JETNET iQ PULSE

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Rollie Vincent
JETNET iQ Creator/Director

Under Pressure

Over the past 40 days and nights or so, the atrocities of Russia's invasion of Ukraine have displaced most other "breaking news" stories in the global media. Images of bombed apartment complexes, scorched civil aircraft hangars, and scenes of chaos only suggest the true scale of human suffering – all on Western Europe's doorstep. Reverberations of the brutal conflict are being felt in all corners of the world, stoking inflation, stressing supply chains, and instigating fears of a broader conflict. Companies are under pressure to rein in their operations and cease cooperating with Russia and its political and business leaders.

While Russia and Ukraine's share of the global business aviation fleet hovers below 1%, the Eastern European region punches above its weight class as a source of wealth and demand for business and private aircraft. We estimate that there are 3,000-4,000 ultra high net worth individuals (UNHWIs) in the Russian Federation, defined as people with net assets of at least $U.S. 30 million. Government sanctions aimed at Russia's political and business elite include targeted, high-profile asset seizures that include private aircraft and yachts. Organizations in our industry that have traditionally served this now-sanctioned group are scrambling to conform to the quickly changing business landscape, a frantic albeit lucrative 24x7 heyday for legal experts.

In 1981, British musicians Queen and David Bowie collaborated on their powerful rock classic *Under Pressure*, a song that has spawned many different interpretations. Looking around our industry, pressures abound that challenge our ability to perform, from aircraft appraiser to A&P mechanic to broker, financier, and contracts lawyer all anxiously striving to close on an attractive deal for an eagerly awaiting buyer.

As we highlighted in our last issue of JETNET iQ PULSE, while our industry feels like we may have entered a Golden Age of demand, pressures on individuals and their organizations to perform have clearly intensified.

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Many customers new to business and private aviation have entered the industry just as it has become more difficult to meet their expectations. In some cases, service gaps have opened and wait times have become noticeably longer. Managing expectations has become mission-critical in today's marketplace, where a plethora of new entrants is vying to serve some of the world's most demanding customers. As Freddie Mercury and David Bowie would sing: "This is ourselves under pressure."

Outlook

As we enter the 2nd Quarter of 2022, the initial shock of the Russian invasion of Ukraine has redrawn the old East / West Cold War battlelines, a sad and bewildering development that bleeds onto the pages of the world's daily news. While the war is being fought on Ukrainian territory, its ramifications are far-reaching – surging inflation, straining pressure on aerospace supply chains (particularly for highly-valued aerospace titanium), and both sides' closure of vast air corridor networks. Brent crude jumped to $U.S. 133 per barrel on March 8, 2022, up 96% YOY, as surging prices weigh on consumers, businesses, and their regulators.

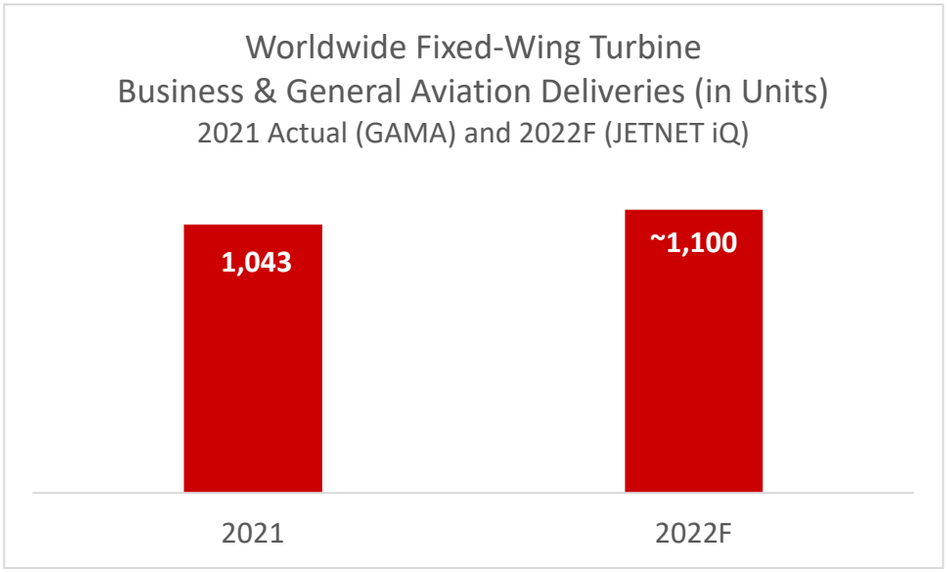
We remain concerned about the impact of the Russia-Ukraine war on aerospace titanium supplies, particularly given the high degree of titanium content in today's latest-generation and most fuel-efficient engines and airframes. If predictions of a full rebound in airline passenger traffic by 2024 prove accurate, the demands for titanium from Airbus and Boeing will surely exhaust any safety stockpiles they may be holding. The hunt has already begun for this precious metal, led by hunters with much larger checkbooks in hand than the OEMs in the business and general aviation industry. New sources of aerospace titanium will need to be developed (and quickly) given the long lead times already facing the industry. Yes, we do live in interesting times.

The depressing images confirming the destruction of the sole Antonov AN-225 heavy lifter are a reminder of the evils of war and the rapidity with which marketplace conditions can change. Investors seeking a quick return might think about the less-than-sexy aerospace metals markets before straying too far into other alternative investments.

Despite surging OEM backlogs and book-to-bills, we continue to expect modest YOY growth in business jet and turboprop deliveries in the near-term, driven primarily by production and supply chain limitations. While aircraft transaction prices (new and pre-owned) have busted right through any notion of a glass ceiling, we continue to hear of the daily pressures that put stress into workflows and that disrupt smooth production cadence. While we may one day live in a world of 3D printing where aircraft production and assembly are not constrained by factory loading dock delays and logistics, those days – like lasting peace in Eastern Europe – are not yet here.

Our forecast is for ~1,100 new fixed-wing B&GA turbine deliveries in 2022, up a modest 5-6% YOY. While new aircraft demand remains robust by almost any prior-year standard, labor shortages, supply chain pressures, and (appropriately) cautious management practices are tempering any significant increases in production.

2021 Fixed-Wing Turbine Aircraft Deliveries and 2022 JETNET iQ Forecast



*Source: GAMA 2021 General Aviation Aircraft Shipment Report, February 23, 2022; excludes twin-aisle airliners and agricultural & military trainer turboprops.

Business Conditions

GDP

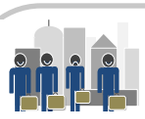
The Economist's **GDP growth forecasts** for 2022 are: U.S. +3.0%, Euro Area +3.5%, U.K. +4.1%, Mexico +1.9%, Brazil +0.3%, Canada +3.8%, China +5.2%, Australia +3.3%, and ***Russia -10.1%***

Business jet cycles (take-offs and landings) in March 2022 were up by 6% YOY for U.S. Part 91, up by 13% YOY for U.S. Part 91K, up by 15% YOY for U.S. Part 135, and up by 35% for European EASA 145 operations

Dow Jones Index (U.S.) was up 4%, **FTSE 100** (U.K.) was up 11%, **CAC 40** (France) was up 10%, and **DAX 30** (Germany) was down 5% YOY from Apr.6, 2021 to Apr. 4, 2022

U.S. Index of **Consumer Sentiment** was 59.4 in Mar. 2022 vs. 62.8 in Feb. 2022 and 84.9 in Mar. 2021 YOY; Euro Area **Economic Sentiment Indicator** was 108.5 In Mar. 2022 vs. 113.9 in Feb. 2022 and 109.4 in Apr. 2021

U.S. unemployment rate (seasonally adjusted) was 3.6% in March 2022 representing ~6.0 million unemployed people, down 318,000 from Feb. 2022 (3.8%)



U.S. **Purchasing Manager Index** (Manufacturing PMI) was 57.1 in Mar. 2022 vs. 58.6 in Feb. 2022 and 64.7 in Mar. 2021; Euro Area **Business Climate Indicator** was 1.70 in Mar. 2022 vs. 1.80 in Feb. 2022, and 1.0 in Apr. 2021

Transactions of pre-owned business aircraft in Jan.-Dec. 2021 were 3,610 jets and 1,831 turboprops, up 30% and up 27% YOY (JETNET as of Apr. 1, 2022)

Business aircraft deliveries in 2021 were 705 jets (up 10% YOY including Cirrus and Boeing / Airbus single-aisle) and 338 turboprops (up 13% YOY) (Source: GAMA)

Pre-Owned Business Jet Transactions and Inventory

Another look at year-end data on pre-owned business jet transactions (retail sales and leases) in 2021 reveals just how much pressure people in our industry are under, on the purchasing side of the negotiating table, on the shop floors, in the sales / contracts / financing offices, at the various aircraft registries, and all points in between. In late February, a review of what appeared to be 2021 year-end transaction totals indicated 3,144 pre-owned retail jet sales, the highest annual total ever recorded by JETNET. As of April 1, 2022, updated data indicate that more than 3,600 pre-owned jets changed hands in 2021, up 30% YOY and an adjustment of more than sixteen percentage points from just a month ago. A similar surge in aircraft sales registrations occurred on the turboprop side. As of April 1, 2022, pre-owned turboprop retail sales and leases were up an impressive 27% YOY as additional paperwork was entered into the various aircraft registries and recorded in JETNET.

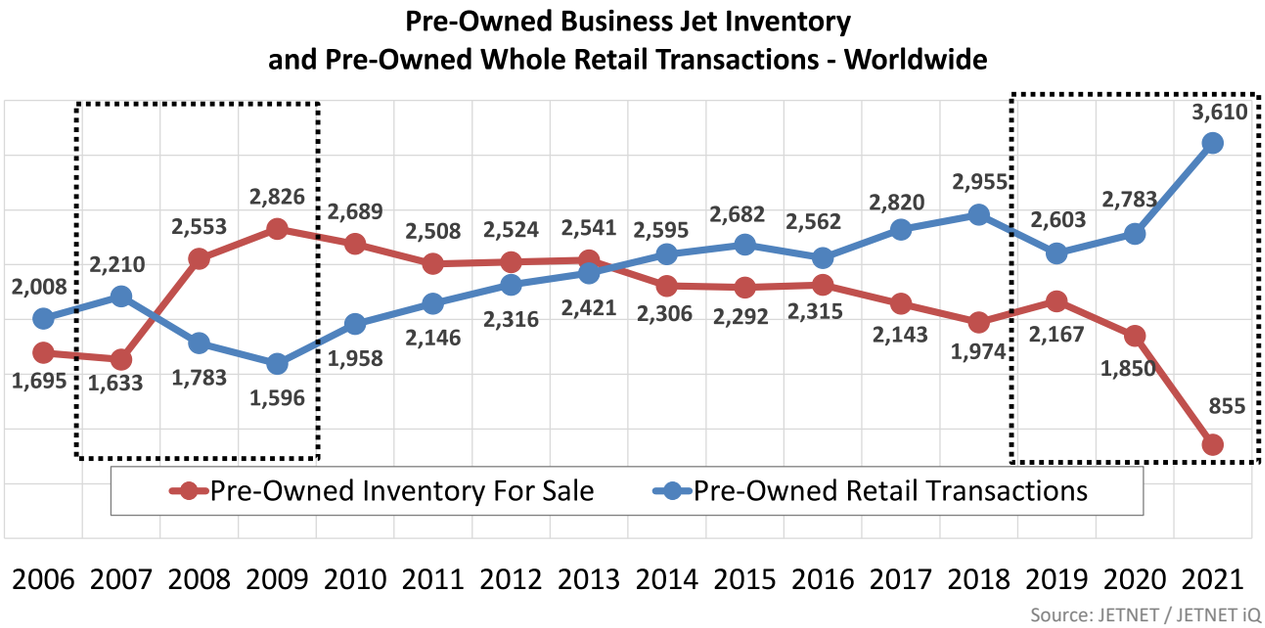
Pre-owned jet inventory that is tracked on the JETNET system fell 46% by the end of 2021 to just 855 aircraft. In many ways, current market conditions remain inverted from the period in the aftermath of the 2008 Global Financial Crisis, with strong prices, strong demand, and very limited inventory.

As of early April 2022, just 706 business jets were listed for sale on JETNET, and of those less than 8% were delivered new since the beginning of 2017. Buyers with very specific requirements – model, age, registration, specification, paint and interior – have less selection these days than Ukraine freedom fighters looking for choices in anti-tank artillery.

Market cadence is being supported by a highly-pressurized network of aircraft brokers and dealers who have honed their inventory hunting skills as never before. Once found, however, would-be buyers are under intense pressure to bypass pre-purchase inspections if their objective is to successfully close on a deal. In these exceptionally tight market conditions, a hoped-for recovery in private and corporate flying in the U.S. (so-called Part 91) is finally occurring (see following page). History suggests that this should result in additional new aircraft sales and trade-ins, but would-be buyers are faced with unusually long wait times for next-delivery positions. Pressure relief – uhhhh, what's that?

Business Jet Transactions and Inventory Trends

At Year End - From 2006 to 2021 (Revised Year-End)



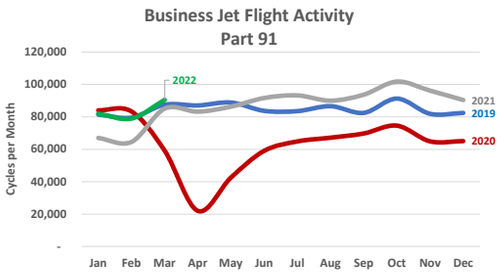
Source: JETNET / JETNET iQ analysis

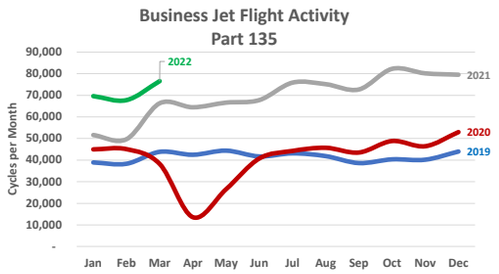
U.S. and European Business Aircraft Utilization

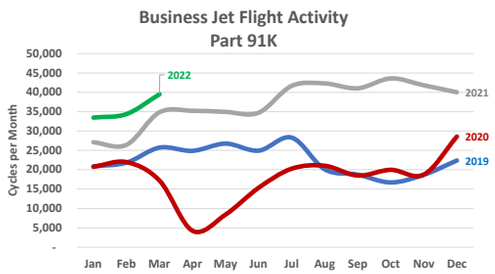
Business aircraft operations – jets and turboprops – for all operational categories in the U.S. and Europe have fully rebounded to pre-COVID levels based on the latest flight information available to JETNET through March 2022.

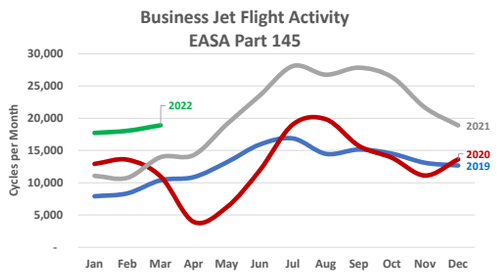
Business Jet Utilization (Cycles per Month)

2019-2020-2021 and 2022 Year-To-Date



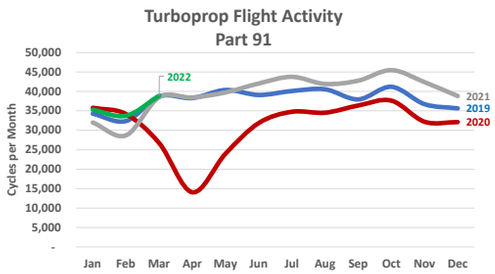


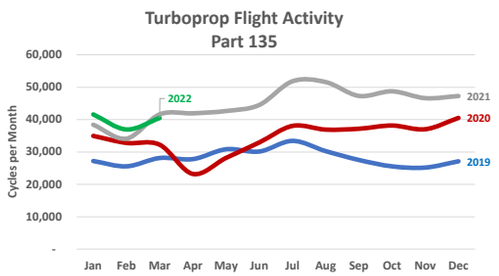


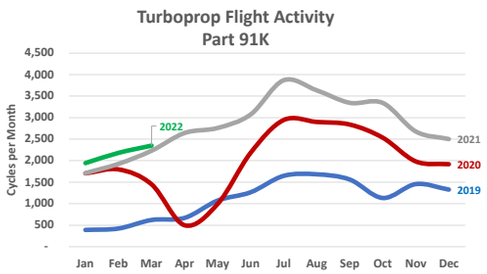


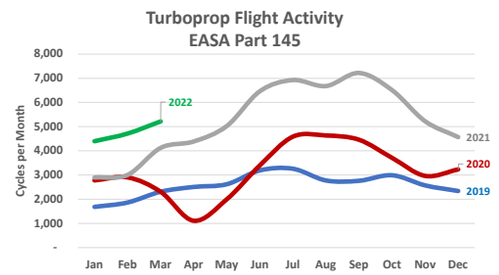
Business Turboprop Utilization (Cycles per Month)

2019-2020-2021 and 2022 Year-To-Date









Source: JETNET / JETNET iQ analysis

Sustainable Aviation Fuel: Usage Patterns and Intentions

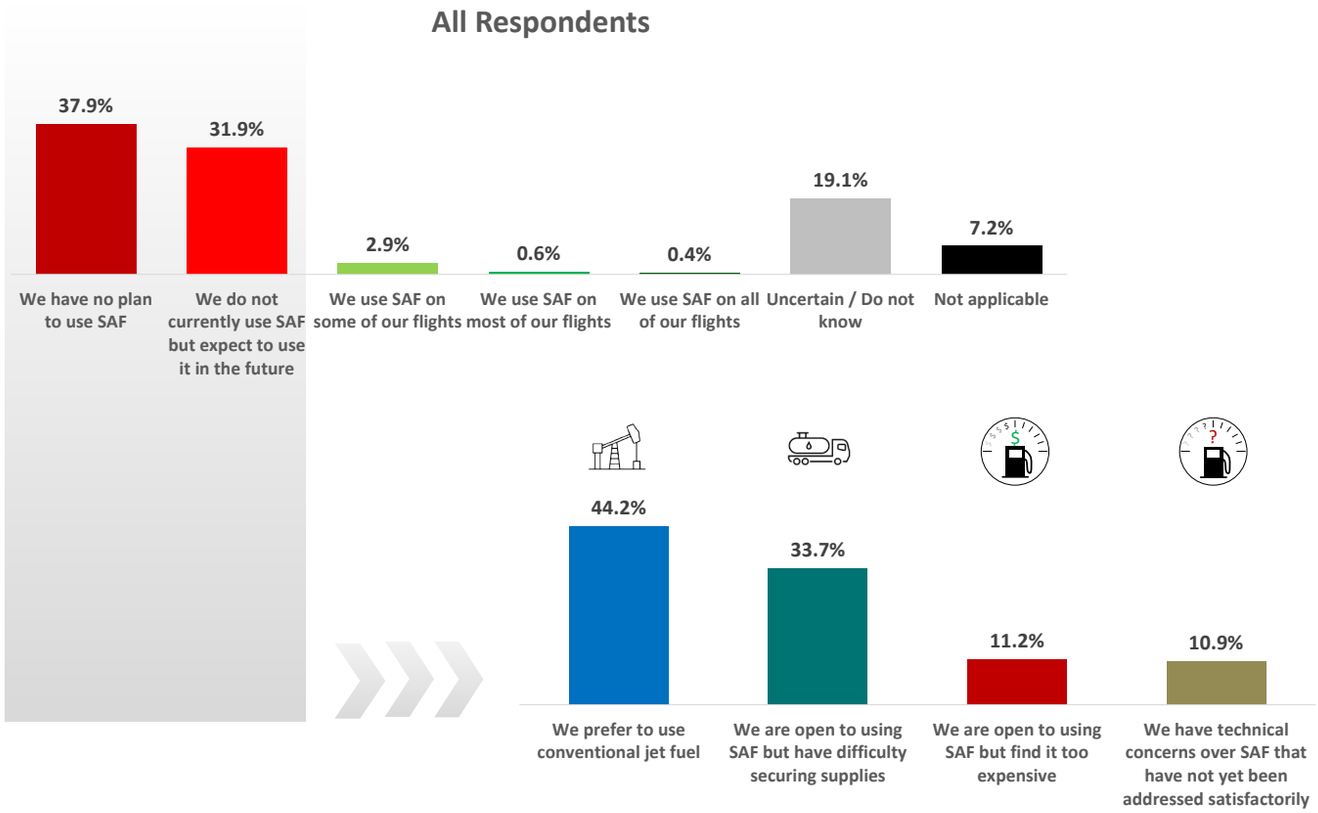
Business aviation's desire to achieve bluer skies and a greener future includes different pathways, including technological development of more fuel-efficient aircraft and engines, improvements in aircraft operational procedures, and less reliance on petroleum-based fuels.

Since Q1 2018, and in anticipation of expanding interest in the environmental impacts of business aviation operations, we began asking questions about sustainable aviation fuel (SAF) in our quarterly JETNET iQ Surveys. The purpose of this series of questions is to measure and monitor aircraft owner / operator perspectives. As the users of these fuels, customers ultimately vote with their wallets when it comes to questions of SAF uptake, usage patterns, and planned future use.

Our Q2 2021 JETNET iQ Survey from last year provides some important starting points from which to measure our current progress towards business aviation's greener future (see below). A year ago, our survey data suggested owners / operators were just starting to take SAF on board, with about 4% of respondents indicating that they had flown with sustainable fuel on at least some of their flights. Encouragingly, a further 32% of respondents at the time expected to use SAF in the future, while ~19% were uncertain. Results pointed to the need for additional fuel supply (points-of-sale), subsidies and other financial incentives, and education initiatives to alleviate lingering technical concerns that had not yet been addressed to the satisfaction of certain owners / operators.

SAF Usage Patterns and Intentions

Q2 2021 JETNET iQ Survey



Source: Q2 2021 JETNET iQ Global Business Aviation Survey
(n=506 business aircraft owners / operators in 65 countries flying 3,209 fixed-wing turbine aircraft)

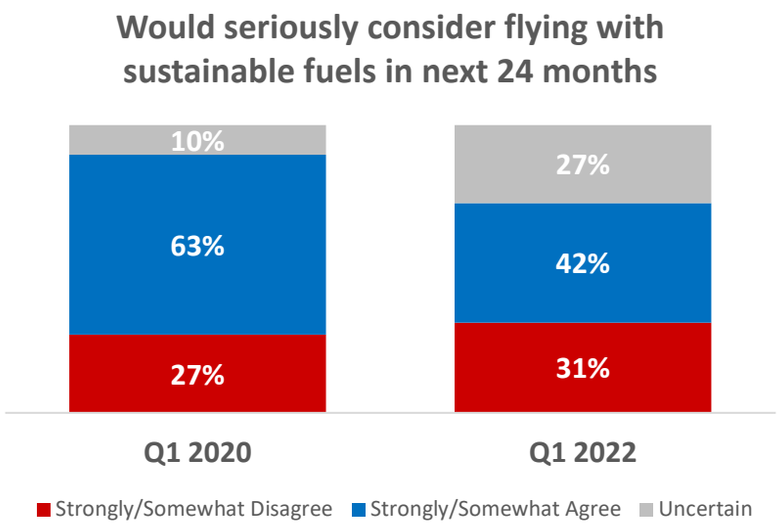
Flying with SAF in the Next 24 Months

While interest in sustainable aviation fuel (SAF) is relatively high, our latest JETNET iQ survey of business aircraft owners / operators suggests that purchase consideration has waned somewhat. Forty-two percent of respondents to the Q1 2022 JETNET iQ Survey indicated that they would seriously consider flying with SAF over the next 24 months, down from 63% two years ago.

A more in-depth review of results suggests that interest has slipped across all major world regions, but particularly in North America (U.S. and Canada). While the proportion of business aircraft owners / operators who indicate that they are resistant to SAF has remained relatively steady at about 30% worldwide, the share of survey respondents who are uncertain has increased by a factor of 2-3X over the two-year period, both at a global and regional level across all major geographies. Whether this is due to SAF availability, cost, technical concerns, or other factors, there is little doubt that environmental considerations such as climate change have essentially evaporated from the world's front-page headlines, if only temporarily.

Keeping focused on industry targets of zero carbon emissions may seem difficult at times like these, but the future will be upon us sooner than we know, and creating the future is one of the things at which we are particularly skilled. As Dennis Gabor, the Hungarian-born winner of the 1971 Nobel Prize in Physics, said: "The future cannot be predicted, but futures can be invented. It was man's ability to invent which has made human society what it is."

Flying With SAF in the Next 24 Months
A Comparison of Results from the Q1 2020 and Q1 2022 JETNET iQ Surveys



Sources: Q1 2020 and Q2 2022 JETNET iQ Global Business Aviation Surveys

SAF's Role in the Quest for Net-Zero Carbon Emissions

Greg Fell
CEO, JETNET LLC

It feels good to find tangible evidence supporting your beliefs. That's why I was delighted to read that on March 25, 2022, Airbus performed the first A380 flight powered by 100 percent sustainable aviation fuel (SAF). As Airbus notes in its press statement, the A380 is actually the third Airbus aircraft type to fly on 100 percent SAF within a relatively short period of time. The first was an Airbus A350 in March 2021 followed by an A319neo single-aisle aircraft in October 2021. Those flights are important data points in the larger picture of aviation progress and innovation.

I like to think of myself as a realistic futurist. I love reaching for the stars while staying firmly grounded in reality. Early in my pilot training, I learned that keeping on course requires a series of minor corrections and adjustments throughout the flight. Flying is a discipline that favors incremental changes and smooth transitions. I believe that we can apply a similar discipline to help business aviation achieve its goal of net-zero carbon dioxide emissions by 2050.

Wider adoption of SAF is an essential step on our journey to reducing greenhouse gas (GHG) emissions that are harmful to our atmosphere. Even though business aviation accounts for only a tiny faction – .04 percent – of global CO_2 emissions, we can play a key role in accelerating the transition to SAF. Business aviation contributes $150 billion to the U.S. economy and employs more than 1.2 million people, according to the National Business Aviation Association (NBAA). We have the influence to punch above our weight and we are uniquely positioned to serve as authentic role models for positive change.

SAF provides benefits that go beyond reducing CO_2 emissions. "SAF has lower particulate emissions and generates less contrails than fossil jet fuel," according to Neste, the world's leading producer of sustainable aviation fuel and renewable diesel. "This means that the environmental benefits of SAF are more than the 80% carbon emission reduction."

Despite current challenges, the global market for SAF is expected to grow substantially in the future, driven by demand across every segment of the aviation industry. What's missing is a coordinated set of targeted economic incentives and regulatory guidelines that will jumpstart the era of broad SAF adaption. In California, operators can take advantage of state and federal incentives to lower the cost of buying SAF. Oregon and Washington have similar programs in the queue. Ideally, populous states on the U.S. East Coast will follow those examples and create their own programs to encourage wider use of SAF.

To be sure, SAF is not the only answer to mitigating GHG emissions. Improvements in airframe and powerplant technologies, along with more efficient modes of operation and targeted economic policies, are also part of the solution. In the near-term future, we'll probably see more experimentation with aircraft powered by electricity and hydrogen fuels, but those alternatives are still largely in test mode. SAF, on the other hand, is here today and ready for use in turbine-powered aircraft. SAF is a drop-in fuel that requires no special modifications or additional infrastructure to store, deliver or use. Even if you're operating from an airport that doesn't provide SAF, you can still take advantage of it through a procedure called "book and claim," which allows customers to buy SAF at an airport where it isn't physically available and receive credit for the reduction in carbon emissions.

I'll leave you with this thought: We are an admired industry, and our hearts are in the right place. Our quest to achieve net-zero carbon emissions before 2050 is both noble and practical. Let's use our leadership skills in concert with the global aviation community to get the job done.

About JETNET iQ

JETNET iQ is a business aviation market research, analysis and forecasting service consisting of three main elements:

- **JETNET iQ Reports** are the definitive analytical reference for business aviation, incorporating quarterly state-of-the-industry analyses, owner / operator surveys, and detailed delivery and fleet forecasts;
- **JETNET iQ Summits** are annual industry thought-leadership conferences providing unique data, insights and networking opportunities; and
- **JETNET iQ Advisory** provides customized research and analysis for clients on a project-by-project basis.

JETNET iQ Reports are available in various formats on a subscription basis, and are published regularly by JETNET LLC, 101 First Street, Utica, NY 13501 - **currently offered at 11 different levels**. JETNET iQ is a partnership between JETNET LLC of Utica, New York and Rolland Vincent Associates, LLC, of Plano, Texas.

Since late 2010, JETNET has conducted quarterly surveys of the worldwide community of business aircraft owners and operators in order to gauge customer sentiment, brand perceptions, aircraft purchase, selling, and utilization expectations, and other factors. JETNET iQ Global Business Aviation Surveys are password-protected and by invitation-only. Potential respondents are drawn randomly from the JETNET worldwide database of business jet and business turboprop owners and operators; they are initially contacted by telephone and/or e-mail by JETNET's team of multilingual researchers. Target respondents include chief pilots, directors of aviation, and senior management. Each survey includes at least 500 respondents in 50 or more countries each quarter, and respondents closely reflect the worldwide distribution of the business jet and turboprop community.

For more information on JETNET iQ, please contact:
Rolland Vincent, JETNET iQ Creator/Director
Tel: 1-972-439-2069
e-mail: rollie@jetnet.com

To subscribe to JETNET iQ Reports or inquire into sponsorship of JETNET iQ PULSE, please contact:
Paul Cardarelli, JETNET Vice President of Sales
Tel: 315-797-4420, ext. 254
e-mail: paul@jetnet.com

Appendix

Data sources:

Real GDP growth forecasts (2022): The Economist – Apr. 2, 2022
https://www.economist.com/economic-and-financial-indicators/2022/04/02/economic-data-commodities-and-markets
Stock Markets:
Dow Jones Industrial Average: http://ca.spindices.com/indices/equity/dow-jones-industrial-average
London Stock Exchange (FTSE 100): https://www.londonstockexchange.com/indices/ftse-100
Euronext Paris (CAC 40): https://live.euronext.com/en/product/indices/FR0003500008-XPAR
Frankfurt Stock Exchange (DAX 30): https://www.boerse-frankfurt.de/indices/dax?mic=XETR
Initial Unemployment Claims: Bureau of Labor Statistics (U.S.); https://www.dol.gov/ui/data.pdf; "SA" = seasonally adjusted
Unemployment: Bureau of Labor Statistics (U.S.); https://www.bls.gov/news.release/pdf/empsit.pdf
Consumer Confidence: University of Michigan Survey of Consumers (U.S.); http://www.sca.isr.umich.edu
European Commission (Euro Area) – Economic Sentiment Indicator; https://ec.europa.eu/info/sites/default/files/bcs_2022_03_en.pdf
Business Confidence: U.S. ISM Manufacturing PMI (U.S.)
https://www.ismworld.org/globalassets/pub/research-and-surveys/rob/pmi/rob202107pmi.pdf
Eurostat (Euro Area); https://ec.europa.eu/eurostat/databrowser/view/teibs010/default/table?lang=en
https://ec.europa.eu/eurostat/databrowser/view/ei_bsci_m_r2/default/table?lang=en
Business aircraft fleet, deliveries, transactions, days-on-market (DOM), utilization: JETNET; GAMA
Survey results: JETNET iQ Global Business Aviation Surveys (Quarterly)
Photo / Image credits: Rolland Vincent Associates, LLC / JETNET iQ / JETNET

Definitions and Abbreviations:

For the purposes of these Reports, business aircraft may be classified into 4 primary categories, reflecting propulsion, price, performance, and weight class differences. These categories are: Turboprops (Single-Engine Turboprops - SETP and Multi-Engine Turboprops - METP), Small Jets (Personal Jets, Very Light Jets, Light Jets), Medium Jets (Super-Light Jet, Mid-Size Jet, Super Mid-Size Jet), and Large Jets (Large Jet, Large Long-Range Jet, Large Ultra Long-Range Jet, Airline Business Jet). The "Personal Jet" category includes single-engine turbofan-powered models, today represented by the Cirrus Vision Jet.

B&GA: Business & General Aviation
EIS: Entry in Service
FBO: Fixed Base Operator (private air terminal)
FTSE: Financial Times Stock Exchange (London)
GAMA: General Aviation Manufacturers Association
GDP: Gross Domestic Product
HNWI: High Net Worth Individual
MTOW: Maximum Takeoff Weight
NGO: Non-Governmental Organization
OEM: Original Equipment Manufacturer
QOQ: Quarter over Quarter
QTD: Quarter to Date
S&P: Standard & Poor's
SME: Small and Medium-Sized Enterprise
TTM: Trailing Twelve Months
WHO: World Health Organization
YOY: Year over Year
YTD: Year to Date

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