

# Building the Sustainable Aviation Fuel (SAF) Industry and Catalyzing Global Production



**Enabling Energy Transition.** Decarbonization of the aviation industry will require drop-in, low-carbon liquid fuels that are compatible with existing aircraft and infrastructure. Sustainable Aviation Fuel (SAF) is recognized as the key solution for meeting the aviation industry's 2050 net zero goal. Produced from a variety of low-carbon, sustainable feedstocks such as agricultural waste, municipal solid waste, energy crops, or carbon captured from industrial processes or ambient air, SAF is a like-kind replacement for traditional jet fuel. SAF can dramatically reduce lifecycle greenhouse gas emissions (GHGs) compared to conventional fuel made from crude oil, while also significantly improving local air quality by reducing conventional air pollutants like particulate matter.

**Leading Technology.** The LanzaJet Process™ is a leading, globally-recognized alcohol-to-jet (ATJ) technology. It is the world's first integrated process technology that uses low-carbon, sustainable ethanol as the feedstock to produce SAF and renewable diesel. The technology was developed and scaled-up by LanzaTech over a decade and originated with the Pacific Northwest National Laboratory (PNNL), a US Department of Energy (US DOE) National Laboratory. LanzaJet, established in 2020, has exclusive rights to the technology, its further development, and its global commercialization and deployment.

- ✓ **12+ Years R&D**  
Development work started with the US DOE and LanzaTech
- ✓ **2018 ASTM Approval**  
LanzaJet technology and data as basis for pathway approval
- ✓ **300M Gallons**  
SAF production announced to date
- ✓ **1 Billion Gallon Goal**  
Announced with The White House in Sep 2021 to be achieved by 2030
- ✓ **1st Globally**  
Constructing and operating Alcohol-to-Jet (ATJ) commercial plant in 2023
- ✓ **Global Deployment**  
at commercial-scale of 30M GPY to 300M GPY capacity in 2025+



10M GPY | Operational in 2023 | Soperton, Georgia

**World's First Plant.** LanzaJet is constructing the world's first alcohol-to-jet biorefinery in Soperton, Georgia. The 10 million gallon per year plant is being built using modular construction which is nearly complete and will next be shipped to the site. Operations are expected to begin in 2023. It serves as a commercial scale deployment that will inform future engineering designs at larger capacities.

### A Leveraging & Transitioning Existing Ethanol Supply

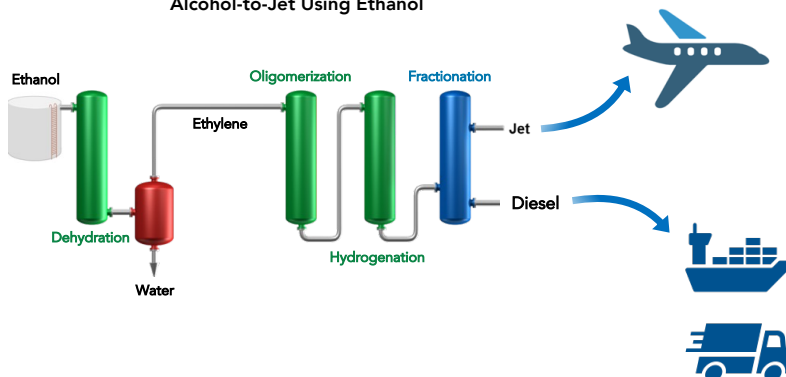
- Existing low-CI ethanol production
- Cellulosic ethanol
- Waste-based ethanol

### B Building New Waste-Based Ethanol Supply

- Industrial / landfill off-gases
- Agricultural waste and residues
- Municipal Solid Waste (MSW)
- Corn fiber cellulose / sugarcane bagasse
- Direct Air Capture (DAC) – CO<sub>2</sub> + H<sub>2</sub>

## The LanzaJet Process™

Alcohol-to-Jet Using Ethanol



**Flexible Platform.** The process technology starts with low-carbon and sustainably-produced ethanol. LanzaJet can use ethanol widely available in today's global market so long as it meets its sustainability and carbon intensity requirements. LanzaJet also partners with other technology companies to create integrated solutions that produce ethanol from waste sources, which are then converted to SAF using LanzaJet's technology. As examples, in India, LanzaJet will use ethanol made from waste carbon emissions using LanzaTech gas fermentation technology. In the UK, LanzaJet has partnered with Nova Pangaea Technologies to create ethanol from local woody waste and agricultural residues. LanzaJet is encouraging the development of ethanol production from waste sources, while in the early years advocating for investment into the production of sustainable, low carbon intensity ethanol through carbon capture and storage, renewable energy, etc.

**Drop-In Fuels.** The LanzaJet Process™ uses nearly all the carbon in the ethanol in its end products. The technology has the highest yields in the industry to produce hydrocarbons with up to 90% SAF and 10% renewable diesel or up to 75% diesel and 25% SAF, with no other byproducts. The shift between SAF and renewable diesel does not require any further capital investment or change in catalyst and is solely attributed to shifting plant operations. LanzaJet's SAF and renewable diesel meet global ASTM specifications. SAF meets ASTM D7566 and can be blended with conventional jet fuel up to 50%, the maximum allowable by ASTM today. LanzaJet has tested its fuel in much higher blends including 92% SAF and 8% fossil jet fuel. LanzaJet's renewable diesel meets ASTM D975.

**Significant Sustainability Benefits.** LanzaJet's SAF reduces greenhouse gas emissions by at least 70-85% compared to conventional jet fuel and can be net zero and carbon negative with certain waste-based ethanol, achieves >95% reduction in particulates, eliminates sulfur, and reduces contrail formation. LanzaJet SAF can qualify under US, UK, EU and global regulatory and voluntary programs.

## Global Commercial Deployment.

LanzaJet is developing projects with Suncor, Shell, Mitsui, British Airways, LanzaTech and others at capacities that range from 30 million gallons per year to upwards of 300 million gallons per year. These projects are expected to be operational starting in 2025 and are in the US, UK, EU, Japan, Canada, and India. Announced projects to date will have the capacity to produce 300 million gallons per year. Announced projects include:

- ✓ **Freedom Pines Fuels**  
10M GPY - Georgia
- ✓ **FLITE**  
30M GPY - Central Europe
- ✓ **Project Speedbird**  
30M GPY - UK
- ✓ **Project Dragon**  
30M GPY - UK
- ✓ **Vattenfall, Shell, SAS**  
30M GPY - Sweden
- ✓ **Mitsui + Cosmo**  
30M – 60M GPY – Japan
- ✓ **Marquis**  
120M GPY - US
- ✓ **Indian Oil Company**  
30M GPY – India