



Fueling the Future

Bombardier Sustainable Aviation Fuel (SAF) Leadership

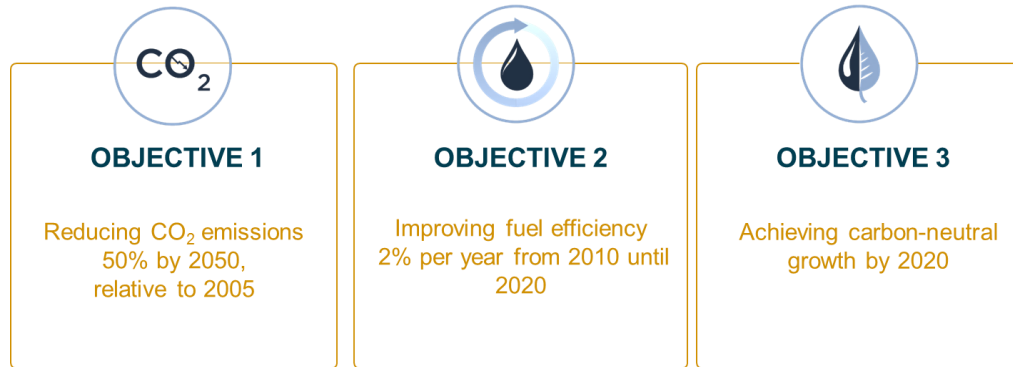
Kahina Oudjehani
Head of Eco-Design and Environmental Affairs
Bombardier Aviation

Feb 6, 2020

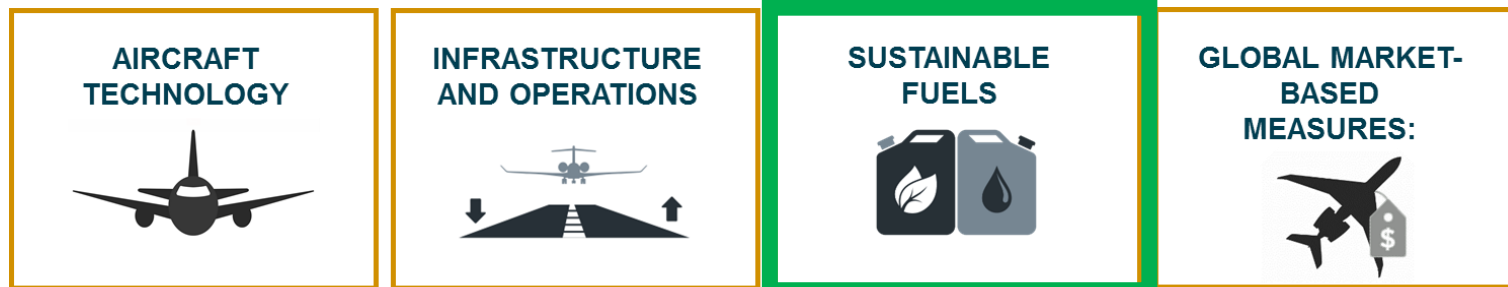
Sustainable Aviation Fuel: Context of Business Aviation

Back in 2009, the Business Aviation industry committed to reduce CO₂ emissions

Together, OEMs and Business Aviation stakeholders identified 3 objectives...



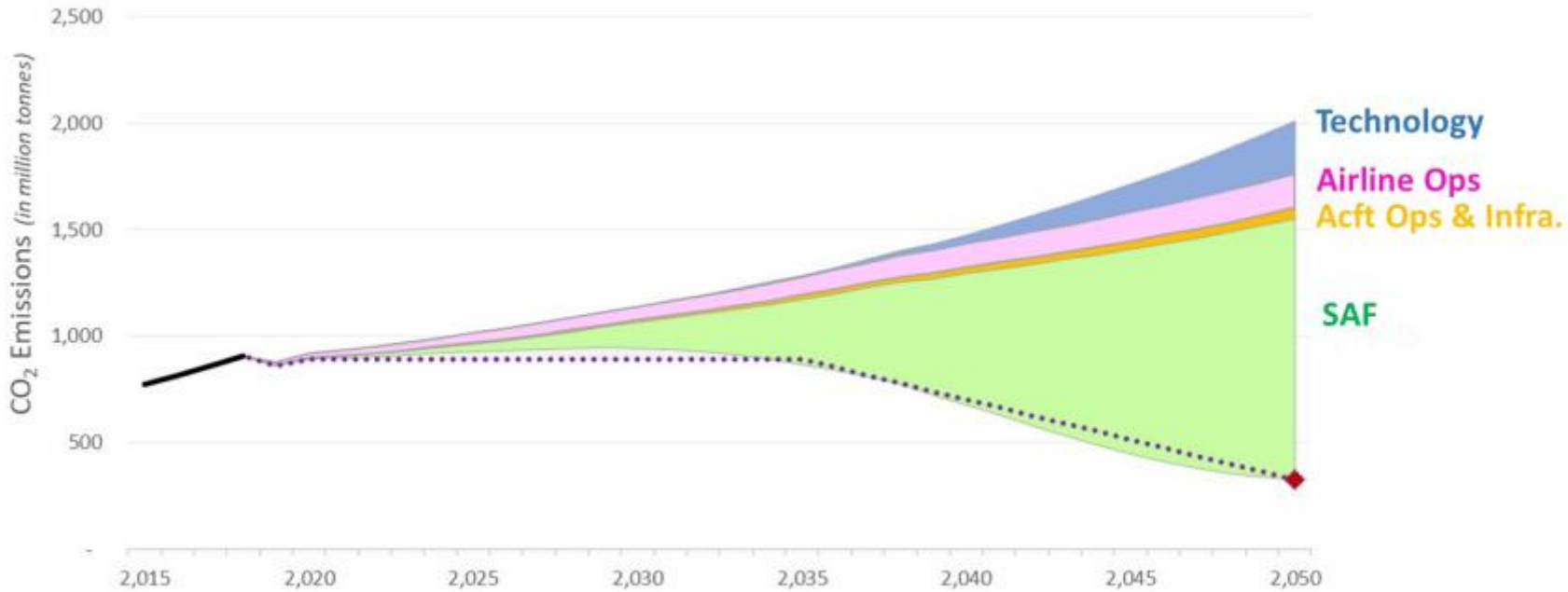
... and 4 key pillars to achieve these objectives



Back then, in collaboration with GAMA and IBAC, Bombardier played a key leadership role in helping our industry define common CO₂ emission reduction targets

1. Source: <https://gama.aero/wp-content/uploads/GAMA-IBAC-Joint-Position-on-Business-Aviation-Tackling-Climate-Change-1.pdf>

Aggressive use of SAF allows for 50% reduction of CO₂



Source:
<https://www.atag.org>

Adoption of SAF is the single biggest driver to help our industry achieve its commitment

What is Sustainable Aviation Fuel (SAF)?

What is SAF?

- Must meet the same safety standards as current aviation fuels
- “Drop-in” fuels : fuels that are fully compatible with existing aircraft and fuel-supply systems
- In addition to safety standards, SAF needs to meet **Sustainability Criteria** (e.g. minimum CO₂ reductions on a life cycle basis)

Example: *Fuels made from biomass*



Source:
<https://www.icao.int>

Sustainable Aviation Fuel: What is it?

Why is the industry interested in SAF?



Reduce net life-cycle CO₂ emissions

for aviation operations



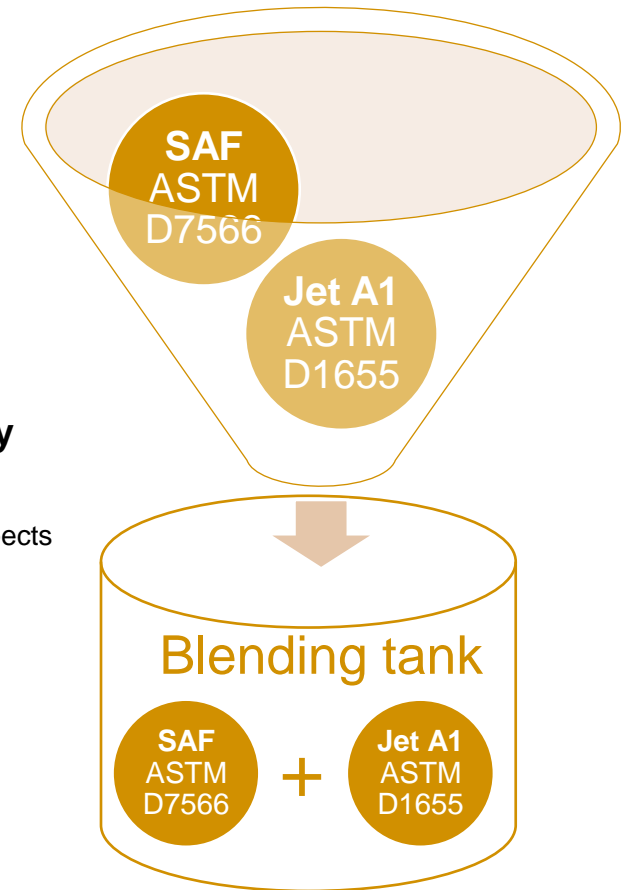
Enhance the sustainability of aviation

environmental, social and economic aspects



Only option that could reduce significantly CO₂

emissions of aviation operation before the availability of disruptive technologies



Typical properties of fuel grade Jet A-1 according to ASTM D1655

Property	Comment	Value or range
Density @ 15°C		775.0 – 840.0 kg/m
Flash point	Lowest temperature at which vapours of the material will ignite, when given an ignition source	Min. 38°C
Freezing point	Temperature at which wax crystals formed in the fuel as it cools completely disappear when the fuel is rewarmed	Max -47°C
Aromatics content	Related with smoke and soot formation	Max. 25%, volume
Sulphur content	Produces harmful emissions	Max. 0.30%, mass
Net heat of combustion	Energy liberated when completely burned, at constant pressure	42.8 MJ/kg

Where is it produced today?

Overview of SAF World Producers



Sustainable Aviation Fuel: Support by manufacturers like Bombardier

Bombardier has taken a key role in promoting SAF in business aviation

2016

GAMA Leadership

David Coleal becomes GAMA Environment Committee Chair:

- Board presentations in Feb, May, Oct
- Committee meetings in July, Nov

2017-20

Aircraft Operator Engagement

BBD-Industry Leaders Roundtable:

- Semi-annual private discussions at EBACE and NBAA-BACE

2018

SAF Industry Coalition

Formed in May 2018:

- Bombardier positioned as the industry leader
- Biweekly steering group meetings

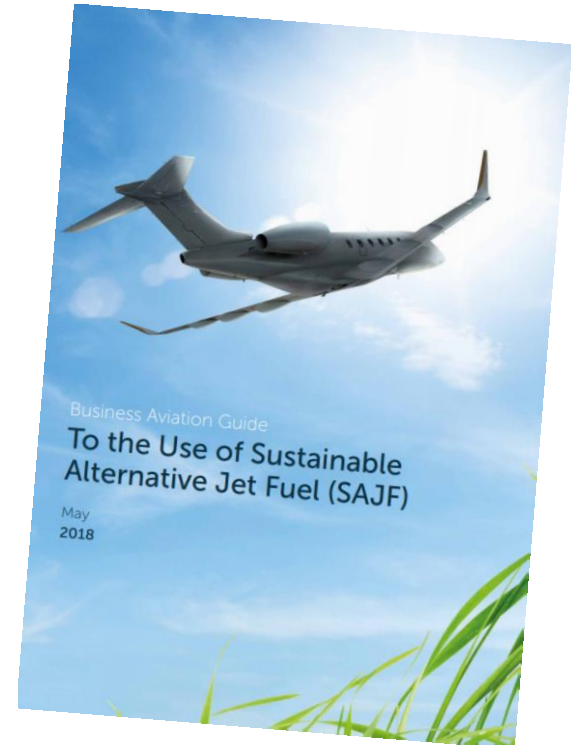
2009-20

Thought Leadership

Business Aviation Commitment on Climate Change

OEM leadership since 2009:

- Updated in 2015
- New update underway for Feb 2020



In 2019 alone, Bombardier has seized multiple opportunities to promote SAF

2019

Industry Activities

2019 engagement at SAF events

Jan 17: Van Nuys, CA

May 18: Farnborough, U.K.

May 20-23: EBACE @Geneva

Oct. 14-18: NBAA-BACE @Las Vegas

Van Nuys: SAF Coalition Leaders (Jan 2019)



Farnborough SAF event (May 2019)



NBAA-BACE: I want my SAF now panel (Oct 2019)



BBD-Industry Leaders Roundtable (Oct 2019)



Bombardier Usage of SAF

Growing Use of SAF

TO DATE: BBD demo fleet and BFTC aircraft have been using since 2017, totaling some 90 hours during 35 flights.

FUTURE: Preparing for SAF deployment at YUL for production aircraft deliveries.

2017-2020

On Nov. 27, Bombardier Aviation received its first shipment of SAF, in Montreal

**PRESS
RELEASE**

BOMBARDIER

Bombardier Reinforces Commitment to Environment and Receives First Shipment of Sustainable Aviation Fuel in Montreal

- Avfuel Corporation supplied inaugural shipment of sustainable aviation fuel (SAF) to be deployed to Bombardier customers upon aircraft delivery
- Shipment represents another step in Bombardier's commitment to secure long-term SAF supply, a key pillar of working toward a sustainable future for business aviation
- Bombardier has used SAF for aircraft demonstration purposes in the U.S. and internationally since 2017
- Bombardier continues to play a leading role in the industry-wide commitment to addressing climate change by reducing CO₂ emissions

Montreal, November 26, 2019 – Bombardier announced today that it received an inaugural shipment of sustainable aviation fuel (SAF) at its Montreal facilities, further reinforcing the company's commitment to sustainable flying. This step is the first in the company's plan to secure long-term partnerships with fuel suppliers to deploy SAF to all of its facilities as worldwide supply becomes more readily available.



BOMBARDIER

Our needs for the future



Local production



Competitive prices
(concept of availability/demand)



Accessible volumes
Long-term supplier



Promote waste-based fuels
More effective at reducing CO₂
(e.g. forest and household waste)

Government support is needed to make SAF available at competitive prices and in sufficient quantities.

Exceptional by design

