries around the world
A Leader In Sustainability

- Recognized as an industry leader for sustainability innovation
  - Carbon-neutral growth by 2020
  - Use of renewable fuels for daily flight operations
  - Targeting 50% reduction in CO2 emissions by 2050
Through organizations like NBAA, GAMA and IBAC, business aviation has committed to being a good steward of the environment.

Press release on November 24, 2009

Commitment is based on four pillars:
- Improved technology
- Improved infrastructure & operations
- Use of alternative fuels
- Market-based measures
Backdrop – EBACE (2018)

Reaffirmed Business Aviation Commitment in 2018 at EBACE
Gulfstream Is Taking a Proactive Approach

- Actively using Sustainable Alternative Jet Fuel (SAJF) since 2016 at company headquarters in Savannah
- 30/70 blend
- Technology: Hydroprocessed esters and fatty acids (HEFA)
- SAJF will soon be available in our Long Beach, California, facility
Gulfstream’s SAJF Program – Sustainability Aspects

- **Sustainability**
  - Life-Cycle Analysis (LCA) results recognize at least 60% reduction in CO2 emissions for every gallon of renewable fuel (18% for every gallon of blended fuel).
  - Meets US Environmental Protection Agency (EPA) and Roundtable on Sustainable Biomaterials (RSB) sustainability requirements
  - Renewable fuels will be recognized within the EU ETS and in a future global market-based measure system (like CORSIA).
SAJF Fuels: Our Story

• 2011: The G450 became the first business aircraft to make a transatlantic flight on renewable fuel.
  – Blended fuel (50/50) was not certified

• 2012: Flew the entire in-production fleet to a major airshow (NBAA) on renewable fuels

• 2013: Initiated discussions with refineries/suppliers
  – Considered only certified fuels … “drop-in fuel”

• 2015: Gulfstream signed a three-year agreement for blended renewable fuel with World Fuel Services/AltAir (World Energy).
  – 30/70 blend
SAJF - Savannah

• First delivery – April 19th, 2016
• Usage by FAST, Corporate & Flight Test
• 2018 – Flew to EBACE airshow in Geneva on SAJF
• Three city-pair speed records … demonstrated no loss in performance
  – G650ER: October 2017, Newark, N.J., to Tokyo
  – G600: May 2018, Savannah to Geneva
  – G280: January 2019, Savannah to Van Nuys, Calif.

1st A/C manufacturer to operate on SAJF on a regular basis
Where Are We Now?

- Gulfstream is the only business jet manufacturer to sign an offtake agreement for a continuous supply of SAJF.

- As of today, Gulfstream:
  - Has used more than 430,000 gallons of blended (30/70) SAJF
  - Saved more than 750 metric tons of CO2
  - Accumulated more than 1,700 flight hours
  - Flown over 700,000 nm
  - ~70% of the way to meeting the 1-million-nm goal

- Recently announced Gulfstream Long Beach will use SAJF
  - 1st customer operation from Long Beach – February 8, 2019