PARTNERING THE AIRCRAFT OF THE FUTURE
## CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overview</td>
<td>04</td>
</tr>
<tr>
<td>Leading Technology Supplier</td>
<td>06</td>
</tr>
<tr>
<td>Targeting Innovation at all Levels</td>
<td>08</td>
</tr>
<tr>
<td><strong>Aerostructures</strong></td>
<td></td>
</tr>
<tr>
<td>Aerostructures Introduction</td>
<td>10</td>
</tr>
<tr>
<td>Nacelles, Pylons and Lip Skins</td>
<td>12</td>
</tr>
<tr>
<td><strong>Engine Systems</strong></td>
<td></td>
</tr>
<tr>
<td>Engine Systems and Modules</td>
<td>14</td>
</tr>
<tr>
<td><strong>Special Technologies</strong></td>
<td></td>
</tr>
<tr>
<td>Electrical Wiring Systems</td>
<td>16</td>
</tr>
<tr>
<td>Landing Gear</td>
<td>18</td>
</tr>
<tr>
<td>Transparencies</td>
<td>20</td>
</tr>
<tr>
<td>Ice Protection Systems, Fuel Tanks and Flotation Systems</td>
<td>22</td>
</tr>
<tr>
<td><strong>Services</strong></td>
<td></td>
</tr>
<tr>
<td>Aircraft and Components</td>
<td>24</td>
</tr>
<tr>
<td>Engines</td>
<td>26</td>
</tr>
<tr>
<td>Transparencies, Ice Protection Systems, Fuel Tanks and Flotation Systems</td>
<td>28</td>
</tr>
<tr>
<td>Our Global Footprint</td>
<td>30</td>
</tr>
</tbody>
</table>
OVERVIEW

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.

Sales by market

- Military 28%
- Commercial 72%

Sales by product area

- Engine Systems 37%
- Aerostructures 49%
- Special Technologies 14%
THE WORLD’S LEADING TECHNOLOGY SUPPLIER

We are technology leaders in aerostructures, engine systems and special technologies, providing the solutions our customers need. Our global technology network brings together international teams of specialists from across our business to collaborate with universities, knowledge institutes, suppliers and customers on innovation platforms and research studies. 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.

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.

Thermoplastics
Thermoplastic components can be 25% lighter than traditional metallic structures and GKN Aerospace is a market-leader in the lightweight technology. The leading edges of the Airbus A380, the rudder and elevator of the Gulfstream G650 empennage as well as the horizontal tail plane of the AW169 are all proven examples of the application of our unique thermoplastic composite technology.

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 Bombardier C Series.

Product positions

Additive Manufacturing
GKN Aerospace is the global leader in Additive Manufacturing. GKN Aerospace has 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%.
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

Chemistry & Materials
- Erosion and low-drag coatings
- Anti-ice coatings
- Hydrophobic coating
- AM 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

Systems & Major Assemblies
- Electrical Wiring Systems
- Fuselage Structures
- Nacelles and Lip Skins
- Winglets
- Trailing Edge Assemblies
- Anti-ice Systems
- Engine Components
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 structure lip skins. 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.

Aerostructures
NACELLES, PYLONS AND LIP SKINS
ENGINE SYSTEMS AND MODULES

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 manufacture (AM) and utilise manufacturing process modelling as an enabler of extremely light weight 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 GE’s.
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.

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 GE’re. 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.
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, Bombardier, 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 Bombardier C Series.

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.
Special Technologies
TRANSPARENCIES

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-spall 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
Special Technologies
LANDING GEAR

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. GKN Aerospace also provides spare parts for the helicopter.
Special Technologies

ICE PROTECTION SYSTEMS, FUEL TANKS AND FLOTATION SYSTEMS

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
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 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:
> Maintenance
> Modification
> Painting
> Working parties
> Damage assessment
> Fleet management support
> CAMO
> AOG support
> Turnkey solution for severe repair and ferry flight preparation
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

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

**Services**

**ENGINE SERVICES**

TFE731
- On-site HSIs

LM1600
- Authorised Service Provider since 1992
- Full repair capabilities for the ELM16A 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

Fan blade repair

TFE731 maintenance
Services
TRANSARENTIES, ICE PROTECTION SYSTEMS, FUEL TANKS AND FLOTATION SYSTEMS

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
OUR GLOBAL FOOTPRINT

Strategically Located Adjacent To Customers

Growing Footprint In Asia

51 Manufacturing Locations In 14 Countries

Global Technology Centres
- UK - Bristol
- NETHERLANDS - Hoogeveen
- SWEDEN - Trollhättan
- US - Oakridge
Telephone: +44 (0) 1527 517715
E-mail: info@gknaerospace.com

www.gkn.com/aerospace