

Focus area	Company	Contact	Position	Website
Komposit	Bind-A-TeX Ltd	Chris Lever	Managing Director	<a href="http://www.bindatex.co.uk">www.bindatex.co.uk</a>

Bindatex specialise in the precision narrow-width slitting of prepreg composite tapes used in the aerospace, space and more recently in the development of carbon fibre hydrogen fuel storage vessels. The company has been a key partner working with companies such as Victrex helping to develop thermoplastic composite narrow tapes that will be used in the next generation of lightweight and more fuel efficient composite commercial aircraft.

Newly developed prepreg composite materials present new challenges in handling and slitting to narrow widths so that automated manufacturing can be utilised such as Automated Fibre Placement (AFP) and Automated Tape Laying (ATL). Bindatex has developed proprietary technology that enables them to handle many different fibre weights, bio resins with high tack properties and brittle thermoplastic carbon fibre preregs. This ensures that they are slit consistently within width tolerance, are free from twists and tangles and are presented in packages within specification that can not only be used in the development of composite parts but also in serial production. They have recently participated in an Innovate UK project to develop an advanced winding capability for next generation thermoplastic composite tapes to be used in the next generation of lightweight composite aircraft. The company is also involved in the development of wider tapes with heavier fibre and resin content to increase deposition rates and maximise automation in manufacturing processes. One project is to provide a lightweight composite based lightning strike insulation for commercial aircraft.

Komposit	CCP Gransden Ltd	Jim Erskine	Managing Director	<a href="http://www.ccpgransden.com">www.ccpgransden.com</a>
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CCP Gransden is a leading specialist in advanced composites design and manufacture, engineering innovative performance improvements through robust materials. CCP Gransden has a sophisticated aerospace grade manufacturing facility that delivers one of the UK's widest selections of advanced composite manufacturing processes inhouse to a variety of esteemed customers. CCP Gransden are AS9100, ADSSC21 and JOSCAR approved. Core services include continuous fibre thermoplastic composites, an advanced high volume manufacturing cell, single stage overmoulding of thermoplastic composites, inpress snap cure thermoset composites, and robotic 7 axis filament winding all paired with a suite of supporting equipment including a Belotti 5 axis CNC, Flow Waterjet cutter, fully equipped paint room, specialist assembly line, Romer Arm inspection, and Zund Fabric cutter.

CCP has been a partner in various grant funded project: Manufacture and assembly of Starstreak canisters and optical casings, aerospace access panels, composite radomes, high pressure hydrogen storage vessels, automotive structures to reduce weight, sustainable composites solutions including; natural fibre composites, biobased resins, recyclability, and lifecycle analysis.

Batteri	CDO2 Ltd	Gary Kendall	Director	<a href="http://www.cdo2.com">www.cdo2.com</a>
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CDO2 specialise in battery technology and is developing a high performance battery pack ideally suited for aerospace use. The company has developed a patented mechanism for embedding cell level monitoring and control into the battery busbar. This allows the maximum power to be made available in the battery pack, right down to low states of charge. This compares with the conventional approach which requires 10% of the available energy to be held in reserve due to uncertainty in measuring the battery pack state of charge. The company is looking at the specific fire safety requirements of the aerospace industry, which require that the battery pack must be capable of safely containing a battery cell explosion and is involved in a the Future Flight Challenge providing the battery packs for a 650kg fully electric two seater aircraft made by Flylight Airports.

The company has develop a very light battery pack design with 3 main benefits: 1.It has an energy density of 220 Wh/kg. This will allow aircraft manufacturers to achieve their flight duration targets eg a better capacity - 25% larger. 2. The cell level monitoring and control is able to accurately determine the available power and energy in each cell to safely utilise all of the energy available in the battery pack. This can detect and isolate any faults in individual battery cells and will lead to an estimated additional 10% effective power and energy capacity, further increasing the duration time of the aircraft. 3. The battery packaging has been designed to be capable of containing the explosion of any individual cell without destroying the battery pack. This is the most weight efficient mechanism for achieving DO311 certification for "Minimum Operational Performance Standards for Rechargeable Lithium Batteries and Battery Systems" by the Radio Technical Commission for Aeronautics (RTCA). The company is working with light aircraft manufacturers in the UK but is keen to look at incorporating the technology into larger fully electric aircraft.

<b>Batteri</b>	<b>Electroflight Ltd</b>	Doug Campbell	Technical Director	<a href="http://www.electro-flight.com">www.electro-flight.com</a>
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ELECTROFLIGHT operates a technology and engineering services business. The company's core competence is high integrity, bespoke battery systems for aerospace and defence. The company is a partner in the Rolls Royce ACCEL project and developed a fully Integrated electric powertrain including an innovative energy storage solution for the ' Spirit of Innovation' aircraft, which holds the world all-electric air speed record. The company secured funding through the 2020 bilateral call with Sweden to work with Heart Aerospace to design, build and test an innovative prototype high energy propulsion battery pack for electric aircraft consisting of a battery pack, battery management system (BMS) and charger.

The ES19 battery system development for Heart Aerospace has afforded the opportunity for Electroflight to tackle the challenges of developing very large battery systems suitable for 19 seat regional or larger hybrid commercial passenger carrying aircraft. Electroflight has been contracted to design, build, test, and manufacture an eVTOL battery system ready for initial prototype flights in Q1 2022. The eVTOL battery system has been developed and manufactured compliant to DO311a and DO160g alongside the full suite of certification requirements where the means of compliance has been agreed by EASA. Electroflight is also running the full verification testing program bringing significant expertise in testing methodologies for battery systems. Design highlights from this program are the highly optimised composite case design, meeting challenging requirements around thermal runaway containment alongside the functional challenges of a swappable battery design.

<b>Batteri</b>	<b>Flux Aviation Ltd</b>	Radovan Gallo	CEO	<a href="http://www.fluxaviation.com">www.fluxaviation.com</a>
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The company is developing high performance battery electric powertrains for aviation use as a sustainable replacement for combustion engines. The company has assembled a team of experienced engineering leaders passionate about aviation with expertise across electric propulsion technologies, including battery systems, electric motors and power electronics and is focused on developing and manufacturing high performance electric propulsion systems that will provide a step change in performance and safety over existing solutions.

Flux Aviation is developing a complete electric powertrain system to satisfy the growing demand from existing light aircraft manufacturers. The 80kW battery electric powertrain is designed to be compatible with many popular general aviation aircraft types. Their battery electric powertrains emit no greenhouse gasses at the point of use, dramatically improve operating costs due to a lower cost of electricity and simpler maintenance schedule and reduce noise emissions.

<b>Coating</b>	<b>Hardide</b>	Rob Holmes	Vice President	<a href="http://www.hardide.com">www.hardide.com</a>
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Hardide Coatings is the leading global innovator and provider of advanced tungsten carbide/tungsten metal matrix composite coatings. The company develops and manufactures nanostructured tungsten carbide/tungsten metal matrix composite coatings for the aerospace industry. They currently supply hard chrome replacement technology to the aerospace and associated industries.

The company's coatings significantly increase the life of critical metal parts operating in abrasive, erosive, corrosive and chemically aggressive environments. Independent tests have proven HardideA improves the fatigue life of metal components by 4.5% compared with uncoated substrates. HardideA aerospace coating is a direct replacement for hard chrome plating (HCP) and HVOF, matching the thickness and hardness of HCP and outperforming the material in several critical areas providing enhanced protection against galling, corrosion, wear, fretting, impact and fatigue. Hard Chrome is being phased out of the market due to REACH regulations, Hardide coatings are 100% REACH compliant. Hardide coatings can be very effective to reduce leakage of hydraulic actuators. Porefree Hardide coating can be used as hydrogen barrier for the future sustainable aviation Hydrogen fuel systems.

<b>Komposit</b>	<b>ICOMAT Ltd</b>	Dominic Bloom	Business Development Manager - Aerospace & Defence	<a href="http://www.icomat.co.uk">www.icomat.co.uk</a>
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A University of Bristol spinout, iCOMAT has pioneered the revolutionary Rapid Tow Shearing (RTS) technology, the world's first defect free fibre steering process for composites. RTS has already been patented in the UK (GB2492594) with another four patents pending approval. The patented technology is enabling customers to unlock new levels of performance from composites and to manufacture lighter, more cost effective, high performing products. iCOMAT has successfully led InnovateUK projects, with Airbus, BAE and the National Composites Centre (NCC) as partners and is moving to commercialisation. The company has developed an industrial grade machine which can manufacture complex steered parts, with low CAPEX costs.

Current state-of-the-art automated composites manufacturing such as Automated Tape Placement (ATL) and Automated Fibre Placement (AFP) machines have limited steering capabilities and rely on bending tapes to steer their paths, leading to localised defects, such as tape gaps/overlaps and wrinkles, and must be done at slow speeds. The design space is therefore limited, and effective fibre steering is imperative to achieve lowcost lightweight parts, given the complex shape/load paths required in aerospace. iCOMAT offers a stepchange improvement in producing lightweight (up to 65% weight savings) and cost efficient (reduced raw materials & production time) composite structures for the composites industry based on the world's first automated tape laying machine with fibresteering capabilities. iCOMAT's core product offering is the supply of manufacturing machines (including gantry and robotic tape laying equipment), based on the RTS technology.

Loop Technology is an advanced industrial automation company supplying disruptive composite preforming and agile assembly systems into the aerospace market. Loop has developed a complementary range of products targeting state-of-the-art manufacturing challenges in future aircraft programmes. Loop offer capabilities in advanced automation systems involving robotics, machine vision and motion. Two main themes are supported, ultra high rate composite preforming and agile assembly automation.

The composite preforming portfolio provides a solution for manufacturers of large high rate composite aero structures and similar components who require the ultimate in rate, accuracy and quality in the preforming process. Loop has developed a toolbox of automation products that deliver a complete end-to-end preforming solution from raw material in to finished preform out. The solutions provide a sustainable, high volume manufacturing capability consuming 40% less energy in a 1/10 of the space required and at a 50% reduced cost when compared to other systems. Loop's solution uses wide format material for rates in excess of 200 Kg/hr. The agile assembly products are for manufacturers of metallic and composite aero structures. Loop has developed a suite of smaller automated vision guided tools bringing unparalleled flexibility to part positioning, drilling, fastening, sealing and inspection applications. They offer a labour content reduction of up to 80% and cost saving of up to 30%. Unlike traditional solutions that use large highly specialised machines Loop's solution uses flexible automation that removes the need for absolute accuracy and provides access into both open and closed box structures.

A spinout from the University of Cambridge Nexus Materials is focused on developing new materials for the net zero transition. The company has developed technology which predicts how alloys will behave, accelerating new alloy design and adoption and improvements in mechanical strength.

The company uses machine learning algorithms to accelerate chemistry and is building a scheme of simulation which can span all scales from atomic to macroscopic to predict better how a material will behave. They are able to train the algorithms in hours vastly increasing the potential to accelerate the adoption of new materials within the aerospace industry. The company is already working with large multinational companies who are looking to transition to lower carbon net zero materials.

Oscar Propulsion (Oscar) is a technology company focused on resolving the negative environmental noise impact of current and future ducted fan propulsion systems. Unlike alternative technologies which use noise absorbent materials to try to dampen sound, Oscar has developed a Noise Prevention at Source (NPaS) technology that prevents the sound from being generated in the first place. Whilst much work has been completed on reducing emitted noise created by the fan blades (both through reducing noise created and also by absorbing noise within the nacelle), little work has been undertaken to address noise created later in the engine, such as from the air interacting with OGVs. Current technology is functional, straightening the airflow but creating turbulence that generates noise. Oscar's NPaS technology reduces that noise significantly, creating a considerably quieter engine overall and therefore having a positive environmental impact.

The patented technology has been shown to reduce broadband noise emitted from ducted fan outlet guide vanes (OGVs) and stators by up to 7dB. This technology addresses the noise at the point of creation by introducing porous material to reduce the rate of pressure variation at the leading edge of the OGV's, thereby reducing the severity of the turbulence created and resultant noise. It is unique in ducted fan noise reduction post rotation and could allow a saving in cost and weight in other mitigation designs. Since the fan OGV/stator interaction noise is the dominant fan noise source Oscar's technology looks to simplify the reduction of this interaction noise for next generation of engines. The technology is suitable for any ducted propeller application, which gives it considerable market appeal to a number of sectors, including aviation. Interest from the sector has grown over the last 9 months from aviation engine suppliers and aerospace stakeholders.

The company has 2 main services. Manufacture of miniature ballscrews for special projects in aerospace, defence and space and repair and replacement of commercial ballscrews across all manufacturing sectors. The company's miniature ballscrews operate the world's first all electric helicopter landing gear (Leonardo), operate missile actuation and has recently won a new order for a satellite application. The company has an existing relationship with GKN Aerospace UK and it is felt that the aerospace sector in Sweden could provide the opportunity to engage with civil aerospace programmes particularly in the areas of lightweighting and electrification.

Ballscrews are not a new technology however most large manufacturers of ballscrews will produce standard sizes and tend to be less flexible in changing designs to suit a project. PGM uniquely use lightweight materials and has developed a process of producing an incredibly smooth surface finish which enables fast operating speeds. Lubricant free ballscrews reduce maintenance requirements and cost. PGM has designed and developed ballscrews in various materials to reduce weight and has a current development project around a super efficient leadscrew which could replace ballscrews at a fraction of the cost. Their telescopic ballscrew can be electrically driven and reduces the footprint of a traditional actuator which makes it a perfect candidate for lightweighting thereby reducing fuel consumption. The company's titanium ballscrews were developed for use in space satellites as they are exceptionally lightweight. Their experience of developing ballscrews for Space and Defence makes some of these unique features easily transferrable to the civil aerospace sector. Also now working on a project to create an exceptionally light leadscrew, building on the success of PGM Reball's titanium leadscrew.

Progressive Technology is a precision machining, metal additive manufacturing and composites manufacturer supplying aerospace, defence, medical and motorsport sectors. The company has extensive expertise in the manufacture of lightweight complex precision components.

Magnesium alloys are utilised in the aerospace and automotive sectors due to their low density and favourable strength to weight ratio (high specific strength) to achieve light weight structures. The company is currently researching and developing additive manufacturing of magnesium alloys. Their project proposes to solve the current issues with its manufacture, developing the necessary process parameters and post process treatments to enable robust and repeatable manufacture of functional high performance magnesium alloy components for aerospace applications

Qdot Technology Ltd. is a spinout from the University of Oxford developing electric aircraft propulsion technologies. The company is developing an integrated propulsor system, incorporating propellers, electric motors, and a battery. The purpose of the battery in this system is to provide a power boost for operations such as takeoff and landing. This fully integrated approach is novel and offers advantages in terms of reduced system weight. The product is particularly suited to electric vertical takeoff and landing (eVTOL) aircraft due to the large difference in power requirements between the takeoff and cruise phases of the flight.

Qdot has designed an integrated battery pack system from the cell level up to improve heat management, which achieves class leading power densities and prolonged lifetimes. The company is combining this with its additive heat exchanger technology, which is compact, conformal, and low weight, to make a propulsion system that can reduce fuel consumption by up to 25% to reject the heat generated in the electrical components of the propulsor system (motors, power electronics, batteries) to the air, the company has developed a novel additive manufacturing process to make high performance heat exchangers. These technologies translate into a propulsion system that is smaller in volume and offers higher payload and range capability than competitors.

Reaction Engines Ltd was founded to develop SABRE, a synergetic airbreathing rocket engine. SABRE's thermodynamic cycle requires complex thermal management including high performance heat exchangers. The company's microtube technology consists of many thousands of tiny tubes arranged in proprietary forms to provide unparalleled heat exchanger performance. The ability to form leaktight seals consistently on thousands of tubes is a key strength. As the heat exchangers provide a stepchange in performance, they have wide applications in sectors where heat needs to be transferred between two fluids.

The company's heat exchangers are relevant wherever a thermal management challenge exists. They are particularly suited to the aerospace industry as they are lightweight and have very low pressure drops (i.e. drag). The decarbonisation of aviation is changing how heat is rejected from aircraft and presents challenges when it comes to thermal management. Electric motors, batteries and fuel cells all generate heat but must be kept at relatively low temperatures. Unlike combustion engines, heat is not removed by a high volume stream of exhausted gases and must instead be removed with air or liquid cooling loops.

Reaction Engines, has developed several products that solve these problems:

1. The microtube condenser, used for cabin cooling. Lighter than competing products it has a very low airside pressure drop. This results in a minimal amount of fan power being required to drive air across it whilst being very low drag, should it be positioned in the airstream.
2. HXLIFE foils which use a phase change medium to significantly improve the heat transfer across the face of battery cells
3. Annular microtube radiators which are up to ten times lighter than the competition while being unmatched in terms of drag, making them an enabling technology for hydrogen fuel cell aviation.

SHD Group is a global manufacturing business with sites in the UK, US and Europe. The company manufactures a wide range of tooling and component prepregs suitable for autoclave, press and oven curing, utilised in the manufacture of lightweight, composite components, with a focus on high performance and sustainability.

SHD offers over 800 "bespoke" product solutions which have been supplied in 2020 alone, providing standard, niche and specialist products developed through collaboration, including our industry leading bio resin product range including PFA products. The following technologies are particularly relevant to the Swedish aerospace market:

1. Non combustible composite materials for aero engine parts - a sustainable, bioderived composite material which can be used for ducting, heat shielding, nacelles, battery enclosures etc, which potentially offers a great aid to lightweighting next generation UHBR turbofans to reduce fuel burn
2. Thermoset epoxy / high temperature based component prepregs
3. Thermoset tooling prepregs

A spinout from Nottingham University, TextureJet designs, develops and deploys surface texturing and finishing technologies for the high value manufacturing sector that enables significant reductions in environmental impact and cost in comparison to current technologies.

Finishing and Texturing applications are employed widely across a range of high value manufacturing industries from automotive to aerospace to biomedical. Current technologies commonly employed in this area are deemed antiquated, dirty and dangerous from acid chemical etching and pickling to media blasting. TextureJet's technologies possess distinct advantages enabling a more sustainable and cost efficient manufacturing technology to those currently on the market. TextureJet's STAT technology can redefine the surface of metal components utilising electrolysis controllable removing material at an atomic level. It can roughen, etch, polish and structure component surfaces presenting. It is clean and sustainable only utilising pH neutral saltwater solutions in a closed system producing very little waste unlike such technologies as chemical etching and pickling that require hazardous acids and alkalis and produce significant toxic liquid waste streams. It requires no masking, causes no surface damage or contamination unlike thermal or abrasive methods such as media blasting or laser and can be delivered insitu on the production line as there are no complex H&S requirements such as providing separate operational areas leading to a significant reduction in factory footprint. STAT technology has found applications in several areas from discrete finishing of additively manufactured components (one of the identified pains of industry adoption of AM built components), surface preparation prior to bonding or coating to to scale removal on cast components alongside surface marking for aesthetic and performance.