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PARTNERING THE AIRCRAFT OF THE FUTURE

GKN Aerospace contribution to the F-35:

- Canopy
- High value composite assemblies
- Aluminum and titanium aerostructures
- Inflight opening doors
- Breakthrough composite technology for drag brace
- Electrical Wiring Interconnection System (EWIS)
- Flaperons
- CV outboard leading flaps
- Drag chute fairing assembly
- Arresting gear
GKN Aerospace is the world’s leading technology supplier to the aerospace industry. As a truly global company, GKN Aerospace serves all of today’s leading aircraft and engine manufacturers.

GKN Aerospace develops, builds and supplies an extensive range of advanced aerospace systems, components and technologies – for use in aircraft ranging from business jets, helicopters and military aircraft to the most used single aisles and the largest passenger planes in the world.

GKN Aerospace’s technology is on-board 100,000 flights a day, covering all major aircraft and engine growth platforms. Lightweight composites, additive manufacturing technology, innovative engine structures, wiring systems to drive electrification and smart transparencies all help our customers to reduce aircraft weight, fuel burn and emissions – enhancing aircraft performance and shaping the aviation industry of the future.
GKN Aerospace at a glance

- 2018 sales: £3.5bn
- 17,000 employees
- 50 manufacturing locations
- 15 countries
- 4 Global Technology Centres
AM Component manufactured at GKN Aerospace’s centre of excellence in Filton (UK)

AW-169 Horizontal Thermoplastic Tailplane

Lightweight A320 windshield undergoing final inspection
GKN Aerospace is well positioned to make aircraft fly further, faster and greener. In 2018 and 2019 we have made record investments in technology worldwide to position us for the next generation of aircraft. Outstanding customer relationships enable us to accelerate new technologies for today and tomorrow. We look beyond immediate market requirements, assessing the impact of environmental and technological trends to shape the future of the industry. We operate at the forefront of many breakthrough technologies in aerostructures, engine systems and special technologies.

Composites - Thermoplastics
Thermoplastic composite components can be 25% lighter than traditional metallic structures and GKN Aerospace is a leading innovator in this lightweight technology. The rudder and elevator of the Gulfstream G650 empennage, the rudders of G500 and G600 as well as the horizontal tail plane of the AW169, are all proven examples of the application of our GKN Aerospace's unique thermoplastic composite technology.

Spin forming
Inspired by the pioneering use on the B787 for drag reduction, the laminar flow lip skin for the B737 MAX and B777X engine nacelle are made from a one-piece, spun-formed sheet of aluminum. The lip skins offer a weight reduction and generate a laminar flow surface that reduces drag and improves aerodynamic performance.

Additive Manufacturing
GKN Aerospace is the global leader in Additive Manufacturing. We have the largest range of flying Additive Manufacturing (AM) parts and the broadest suite of AM technologies globally. Our AM technology is flying on 7 major aircraft and rotor-craft platforms. AM can cut manufacturing material waste by 90% and reduce weight by 50%.

Smart Engine Systems
We use our leading composite engine technology for the cold section of the engine, the fan case and the blades to reduce weight and enhance the performance of the engine by decreasing fuel burn and improving durability.

More Electrical Aircraft
Together with our customers we are leading the way in the development towards More Electrical Aircraft (MEA). Our electrical wiring interconnection systems (EWIS) already power industry leading aircraft such as the Lockheed Martin F-35 and the Airbus A220.

Product positions

Wings
Empennages
Nacelles
Fuselages
Engine Modules
Integrated Wiring Systems
Landing Gears + Fuel and Flotation systems
Transparencies + Ice Protection Systems
GKN Aerospace’s Global Technology Centre in Bristol UK, will open in 2020. The facility will host 300 highly skilled engineers, and will include collaborative space for research and development. The facility will serve as a base for GKN Aerospace’s technology partnership in the Airbus’ “Wing of Tomorrow” technology programme and will focus on additive manufacturing (AM), advanced composites, assembly and industry 4.0 processes to enable the high rate production of aircraft structures.
A connected network

GKN Aerospace's Global Technology Centres will keep us at the forefront of the latest technologies and manufacturing processes for the next-generation of aircraft. Each centre has a unique technology focus – covering additive manufacturing, composites and smart aero-engine systems – and is supported and linked by a clear digital strategy. As we move towards a cleaner, greener and more efficient aerospace future, we are partnering with customers, universities, research institutes, suppliers and governments to ensure we have the skills, innovation and supply-chain to contribute to a sustainable aerospace future.
At GKN Aerospace we are committed to helping minimise the environmental impact of aviation. Every system and component that we engineer is aimed at being lighter, stronger and more efficient than its predecessor. With technology on board 100,000 flights a day, we are proud to be part of the solution in tackling fuel burn, emissions and noise pollution.

As market leaders in aerostructures, aero-engines and special technologies, we are well positioned to engineer a more sustainable aerospace future.

GKN Aerospace is already significantly contributing to the reduction of the environmental footprint of air traffic with better products that burn less fuel and better processes consuming less energy and resources. Among these achievements:

- Our Thermoplastic Rudder and Elevator in Gulfstream and Dassault business jets save 30% weight compared to traditional materials.
- Our optical ice detector with smart ice protection reduces waste and our hydrophobic coating for transparencies eliminates the need for de-ice fluids and windscreen wipers.
- Our four Global Technology Centres are designed to create collaborative spaces where we work together with our customers, suppliers, industry partners, academia and research institutes on research and development programs that will make aircraft fly faster, further and greener, embarking on a sustainable future for aerospace.

Orangeburg South Carolina
GKN Aerospace’s unique spin forming technology for aluminium engine lip skins reduces weight and drag, improving aerodynamic performance on platforms including the 777X.

Trollhättan Sweden
The use of additive manufacturing processes on GKN Aerospace manufactured engine fan case mount rings has led to 600kg reduction in titanium used per completed product.
Hoogeveen the Netherlands
GKN Aerospace research on a multi-functional fuselage made from thermoplastic composites aims to reduce weight by 1000kg and to increase the use of recyclable materials.

Bristol UK
GKN Aerospace’s design and manufacture of composite spars, such as the 27m-long rear wing spar on the A350 XWB, improves aircraft performance, reducing weight and fuel consumption.

Oakridge Tennessee
Research led by GKN Aerospace at Oakridge National Laboratory into laser wire deposition for complex large titanium aerostructures aims to reduce material waste by up to 90%.

Luton UK
Electro-thermal ice protection that GKN Aerospace manufactures for platforms such as the 787, removes the need to bleed hot air from the aircraft engine to prevent ice build-up, therefore improving fuel efficiency.
TARGETING INNOVATION AT ALL LEVELS

**Major Components**
- Cabin windows
- Co-cured wing covers
- Canopies
- Composite fan cases
- Laser welded structures
- Space propulsion structures
- Fuselage panels
- Empennages
- Composite landing gear components
- Electrical wiring systems
- Flaps and Winglets
- Landing Gears
- Nacelles and Lipskins

**Chemistry & Materials**
- Erosion and low-drag coatings
- Anti-ice coatings
- Hydrophobic coating
- Additive Manufacturing powders
- High temperature materials
- Metal/composite material combinations
- Thermoplastic / thermoset materials

**Processes**
- Near net joining
- Additive manufacturing
- Forming and welding
- Assembly automation
- Composite automation
- Wiring design and manufacturing
- Spin Forming

**PARTNERING THE AIRCRAFT OF THE FUTURE**

**Seat Tracks**
**Floor Assemblies**
**Pylon Fittings**
Systems & Major Assemblies

- Wing Ice Protection
- Outer Wing Box & Box Components
- Passenger Cabin Windows
- Fin Roots
GKN Aerospace is a global leader in aerostructures, supporting our customers in making aircraft fly faster, further and greener. We provide full design, development, manufacture, assembly, integration and certification of primary and secondary structures for the world’s most advanced rotorcraft and fixed-wing aircraft.

With a clear focus on fuselages, empennages, nacelles and wing components, we can substantially accelerate and improve design and build processes and deliver the optimal solution for our customers. With proven lightweight components in the sky today, aircraft manufacturers choose to partner with GKN Aerospace.
Products

- Wing box and covers
- Leading and trailing edge assemblies
- Empennage and flight control surfaces
- Winglets
- Composite wing components
- Metallic wing components
- Integrated floor assemblies
- Complete fuselage structures
- Fuselage detailed components
- Helicopter blades
- Systems
- Fibre Metal Laminate fuselage panels
Combining innovative design with advanced composite and metallic materials and proven manufacturing technology, we provide lightweight nacelles with reduced part count and lower life cycle costs.

With our unique spin-forming technology we manufacture single piece lip skin structures. We produce the world’s largest spin-formed lip skin 14’ (4.3m) high.

GKN Aerospace is responsible for the complete design, development, manufacture, assembly and certification of a range of turboprop and turbofan solutions including the engine build unit (EBU) and podding. Our turbofan design solutions incorporate a lightweight composite design for both the engine inlet and the fan cowl doors. We work in partnership with our customers to explore new turboprop platform technologies aimed at lowering cost, weight and sound attenuation as well as meeting new icing requirements.
GKN Aerospace’s landing gear business specialises in the design, development and manufacturing of landing gear systems for small- to mid-size aircraft and helicopters. It has full life-cycle capabilities including MRO and spares support and a good track record in delivering weight- and cost-efficient landing system designs.

GKN Aerospace designs, manufactures and supports landing gear systems to leading aircraft and system integrators, including Boeing, Northrop Grumman, Lockheed Martin, NHIndustries, General Atomics and UTC Aerospace Systems. The supported platforms include the Apache AH 64, Bombardier Dash 8 Q400, NH90 multipurpose helicopter, F-35, and F-16.
GKN Aerospace is shaping the next generation of landing gear systems through its industry-leading technology development in thick-walled polymer matrix composites (PMC) applications for flight critical and primary structural components. The fully automated landing gear composite manufacturing plant, which was opened in March 2015 in the Netherlands, is testimony of our ability to develop affordable and sustainable integrator solutions with optimised and sustainable weight and performance characteristics.

Developed by Europe’s NHIndustries partnership - a combination of Airbus Helicopters, Leonardo (AgustaWestland), and GKN Aerospace - the NH90 was designed to meet NATO’s requirement for a modern medium-sized multi-role military helicopter for both land and maritime operations.

The NH90 is a twin-engine aircraft incorporating innovative features such as a full glass cockpit and fly-by-wire control system with four-axis autopilot and advanced mission flight aids, along with on-board monitoring and diagnostics systems.

The tail, cabin door, highly advanced landing gear, sponsons and intermediate gearbox of the NH90 are designed, developed and manufactured at GKN Aerospace. We also provide spare parts for the helicopter.
GKN Aerospace’s wiring business is recognised as a market and technology leader in electrical wiring interconnection systems (EWIS) for commercial and military aircraft and aircraft engines.

We design, manufacture and support EWIS, electrical panels and boxes to all leading aerospace brands including Airbus, Boeing, Gulfstream, Honda, Honeywell, Leonardo, Lockheed Martin, Pratt & Whitney, UTAS, Raytheon and Rolls-Royce.

As EWIS systems are affected by almost any configuration change of the aircraft, the efficient management of complex and frequent design changes into production is core to the business. The proprietary wiring design and manufacturing system (WDMS) toolset integrates all aspects of wiring system management, including perfect configuration management and continuous monitoring into one powerful online system. With WDMS, we offer our customers a single process across multiple sites, resulting in a consistent quality product that supports all the customers’ needs over the entire life cycle of their programmes. The proven system is recognised worldwide as best practice in the industry.

GKN Aerospace is responsible for the design and production of the entire Electrical Wiring Interconnection System of the Lockheed Martin F-35 Lightning II and of the Airbus A220.

The international production in strategic regions including Turkey, China, India, the Netherlands, Canada and the USA enhances affordability, and supports customers with local content, offset and industrial participation.
GKN Aerospace is a leading tier one provider of both structural and rotating engine components, subsystems and modules with a broad range of capabilities and close strategic partnerships with all the major OEMs and tier one suppliers – General Electric, Pratt & Whitney, Rolls-Royce, Safran Aircraft Engines and MTU.

Our capabilities have been, and continue to be, developed through constant investment and innovation. We have developed our partnerships taking full design responsibility for both aerodynamic and mechanical design. We offer technology solutions that can reduce the weight of metallic engine parts by up to 15%, thanks to optimised load path design and aerodynamic duct design. Our laser welded fabricated structures replace single piece castings. Our welded concepts also integrate additive manufacturing (AM) and utilise manufacturing process modelling to enable extremely lightweight designs.

GKN Aerospace specialises in cold and hot structural parts, and is one of the world’s leading independent suppliers of light-weight engine frame structures.

Our offer is focused on four engine modules:

**Fan statics**
We have developed the compressor structures for engines such as Trent 900 and Trent XWB, the Pratt & Whitney PW1000 geared turbofan and for GEnx.
We lead the market in the design and production of fan containment and non-containment cases in titanium, aluminium, alloy and composites.

**Fan rotatives**
GKN Aerospace is a market leader in metallic fan blade manufacture, supplying all the major aero-engine OEM’s.
We manufacture a broad range of rotating aero-engine products including both fan hubs and metallic fan blades, composite fan spacers and spinners. We are the world’s largest non-OEM provider of fan blade repair services.

**Low-Pressure (LP) compressor**
We have designed and tested sub-scale LP compressor modules using in-house aerodynamic, aeromechanic and mechanical design tools. We have a long manufacturing experience in compressor rotors and blisks.

**Extended turbine exhaust**
We have developed the turbine exhaust structures for engines such as the Pratt & Whitney PW1000 geared turbofan, Engine Alliance GP7000 and the GEnx. Our optimised welded concepts are 10-15% lighter than the competition.

**Military Engines - Whole Engine Competence**
The RM12 is the engine for the Gripen fighter, developed for the Swedish Air Force and is used by the air forces of Sweden, South Africa, Thailand, Hungary and the Czech Republic.
The engine is a single engine adapted derivative of General Electric’s F404-engine.

**Space Propulsion**
GKN Aerospace has participated in the European Ariane launcher programme since its launch and produced the thrust chambers for the Viking rocket engines. On the Vulcain 2 rocket engine we manufacture the nozzle extension and turbines.
GKN Aerospace also manufactures the Ariane V main engine frame, one of the most complex structural systems of the Ariane 5 launcher.
Today we play a growing role in the development of the world’s future space transportation systems, mainly through assignments from the European Space Agency (ESA), such as Ariane 6.
Products and Components

- Whole Engine Competence
- Fan statics
  - Fan cases (metallic and composite)
  - Fan frames
  - Compressor structures
  - Fan OGVs
  - Core engine ducts
- Fan Rotatives
  - Fan blades
  - Shafts
- LP Compressor
  - Compressor blades and vanes
  - Blisks
  - Compressor rotors
- Extended Exhaust
  - Turbine frame structures
  - Fixed guide vanes
  - Nozzle and plug
- Space propulsion
- Fuel pump turbines
- Rocket exhaust nozzles

> Compressor Blisk

> Vulcain Nozzle
We are a world leader in the supply of transparencies to the military and civil markets with a global reputation for our technologies, patents and proprietary processes in glass, acrylic, polycarbonate and coatings.

Working with our customers to extend the capabilities of aircraft transparencies across both military and civil markets, we jointly develop requirements using our proprietary design and analysis tools and development, testing and certification processes to deliver a fully qualified product - a key differentiator for our transparency business. Our products are fitted to platforms from supersonic military jets such as the F-35 Lightning II (JSF) and the Eurofighter Typhoon to the latest in commercial aircraft such as the Airbus A350 XWB and Boeing 787 Dreamliner.

Our ballistic resistant glass (BRG) provides increased protection whilst reducing the overall weight of the vehicle, whether civilian or military. The BRG can be flat or curved to suit most vehicle types and we will add treatments such as heating, sunshade banding, tinting, custom dot matrix paint banding, solar control and an anti-splall protective layer. Our BRG is also supported by a complete aftermarket service.

GKN Aerospace has developed a new hydrophobic coating for cockpit windows. The permanent surface treatment delivers in-flight / ground operation rain shedding and significantly enhances resistance to surface abrasion.

We also provide aftermarket support for a variety of passenger aircraft, business aviation, and special mission aircraft and mature fleets. All our transparency manufacturing sites offer certified repair station services for commercial and military aircraft and provide global support to aircraft operators including offering comprehensive component overhaul and framing services.

**Capabilities**

- Manufacture of passenger cabin windows, windshield/cockpit windows and canopies
- Superior optics – use of CAD technology to remove optical distortion and increase clarity
- Bird impact resistance up to 600 knots
- Shock hazard elimination
- Framing, repair and overhaul, and refurbishment
- Egress (MDC) systems
- OEM licensed
- Train – locomotive screens
- Part 145 FAA and EASA approved
- Ballistic resistant glass
GKN Aerospace designs, develops, qualifies and manufactures a range of elastomeric products and associated systems for aerospace, military, marine and commercial use.

We provide fuel tanks, flotation systems, sea trays, fuel handling systems and silicone seals for global aerospace and defence customers across air, land and sea applications, and offer comprehensive EASA Part 21 approved MRO facilities for all types of flexible fuel tank including self-sealing, crashworthy and explosion suppressing products.

GKN Aerospace is a world leader in electro-thermal ice protection and detection systems. These systems provide controllable surface heating embedded into a leading edge structure, engine inlets and blades, and helicopter rotor blades. This technology can be applied to both military and commercial aircraft.
Products

- Flexible fuel tanks
- Emergency flotation devices
- Silicone seals
- Air portable fuel containers
- Roto-moulded fuel tanks
- Ballistically tolerant fuel tanks
- Sea trays
- Ice protection systems
- Icing wind tunnel

Flexible fuel tanks
Helicopter flotation systems
Ice protection systems
An independent aerospace services provider, GKN Aerospace supports a wide range of regional, commercial and military aircraft. Services range from type certificate holder-related product support services to component availability programmes and aircraft completions and conversions. Unique combination of OEM (design) knowledge and independent after-sales support services.

Worldwide presence
Network of locations and facilities all over the world - in central Europe, the United States and Asia.

Independent global player
As an independent global player, we offer a portfolio that caters to all aircraft, including Airbus, Boeing, Bombardier and Lockheed Martin platforms.

Component Services
ABACUS | Component Availability Programme
A well-known and proven component availability programme. With its worldwide logistic network, the ABACUS programme serves more than 30 operators of regional aircraft, such as all Fokker types, Bombardier Dash 8 aircraft and CRJ Series aircraft.

Supply Chain Solutions
Supply Chain Management
> Guaranteed performance commitments, tailored to customers’ demands

Component MRO Services
> Extensive in-house capabilities in Europe, Singapore and the USA
> Cost savings via cost driver analysis, reliability improvement and redesign

Spare Parts Supply
> Parts obsolescence management and demand forecasting techniques
> Parts redesign engineering and supply

Aircraft completions and conversions
The knowledge as the Fokker Type Certificate holder is used for many different modifications. Every year new modifications are launched on different aircraft types, such as Fokker, Bombardier Dash 8 and CRJ Series, Airbus A320 family, Airbus A330 wide body and Boeing 737.

Modifications are initiated by:
> Increased reliability / reduced maintenance costs such as: redesign obsolete parts, gore seals, SaftGlo®, Dryliner, ACARS
> Mandatory modifications such as: cross feed valves, flight idle stop, reinforced cockpit door, redesign main landing gear
> Operational requirements such as: TCAS 7.1, ADSB-out, CPDLC, GNSS WAAS
> Customer appeal such as: LED lighting, new interiors, refurbishment, datalink / SATcom
Aircraft Completions and Conversions

Services for commercial and defence operators include:

- Painting
- Working parties
- Damage assessment
- Fleet management support
- CAMO
- AOG support
- Turnkey solution for severe repair and ferry flight preparation
- Full or part-refurbishments of existing (VIP) Interiors
- Performance of structural (interior and exterior) modifications
Fan blade repair

TFE731 maintenance

Engine Products

- Component repair
- Fan blades
- Compressor blades
- Fan disks
- Engine cases

Fan blade repair

TFE731 maintenance
Minimising downtime is vital for every operator of aircraft engines and industrial gas turbines. To meet this demand, we tailor maintenance solutions to fit specific operational needs and we always work in close cooperation with our customers.

Essential ingredients in the GKN Aerospace MRO offer include service teams ready for on-site support, around-the-clock technical support service, troubleshooting and availability of lease and exchange engines when the need arises.

With more than 40 years of experience in engine maintenance, we ensure exceptionally high reliability based on deep engine know-how and technical expertise.

We have a range of airworthiness approvals that allows us to readily accept engines from around the world.

GKN Aerospace is the world’s largest non-OEM supplier of fan blade repair services, with a wide range of capabilities and over 30 years of experience in the fan blade and compressor airfoil repair business. We have full in-house capability as one-stop shop, including protective coatings.

We provide:

- All levels of maintenance, up to and including full overhaul and test, for all supported engine types
- On-site maintenance/field service teams
- Lease and exchange engines and parts
- 24 hour AOG service
- Maintenance planning and trend monitoring
- Technical support
- Logistics support
- Component repairs
- Fan blade repairs
- Accessory maintenance
- OEM warranty administration

**TFE731**
- Designated Overhaul Facility since 1989 for PW120/1A, PW121/1A, PW123/B/C/D/E/AF, PW124B, PW125B, PW126/1A and PW127/B/C/D/E/F/G/J/M engines
- On-site HSI

**LM1600**
- Authorised Service Provider since 1992
- Full repair capabilities for the ELM116/2 power turbine
- Field service including Hot Section Exchange on site
- Control system and package support
- Site upgrades
- Spare parts supply

**DR990**
- OEM since 1997
- Control system retrofits and upgrades
- Spare parts supply
- Field service
- Site maintenance and upgrade of existing equipment
Working in partnership and collaboration with OEMs, MRO providers and global stock lists, we provide world class aftermarket service support to operators as part of an integrated package or on an individual basis.

We deliver support through a network of global ‘one-stop shop’ centres focused on metallic and composite airframe, aero-engine and transparencies framing and repair. Our repair stations are fully FAA/EASA certified and provide comprehensive logistics, engineering, technical publications and PMA support.

We provide:

- All year round 24/7 AOG service
- Reduced operator cost of ownership
- Rapid access to a worldwide inventory stock list
- Highly efficient global distribution, maintenance and support network
- Reduced timescales for fuel tank repair through one-stop shop
- Efficient, fast, low cost composite repair on large structures using ‘hot bond box’
- New repair processes to support latest airframe and aero-engine developments

Engineering
- ILS management of planning
- LCC analysis
- Test facilities
- Reliability and maintainability
- Training and technical publications

Engine Nacelles, Nacelle Products
- Full strip and survey
- Design, test and certification of component improvements
- Repair and overhaul exhaust systems

Transparencies & Ice Protection Systems
- Military and civil replacement windows – dedicated test ranges for optical analysis, bird impact, environmental, structural and ballistic testing
- Cockpit window framing and repair
- Glass, acrylic and polycarbonate laminated aircraft windows
- Spares stock and distribution
- De-icing system repair and overhaul
- Icing research wind tunnel

Fuel Systems & Emergency Flotation Systems
- Assessment, repair and overhaul of elastomeric fuel bladders and EMS for military and civil platforms
- Repair facility for self-sealing fuel bladders, including those from other manufacturers

Major Composite & Metallic Structures
- Repair and overhaul of composite and metallic primary and secondary structures
OUR GLOBAL FOOTPRINT

50 Manufacturing Locations in 15 Countries

Strategically Located Adjacent To Customers
Growing Footprint In Asia

Global Technology Centres

- UK - Bristol
- NETHERLANDS - Hoogeveen
- SWEDEN - Trollhättan
- US - Oakridge

Locations:
- NETHERLANDS: 7 Locations
- NORWAY: 1 Location
- SWEDEN: 1 Location
- INDIA: 2 Locations
- CHINA: 1 Location
- THAILAND: 1 Location
- MALAYSIA: 1 Location
- SINGAPORE: 1 Location
- CANADA: 21 Locations
- USA: 3 Locations
- MEXICO: 7 Locations
- UNITED KINGDOM: 1 Location
- NORWAY: 1 Location
- SWEDEN: 1 Location
- CHINA: 2 Locations
- INDIA: 1 Location
- TURKEY: 2 Locations
- ROMANIA: 1 Location
- GERMANY: 1 Location
- SINGAPORE: 1 Location
- THAILAND: 1 Location
- MALAYSIA: 1 Location