

***Gulfstream Sets City-Pair Speed Record on
Renewable Fuels***



***Fostering the Development & Commercialization of SAJF:
for Business Aviation***

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General Dynamics Overview



Aerospace
\$8.46 Billion
Gulfstream
Jet Aviation



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

2018 year-end revenue results

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



1967



2018



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

Gulfstream G500 / G600: Transforming the Industry



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

Backdrop - Business Aviation Commitments - 2009

- 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



The image shows a press release document titled "BUSINESS AVIATION AND CLIMATE CHANGE". At the top right are the logos for IBAC and GAMA. The document lists logos for various business aviation organizations: egama, ABAA, ABAG, AsBAA, LeCt, SBAASA, BBGA, ACAA, ABBAA, IBAA, JBAA, M-BAA, NBAA, and RBAA. The main text discusses the industry's support for ICAO's proposal for aviation sectoral management of greenhouse gas (GHG) emissions in a post-Kyoto Agreement. It highlights the industry's record of achievement, including a 40% improvement in fuel efficiency and a 0.04% reduction in global man-made carbon emissions. The document also outlines the industry's commitment to ICAO targets and lists specific goals: carbon-neutral growth by 2020, a 2% improvement in fuel efficiency per year until 2020, and a 50% reduction in total CO₂ emissions by 2050 relative to 2005. The document concludes with a promise to proactively reduce its impact on the environment.

IBAC **GAMA**

BUSINESS AVIATION AND CLIMATE CHANGE

Advocating for a global aviation sectoral approach in a post-Kyoto global framework

The global business aviation operating and manufacturing communities support the International Civil Aviation Organization's (ICAO) proposal for aviation sectoral management of targets and monitoring of greenhouse gas (GHG) emissions in a post-Kyoto Agreement. We support the ICAO Programme of Action on International Aviation and Climate Change and are in accord with the Declaration of the High Level Meeting on International Aviation and Climate Change convened by ICAO in Montreal on 7-9 October 2009.

Our record of achievement
Business aviation has established an excellent record of consistently improving fuel efficiency, delivering 40% improvement over the past 40 years. Business aviation's global CO₂ emissions are approximately 2% of all aviation and .04% of global man-made carbon emissions. Business aircraft are operated for specific missions and fly efficient, direct routes between airports. Modern navigation equipment, combined with the latest technologies in aircraft and engine design and operational best practices, provide for ever-improving fuel efficiency and reduced GHG emissions.

Our commitment
Nonetheless, our community is resolved to do even more. Business aviation manufacturing and operating communities have jointly developed an aggressive programme in support of ICAO targets. Achieving these targets will require not only sustained effort on the part of the entire business aviation community, but also a partnership between industry and government, and the development of realistic solutions that balance economic growth, progress and technology. The business aviation community therefore commits to the following specific targets:

- Carbon-neutral growth by 2020;
- An improvement in fuel efficiency of an average of 2% per year from today until 2020;
- A reduction in total CO₂ emissions by 50% by 2050 relative to 2005.

We will achieve these objectives through expected advances in four areas: technology, infrastructure and operational improvements, alternative fuels, and market based measures.

Consistent with ICAO recommendations and limitations on data availability, business aviation supports the development of an appropriate alternative metric within ICAO to measure and track business aviation emissions on a fleet basis.

Our needs
Given the global nature of aviation, internationally harmonized policies, rules and procedures are critical to ensure safe, efficient and balanced operations. Our community believes that ICAO must be assigned global sectoral responsibility over aviation emissions targets and monitoring.

Our promise
The business aviation sector has made remarkable improvements in its environmental performance over the last half century. The industry believes that if scope is given to the aviation community to manage environmental stewardship in partnership with industry and under the leadership of ICAO, all will enjoy a vibrant and healthy industry that will continue to proactively reduce its impact on the environment even as the demand for business aviation continues to grow.

www.ibac.org www.gama.aero

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

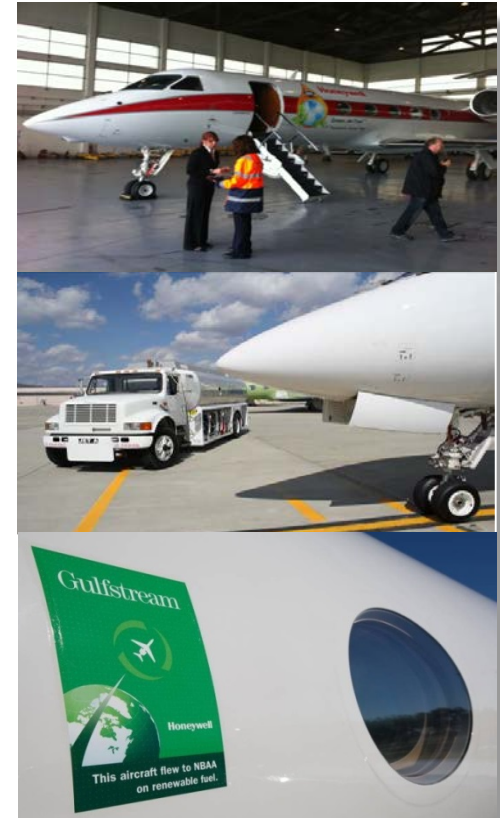
- Sustainability

- 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

**Fostering the Development & Commercialization
of SAJF for Business Aviation**



Questions



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