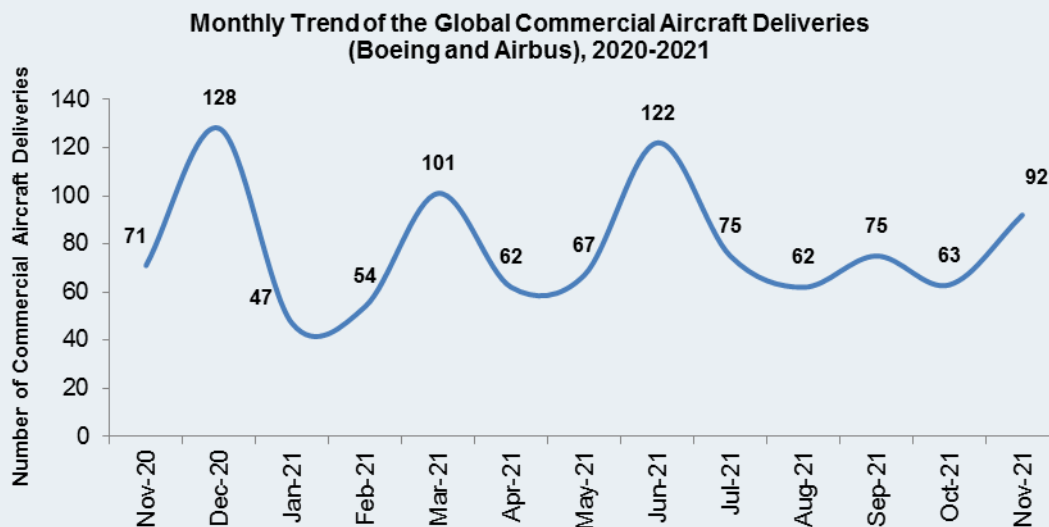


Composites Market Update for November 2021

Continued strong demand in the US Composites Market in November led to robust composites sales that surpassed even the record-breaking performance of the prior November by 8%-10%. November's performance even surpassed October, which is extremely rare. Supply and transportation constraints continued to prevent the market from meeting the full demand, and December's outlook is also very strong, despite historical December performance being one of the lowest months. Construction and building remained strong drivers for demand, but all sectors are performing well, and none seem to be lagging behind at present. Raw material prices continue to creep upward, but at a slower pace than in previous months. This slower growth in the cost of raw materials is likely to continue in the foreseeable future, as transportation costs continue to increase, and labor shortages remain a persistent and significant challenge. The Covid pandemic continues to pose challenges to the industry in two ways. First, the push for vaccine mandates may exacerbate current labor challenges and lead to critical employees leaving their jobs. Simultaneously, the virulence of the Omicron variant, despite being a milder form of the virus, creates risks for further disruptions throughout the supply chain, largely due to the high number of unvaccinated people.

Aerospace

Commercial aircraft (Boeing and Airbus) deliveries increased from 63 aircraft deliveries in October 2021 to 92 aircraft deliveries in November 2021.



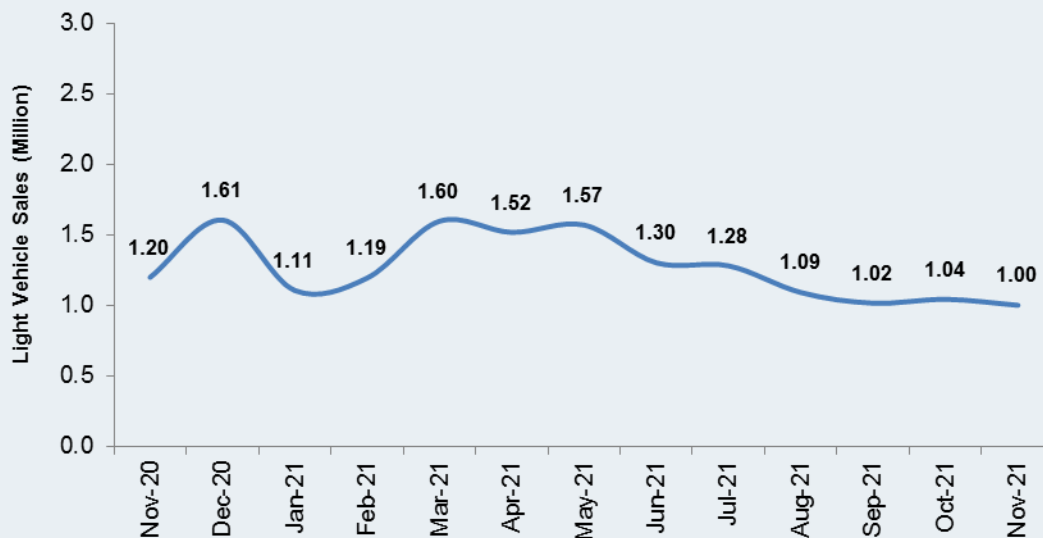
Some highlights of November 2021 are as follows:

- **SAMI Unveils Facility to Manufacture Composite Aerospace Components.** SAMI Composites LLC, to produce composite parts for structural aerospace sub-assemblies, contributing to enhancing the Kingdom's industrial capabilities in the field of air and defense industries. Its advanced precision equipment includes a 13-meter-long, 6.9-meter-diameter autoclave — the biggest in Saudi Arabia, 5-axis CNC (computer numerical control) equipment, NDI (nondestructive inspection) Gantry Robot, and ATL (automated tape laying) and AFP (automated fiber placement) machines. Besides reducing material costs and increasing aircraft fuel efficiency through lightweight components, composite materials also contribute to sustainability.
- **Higher Performance, Lower Cost Helicopter Rotor Blades Developed with OOA, FAA-Qualified Composites.** Erickson Inc. and partner Toray Advanced Composites replaced legacy aluminum S-64 main rotor blades with out-of-autoclave, multi-material composite alternatives. The new composite blades deliver an improved production cycle, reduced initial and lifecycle operating costs, fuel savings and performance gains, reduced vibration and more. The blades reportedly also reduce the amount of engine torque required to lift objects out of the water, as well.
- **Spirit AeroSystems Honored as Industry Leader in Composites Manufacturing.** Spirit AeroSystems Holdings, Inc., has won the 2021 SME Excellence in Composites Manufacturing Award (Large Company) for its advanced composite wing spoiler program for the Airbus A320 aircraft family. The spoilers are produced using Spirit's pioneering Resin Transfer Molding (RTM) technology at its Prestwick, UK facility. Spirit leveraged its unmatched design-for-manufacturing expertise to redesign the A320 spoiler to a fully integrated, out-of-autoclave, single-shot RTM solution. The new spoiler production system delivers significantly improved manufacturing and cost efficiencies, including reduced energy consumption and material waste, compared to the previous hand laid-up, honeycomb core stiffened, and autoclave cured process. The elimination of multiple autoclave cure cycles means that production requires fewer tools and a shorter flow time, contributing to a more sustainable process.
- **Composite Ring Frame Improves Safety, Cost for Workhorse Helicopter.** Airbus Helicopters replaces aluminum primary structure with CFRP using multi-piece preform and single-shot infusion. Airbus Helicopters' redesign of the aluminum H135 ring frame. The H135 light twin-engine helicopter is reportedly the number one emergency medical service (EMS)/air ambulance helicopter in Europe, known for its reliability, versatility and cost-competitiveness.

Automotive

The U.S. new vehicle sales of 1,000,801 units in November 2021 represented a decrease of 17% as compared to 1,199,137 in November 2020.

Monthly Trend of Light Vehicle Sales in the US, 2020-2021



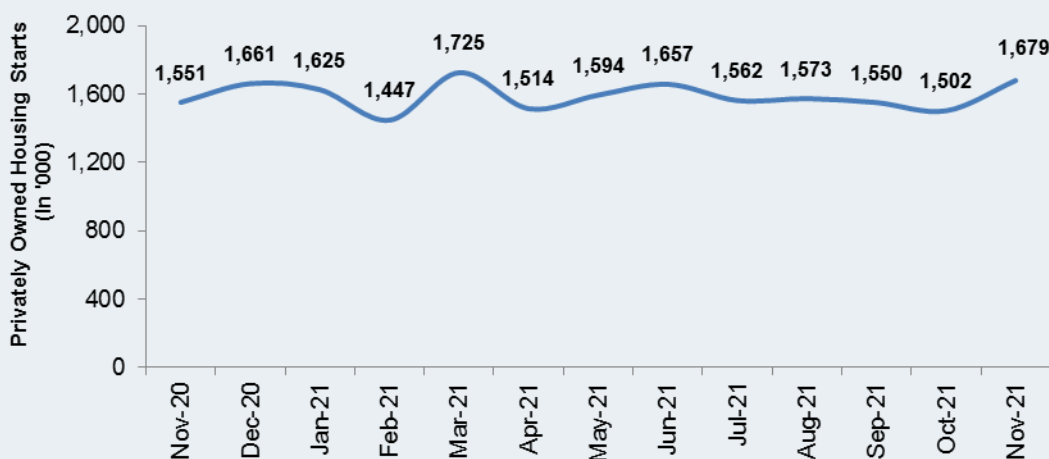
Some highlights of November 2021 are as follows:

- Continental Structural Plastics, Inapal, Benet, CSP Victall and Teijin Automotive Center Europe came together under single brand called Teijin Automotive Technologies.** Through this rebranding, Teijin Automotive Technologies becomes a proven manufacturer of highly-engineered materials for dynamic market divisions with the ability to supply consistent materials and components to customers across North America, Europe and Asia – a capability no other supplier can provide. Spanning several mobility related industries, including automotive, heavy truck, marine and recreational vehicle segments, the new organization which includes Teijin’s automotive composites team in Japan, is positioned to provide advanced materials solutions through its 29 strategically located manufacturing and technical centers. Utilizing all the strengths from the previously separate companies, Teijin Automotive Technologies can provide unique solutions for the next generation of mobility.
- Oribi Composites and Packard Performance Partner to Develop World’s First Advanced Thermoplastic Composite Wheel for off-road Powersports.** The new composite UTV wheels are 50% lighter than aluminum yet are able to handle extreme terrain and driving conditions with no compromise to overall strength and toughness. Thermoplastic composite materials address the shortcomings of traditional thermoset epoxy materials; they are inherently tougher, can be processed into parts faster, and are recyclable. Packard Performance now has the unique ability to offer a lightweight wheel, while still addressing durability and toughness for this demanding application.
- Gatron Manufactured Composites Deflectors of Concept Truck.** The concept vehicle, serves as a platform for anticipating new technologies, including that of a tipper wheel road train which is reported to be a ton lighter than conventional ones developed by Randon Implementos. Five deflectors in total combine a sinuous, aerodynamic design, high strength and low weight.

Construction

Privately-owned housing starts in November were at a seasonally adjusted annual rate of 1,679,000. This is 11.8% above the revised October estimate of 1,502,000 and is 8.3% above the November 2020 rate of 1,551,000. Single-family housing starts in November were at a rate of 1,173,000; this is 11.3% above the revised October figure of 1,054,000. The November rate for units in buildings with five units or more was 491,000.

Monthly Trend of Privately Owned Housing Starts in the US, 2020-2021



One of the highlights of November 2021 is as follows:

- Knicht Architects and Network Rail.** Miguel Escallon, Senior Bridge Designer for Knicht Architects, and Ahmad Kamara, Senior Design Engineer for Network Rail, have been declared as the latest speaker to join ConstructionAM 2022. The event, taking place on 26th and 27th April 2022, in Manchester, UK, will look at the latest innovation from across the industry. Miguel and Ahmad will present 'The Flow Bridge – Design, Engineering and Materiality'. Focusing on the intersection between design innovation and performance, Miguel's use of advanced computational tools allows him to efficiently tackle complex design and optimization problems. With a background in architecture and industrial design, his professional interest lies in bridging the gap between computational design and fabrication.

Wind Energy

According to the latest "Energy Infrastructure Update" report from the Federal Energy Regulatory Commission's Office of Energy Projects, the cumulative installed capacity of 48 units during January-October 2021 was 8,580 MW as compared to 7,161 MW of 64 units during January- October 2020.

With a total installed generating capacity of 130.89 (GW), wind constituted 10.54% of the total installed generating capacity of 1,241.46 (GW) among all energy sources.

Some highlights of November 2021 are as follows:

- **NREL's Innovative Manufacturing Approach for Advanced Wind Turbine Blades.** A team of National Renewable Energy Laboratory (NREL) researchers are furthering their revolutionary combination of recyclable thermoplastics and additive manufacturing (better known as three-dimensional [3D] printing) to manufacture advanced wind turbine blades. If they succeed, the team will reduce turbine blade weight and cost by 10% (or more) and production cycle time by at least 15%, a huge leap (or pirouette) for wind energy technology.
- **Composite Materials to Enable Next Generation of Wind Turbines with Joule Challenge Project.** Developing a manufacturing capability for the large components integral to next-generation turbines is vital if the UK is to accelerate the build-out of fixed and floating offshore wind. The project will set out to prove that composite materials can deliver significant performance and light-weighting opportunities that will be essential to addressing the technical challenge of developing the next generation wind turbine platform beyond 20MW.

Marine

The US marine industry is anticipated to experience good growth in 2021.

Some highlights of November 2021 are as follows:

- **Gulf Craft Unveils World's Largest Composite Yacht Manufactured from Scott Bader's High-Performance Products.** Gulf Craft recently launched the largest composite yacht in the world – Majesty 175. The Majesty 175 is now the largest composite yacht in the world. It's manufactured from a host of Scott Bader products including; Crystic resins, vinyl esters, gelcoats, Crestamould tooling systems, Crestomer and Crestabond structural adhesives. Scott Bader and Gulf Craft have been working in partnership since 2007 to manufacture their world class range of superyachts.
- **Solico Designs Carbon Fiber Yacht for Aeolos Composites.** Carbon fiber materials were a key part of the P30 design concept, which Solico says minimized weight and produced a light, fast yacht. Solico worked with the ISO 12215-5 material properties, along with carbon fiber formats, to conduct a detailed finite element analysis (FEA) analysis of the components and reduce structural weight to a minimum. One of the novel features of the P30 is the hinged carbon fiber bowsprit that enables bows to moor in European marinas that do not permit a bowsprit over the dock.
- **Dual-purpose, full-foiling Yacht Concept Incorporates Carbon Fiber Composites.** A collaboration between Persico Marine, Pininfarina Nautical and Carkeek Design Partners is to develop a lightweight yacht that can transition between day sailing and regatta racing modes. The Persico F70 is an ultra-fast, lightweight, foil-assisted carbon fiber composite day sailor and racer designed to deliver unprecedented performance with style and comfort.

Consumer Goods

New orders for manufactured durable goods in November increased \$6.5 billion or 2.5% to \$268.3 billion, according to the U.S. Census Bureau. This increase, up six of the last seven months, followed a 0.1% October increase. Excluding transportation, new orders increased 0.8%. Excluding defense, new orders increased 2.0%. Transportation equipment, up following two consecutive monthly decreases, led the increase by \$5.0 billion or 6.5% to \$82.1 billion.

Some highlights of November 2021 are as follows:

- **Mishima Unveils World's First Made-to-Order Carbon Fiber Lounge Chair.** Mishima, a Silicon Valley-based Japanese furniture brand, has unveiled its flagship product, the world's first custom made lounge chair and ottoman supported by a single carbon fiber composite structure. The Mishima Lounge Chair and Ottoman touts a true unibody construction, 3D-manufactured with a single pass of continuous carbon fiber thermoplastic composite. Its signature support structure is made without joints or glue with aerospace grade ultra-high modulus carbon fiber for unparalleled strength to support the chair and passes stringent ANSI/BIFMA durability and safety standards.
- **IsoTruss Production Launch of Carbon Fiber Cell Towers to Meet Global Demand for Full 5G Rollout.** IsoTruss carbon fiber cell towers are twelve times stronger than steel, or 1/12 its weight, depending on the design. Ranging in height from 6 to 42 meters, the lightweight IsoTruss composite cell towers are particularly suited to solve the "distancing" problem in 5G rollout, especially at sites with weight limits and zoning considerations, such as rooftops in densely populated urban settings, and in rural areas, which require "last-mile access." Strength and wind resistance are maintained, no matter the height of the tower. IsoTruss carbon fiber lattice towers offer flexibility and modularity in structural design due to their particularly high strength-to-weight ratio, even over other composite structures.
- **BASF Launches New Consumer Electronics Toolkit Made with Elastollan TPU.** BASF has introduced a new Consumer Electronics toolkit with collections of wearables and mobile phone protective cases made with Elastollan Thermoplastic Polyurethane (TPU). The collection of mobile phone protective cases features six classic designs made with Elastollan. Hence, it possesses exceptional defense against scratch, UV, discoloration, good transparency, and easy coloring.

Recent Developments in Materials

- **Solvay Introduces Reactive Waterborne Emulsifier for Solid Epoxy Resins.** Solvay has developed Reactsurf 0092, an alkylphenol ethoxylates-free (APE) and non-ionic reactive water-based emulsifier for solid epoxy resins mainly for use in industrial coatings and paints or binders. Solvay's unique and versatile Reactsurf 0092 technology allows for the formulation of high-performance waterborne epoxy-based coatings which can match or exceed that of solvent-based (SB) coatings but with an appreciably lower level of volatile organic compounds (VOCs). Solvay is continuously developing and supplying products to meet the sustainable development challenges and regulatory requirements its customers are facing today and tomorrow for cleaner, healthier paints, and coatings formulations. The new, cost-effective,

environmentally and processing friendly emulsifier offers easy handling by combining both characteristic external and internal emulsification phases with no additional chemical modification required.

- University of Washington Researchers Develop New Healable Carbon Fiber Composites.** A research team that includes UW mechanical engineering Assistant Professor Aniruddh Vashisth describes a new type of carbon fiber reinforced material that is as strong and light as traditionally used ones but can be repeatedly healed with heat, reversing any fatigue damage and providing a way to break it down and recycle it when it reaches the end of its life. The material is part of a recently developed group known as carbon fiber reinforced vitrimers (vCFRP). The materials typically used today, whether in sporting goods or aerospace, are carbon fiber reinforced polymers (CFRP).
- Momentive Unveils New Niox Polyurethane Foam Additives Products.** Momentive Performance Materials Inc. apprises of the launch of the next generation of Niox polyurethane additives for a wide range of PU applications. These new products offer lower emission properties, while allowing manufacturers to maintain their process and final product performance. Niox silicone stabilizers for slab stock polyurethane foam provide significantly lower emission and reduced odor of the final foams when compared to conventional stabilizers. Niox EF catalysts that can provide lower emission, lower odor and wider processing latitude for bedding, furniture and molded automotive foam applications.

Recent Product Launches in the Composites Market

The following table represents new product launch in the composites market in November 2021.

Product	Company Name	Description
Stronggirt	Strongwell	STRONGWELL's STRONGGIRT® is the ideal continuous insulation (CI) cladding attachment support system. This all-FRP (fiberglass) pultruded composite uses a custom fire-retardant resin system and unique laminate design to offer superior pull out strength, excellent thermal efficiency, and the ability to work with any non-proprietary insulation. The product has been engineered for strength and stiffness to support cladding, insulation, and wind loads, while offering a simple, durable, costeffective solution for installers.

The US Economic Overview – November 2021

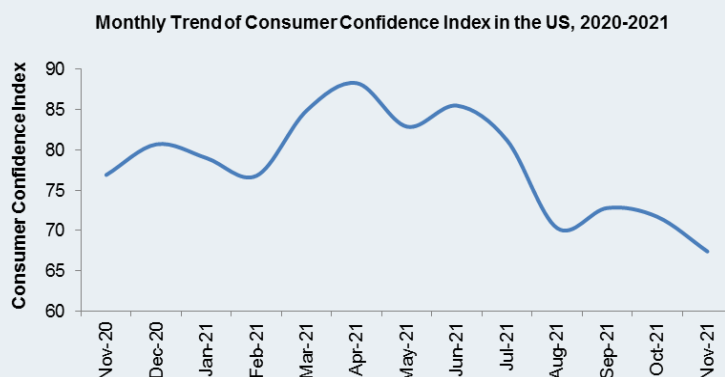
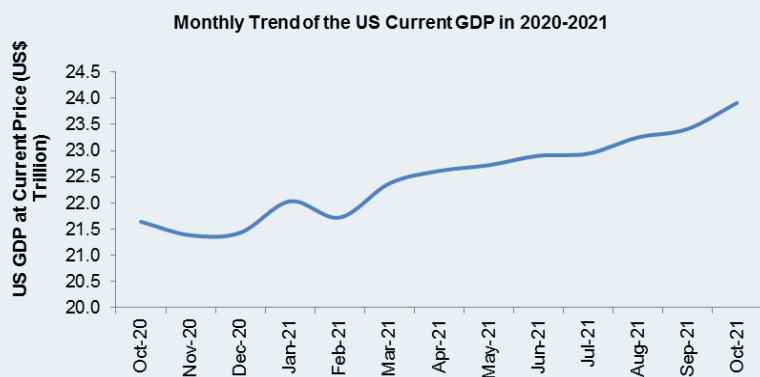
The US Consumer Confidence Index decreased to 67.4 in November 2021 as compared to 71.7 in October 2021. The GDP at current price of the US increased from US \$23.41 trillion in September 2021 to US \$23.91 trillion in October 2021.

Real gross domestic product (GDP) increased at an annual rate of 2.3% in the third quarter of 2021, according to the "third" estimate. The increase in real GDP in the third quarter reflected increases in private inventory investment, personal consumption expenditures (PCE), state and local government

spending, and non-residential fixed investment that were partly offset by decreases in exports, residential fixed investment, and federal government spending.

The increase in third quarter GDP reflected the continued economic impact of the COVID-19 pandemic. A resurgence of COVID-19 cases resulted in new restrictions and delays in the reopening of establishments in some parts of the country. Government assistance payments in the form of forgivable loans to businesses, grants to state and local governments, and social benefits to households all decreased.

The price index for gross domestic purchases increased 5.6% in the third quarter as compared to an increase of 5.8% in the second quarter. The PCE price index increased 5.3% as compared to an increase of 6.5%. Excluding food and energy prices, the PCE price index increased 4.6%, as compared to an increase of 6.1%.



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