



ETHANOL BY AIR & SEA

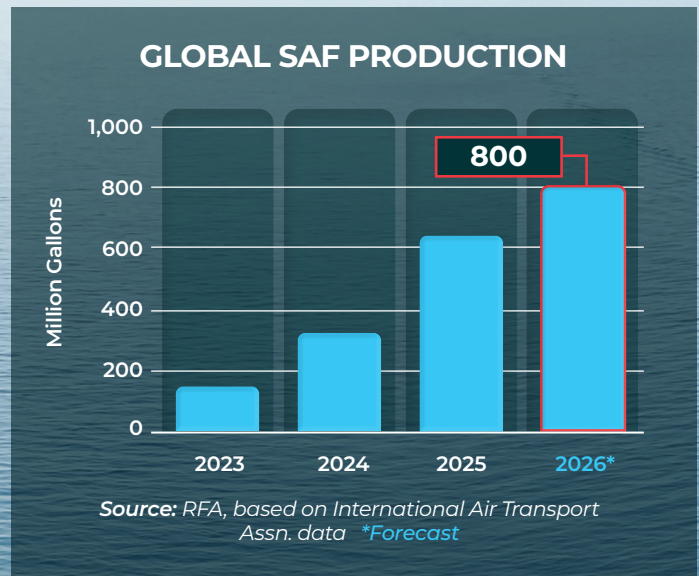
WHEELS UP

Aviation represents potentially the most difficult industry to decarbonize. Jet fuel is energy dense, performance-based, and safety critical. Today, and in the foreseeable future, there is simply no substitute for liquid fuels at speed and altitude. In 2025, global sustainable aviation fuel (SAF) production nearly doubled from 334 million gallons to just over 634 million gallons, according to the International Air Transport Association (IATA).

This increase still represents just 0.6 percent of total jet fuel consumption, and 2026 projections estimate SAF production at just 800 million gallons, falling below estimates to stay on track with the SAF Grand Challenge, which endeavors to support 3 billion gallons of U.S. SAF production by 2030. However, SAF demand from airlines remains strong, although price sensitive, as they continue to prioritize reducing emissions from the aviation sector.

Further action by the ethanol industry can drive down the carbon intensity of alcohol-to-jet (AtJ) feedstock by applying carbon capture, utilization and sequestration where available, and operational upgrades increasing plant efficiency.

RFA member LanzaJet announced in November 2025 that it has fully operated and produced ethanol-based SAF at its LanzaJet Freedom Pines Fuels facility in Georgia, marking both the world's first production of jet fuel using ethanol as a feedstock at a commercial-scale plant, and the first non-oil-based renewable solution compatible with today's aircraft.



MARITIME MOMENTUM

The global maritime fleet uses an estimated 80 billion gallons of fuel annually. Today, most of this is comprised of light/heavy fuel oils, diesel and liquefied natural gas, with alternative fuels playing a small (less than 1%) but increasingly important role in the future maritime fuel profile.

Indeed, ethanol is gaining momentum as a practical, cost-effective marine fuel. Manufacturers of marine engines like Everllence, WinGD and Wärtsilä are investing in dual-fuel ethanol-powered engines and conducting sea trials. These initiatives speak to ethanol's potential to deliver cleaner burning fuel at a lower cost while future-proofing the global fleet. That means American ethanol might soon fuel ships crossing oceans, anchoring U.S. agriculture, and strengthening global trade.

To speed the introduction of ethanol as a maritime fuel, RFA is leading, along with the American Biogas Council, the new American Biofuels Maritime Initiative.

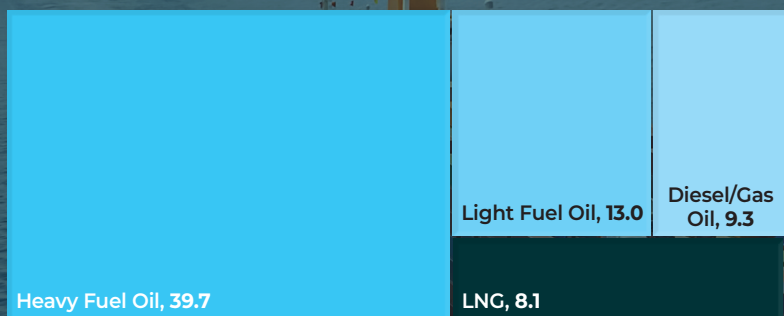


In December 2025, Maersk said it would blend 50% ethanol with 50% methanol in a test onboard the vessel Laura Mærsk. An earlier trial, conducted in October and November, involved a 10% ethanol / 90% e-methanol blend and confirmed that ethanol can be safely and effectively integrated into the fuel mix. Beyond the upcoming E50 test, Maersk plans to conduct a trial using 100% ethanol.

MARINE FUEL OFFERS AN ENORMOUS NEW MARKET OPPORTUNITY FOR U.S. ETHANOL AND AGRICULTURE

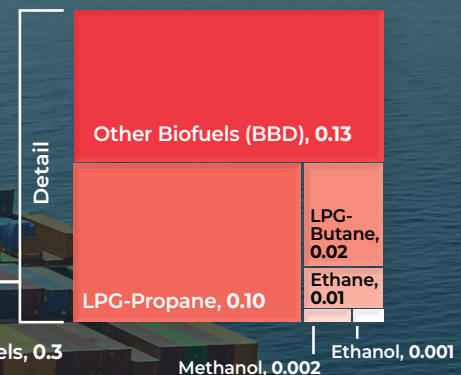
2023 Global Marine Fuel Consumption in
5,000+ Gross Tonnage Ships
(Billion Gallons)

Total = **70.4 BG**



2023 Global Alternative
Marine Fuel Consumption
(Billion Gallons)

Total = **0.3 BG**



Source: RFA