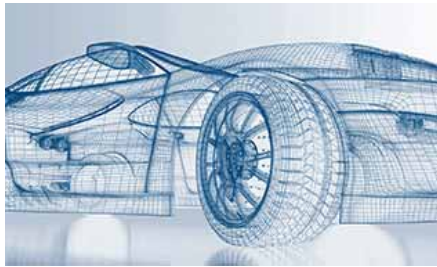


One of the world's largest product development specialists.



www.arrkeurope.com

Engineering

Prototyping

Tooling

Low Volume Production

ARRK AT A GLANCE



Who are ARRK

International technology group

Founded 1948

Turnover 320 M € (2016/17)

Worldwide > 3.729 employees

20 ARRK companies in 18 countries

Listed on the Tokyo Stock Exchange (TSE)

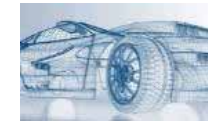


Your global product development specialist



Capabilities

Engineering



Prototyping



Tooling



Low Volume Production (LVP)



ARRK GLOBAL FOOTPRINT



ARRK Facilities around the World

AMERICAS

- 15. USA—San Diego
- 16. Mexico—Tijuana

EUROPE

UK—ARRK EUROPE LTD

- 1. Gloucester (GTC), 1b) Petersfield (Project Management Office)
- 2. Nuneaton (NTC)
- 3. Petersfield (PTC)
- 4. Basildon (BTC)

France — Shapers' France

- 5. Nantes Aigrefeuille & La Séguinière

France—ARRK LCO PROTOMOULE

- 6. Alby Sur Cheran

Spain—ARRK EUROPE LIMITED BARCELONA INCURSAL EN ESPAÑA

- 7. Barcelona

The Netherlands— SPG Pre-Series Tooling & Prototyping BV

- 8. Weert

Poland—Shapers' Polska

- 9. Bydgoszcz

Germany— P+Z Engineering GmbH

- 10. Munich (HQ), A. Augsburg, B. Stuttgart, C. Ingolstadt, D. Cologne, E. Wolfsburg, F. Laupheim, G. Heimsheim, H. Hamburg & I. Neckarsulm

Romania—ARRK R&D S.R.L.

- 11. Cluj-Napoca

India— Shapers' India

- 12. Pune

China— Shapers' Wuhan Co Ltd

- 13. Wuhan



ASIA

- India
- China
- 14. Japan Corporation — OSAKA & Tokyo
- Taiwan
- Thailand
- Malaysia

Engineering

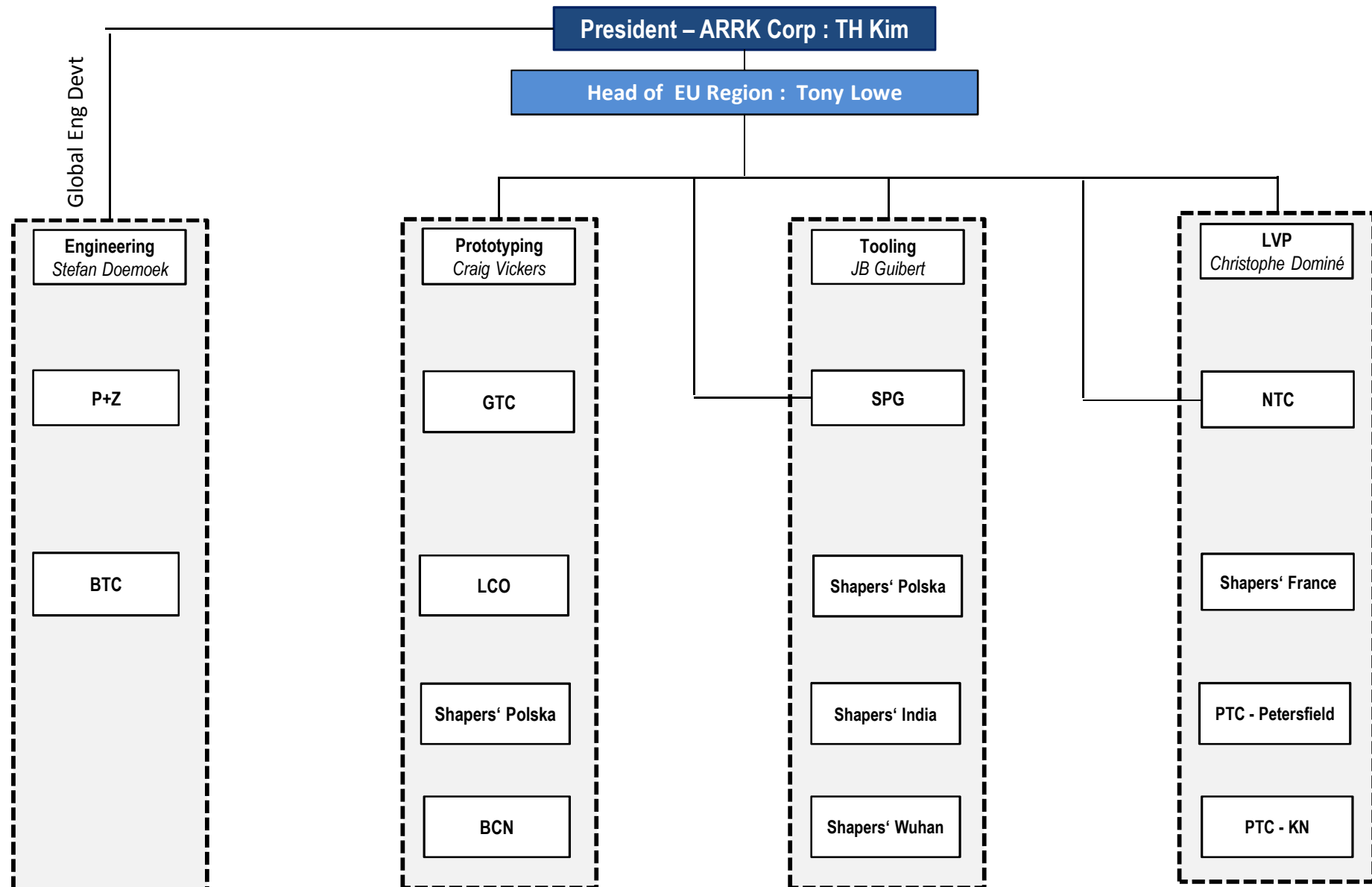
Prototyping

Tooling

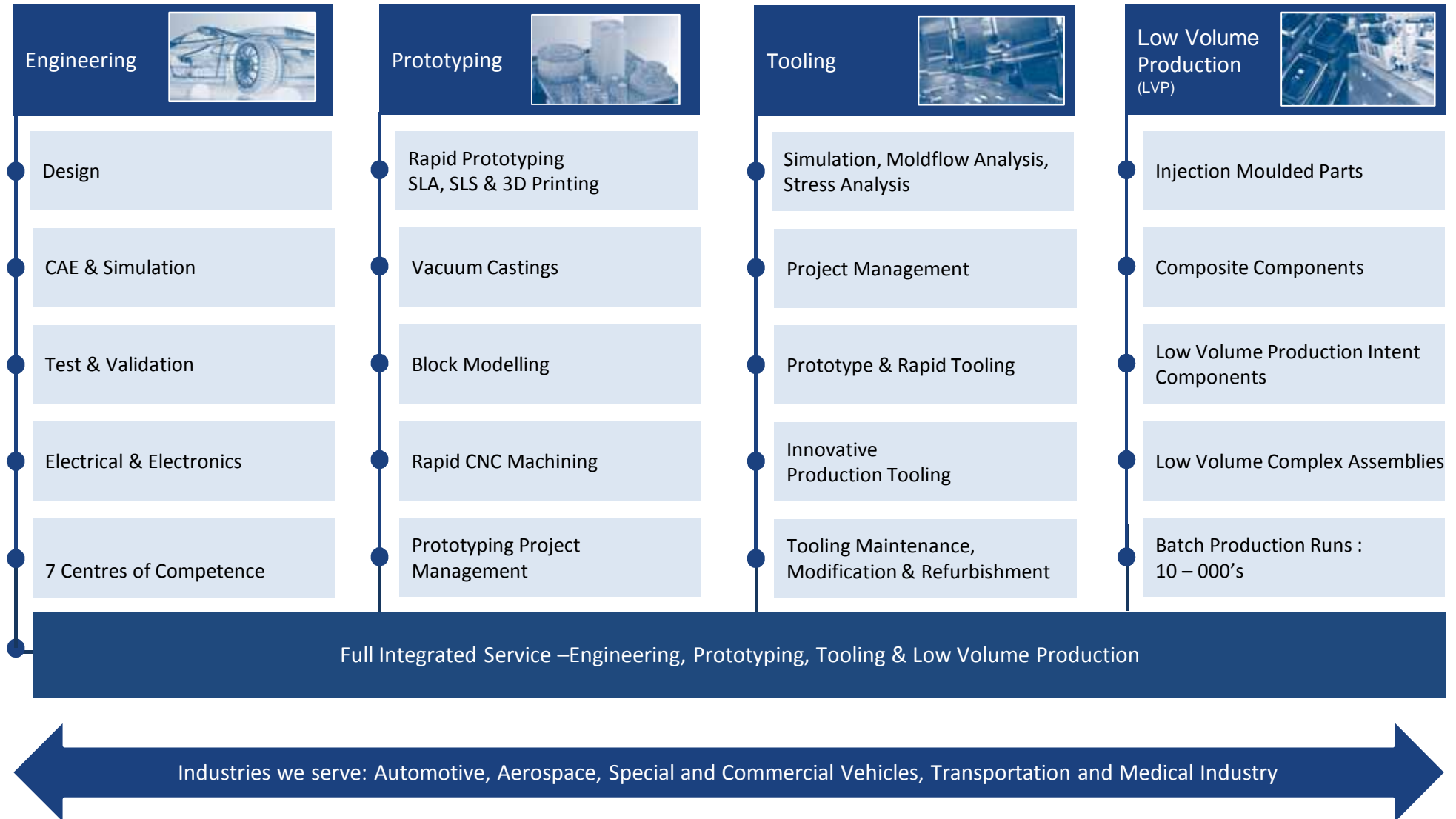
Low Volume Production



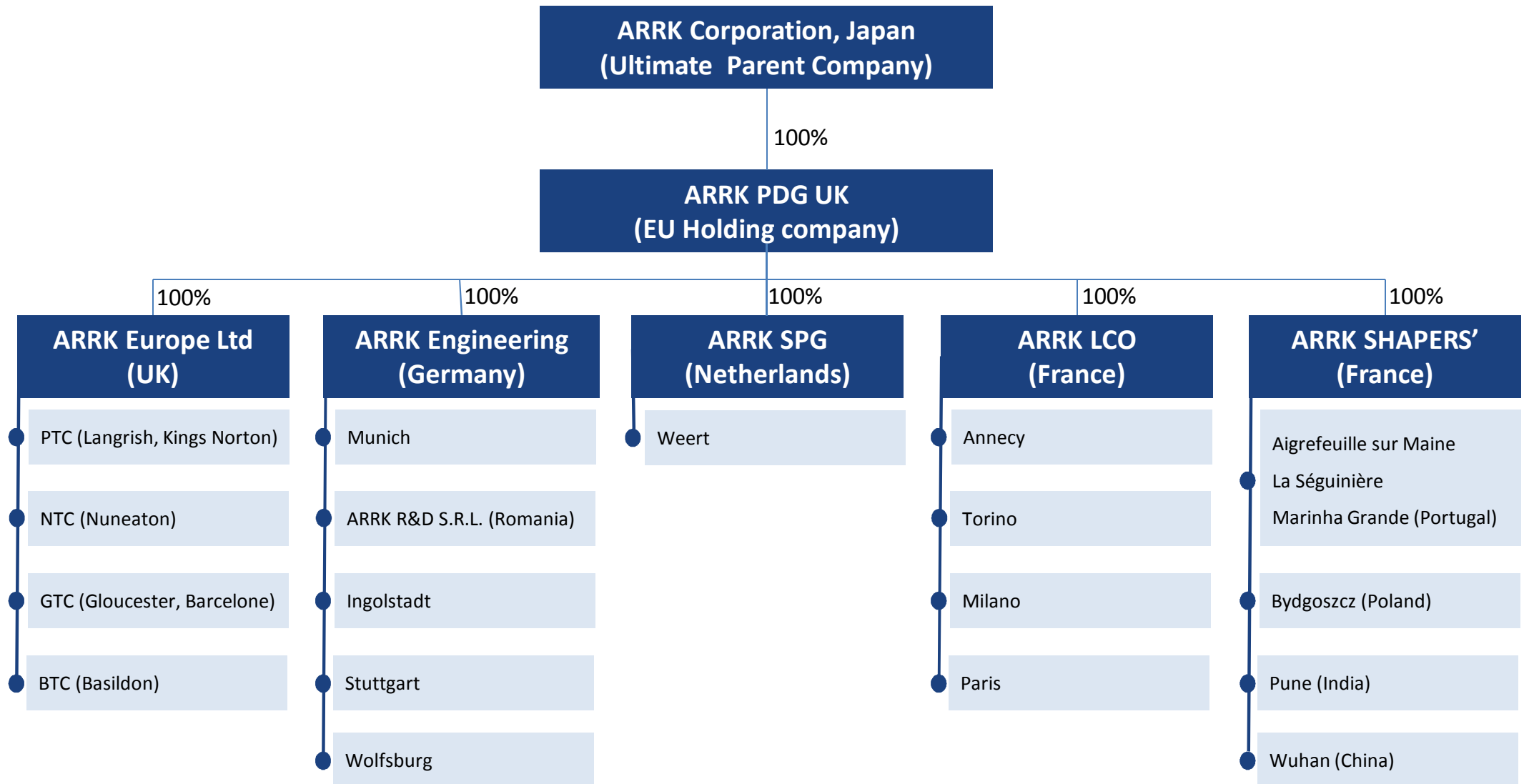
PILLAR/DIVISION STRUCTURE

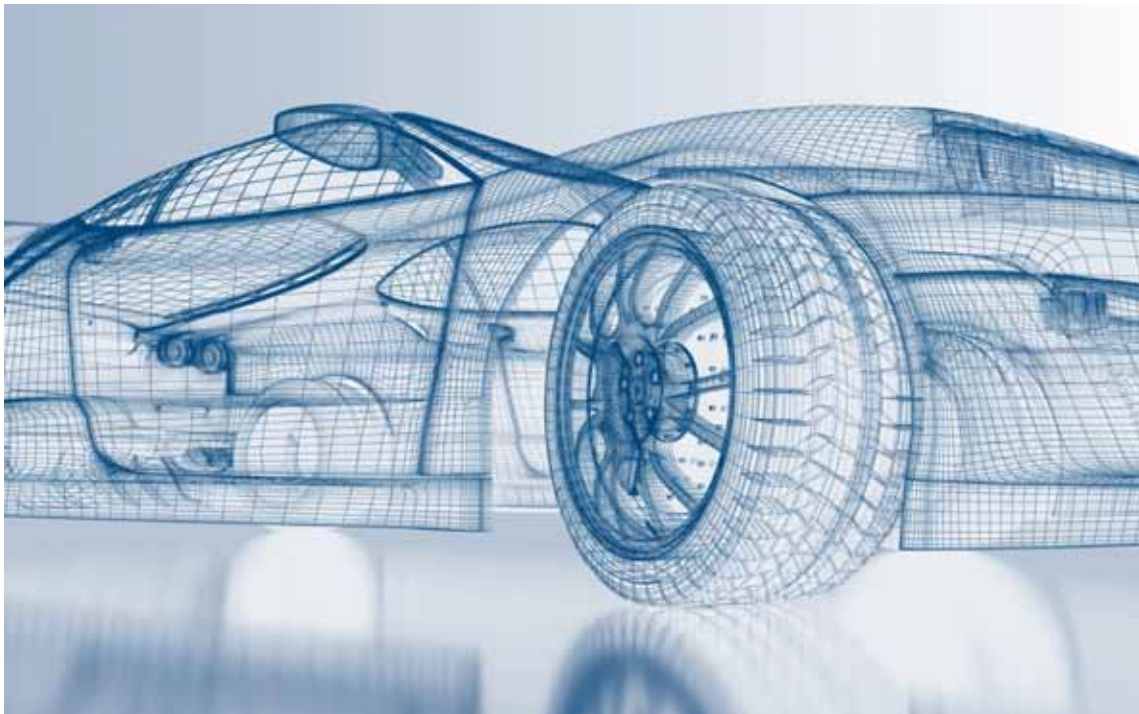


PILLAR/DIVISION STRUCTURE



ARRK IN EUROPE (EUROPEAN SISTER COMPANIES)





Engineering



Design

CAE & Simulation

Test & Validation

Electrical & Electronics

7 Centres of Competence



Engineering

Prototyping

Tooling

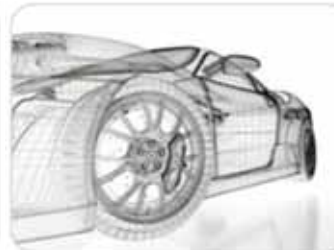
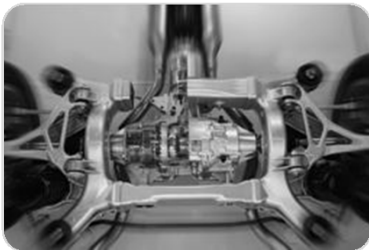
Low Volume Production

Product Know-how Automotive:

- Interior & Exterior
- Body-In-White
- Doors & Closures
- Chassis, Drivetrain, Suspension & Brake System
- Fluid Systems & Engine Peripherals
- Hybrid & Electric Drive Systems
- Composite Components
- Tank Systems

Product Know-how Non-Automotive:

- Aerospace
- Special and Commercial Vehicles
- Transportation
- Consumer Goods
- Medical Industry





Engineering

Prototyping

Tooling

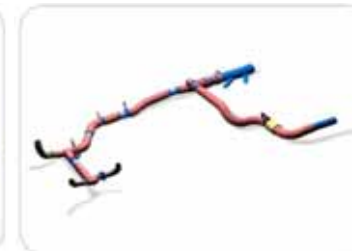
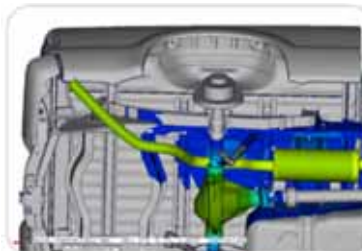
Low Volume Production

Design:

- Interior & Exterior Trim
- BIW & Closures
- Composites
- High-Voltage Storage & Hybrid Components
- Media-Conducting Systems & Thermal Management
- Vehicle Integration & Chassis
- Engine Peripherals
- Plastic Modules

CAE & Simulation:

- Model Creation
- Chassis & Powertrain
- Structural Crash, Occupant Safety, Pedestrian Protection
- Methods & Software Development
- NVH, Stiffness, Durability, Body & Interior
- Fluid Dynamics & Thermal Simulations
- Structural Mechanics Aerospace





Engineering

Prototyping

Tooling

Low Volume Production

Test & Validation:

- Test Coordination
- Materials Development & Materials Analysis
- Power Train
- Sub System & Vehicle T&D Management
- Chassis
- Acoustics & Vibration
- Thermal Management

Electrical & Electronics:

- Hardware Development
- Software & Function Development
- Testing & Validation
- System Integration
- Error Analysis & Series Production Support
- Cable Harness Development
- HMI (Human Machine Interface)





Engineering

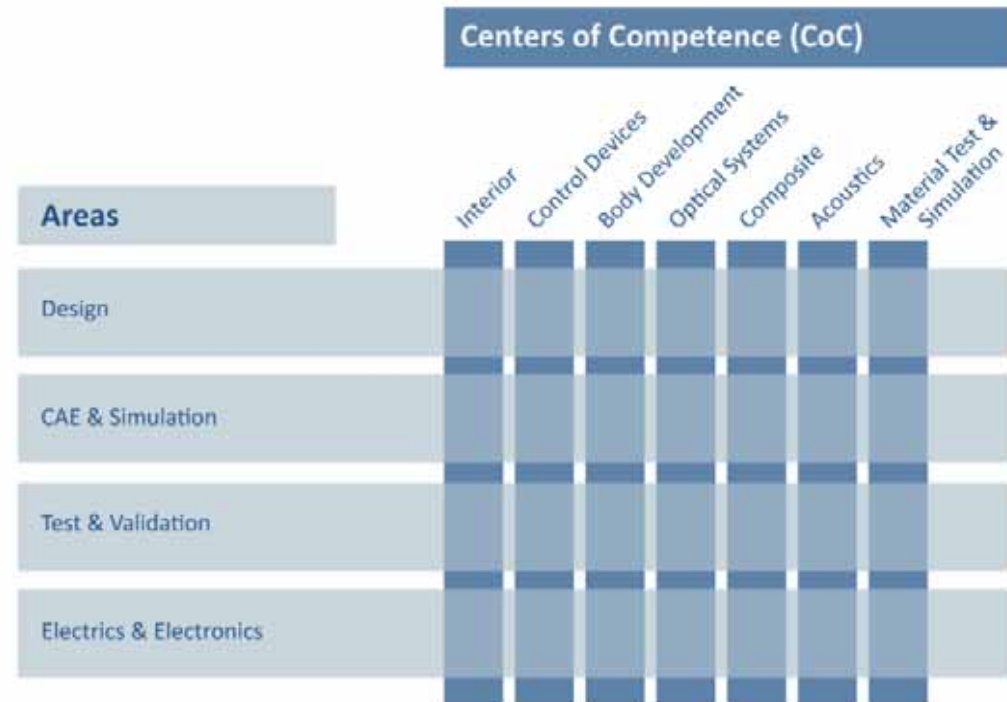
Prototyping

Tooling

Low Volume Production

Our Centres of Competence:

- Interior
- Control Devices
- Body Development
- Optical Systems
- Composite
- Acoustics
- Material Test & Simulation





Prototyping



Prototyping



Rapid Prototyping
SLA, SLS & 3D Printing

Vacuum Castings

Block Modelling

Rapid CNC Machining

Prototyping Project
Management



Engineering

Prototyping

Tooling

Low Volume Production

Prototyping Services:

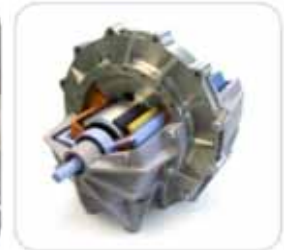
- SLA
- SLS
- 3D Printing
- VAC Casting / PU
- Rapid CNC Machining
- Block Modelling
- Metal Pressings
- Metal Encapsulation

Prototyping, Rapid Tooling and Pre-Series Injection Moulding:

- CNC-milling
- PU / Vacuum Castings
- Silicon Moulding
- Metal Stamping and Pressing
- Aluminium Moulds
- Rapid Steel Tooling
- Proprietary PRE-TENSION® Tool

Applied Technologies:

- Painting, Dying, Flocking
- Galvanic Chrome Plating, Vacuum Metalizing
- Sequential Valve Gating
- Gas Injection
- Insert Moulding
- 2-/3-Shot Moulding
- IMD – In Mould Decoration
- MuCell® Technology





Engineering

Prototyping

Tooling

Low Volume Production

STEREOLITHOGRAPHY (SLA):

22 in-house machines in total (12 UK, 2 x PL, 7 FRA, 1 ESP)

- Engine Manifolds
- Engine Blocks
- Switches, Handles, Knobs and Buttons
- Audio Speaker Grills
- Ventilation Components
- Seating Valances
- Electronic Housings
- Wing Mirror Housings

SELECTIVE LASER SINTERING (SLS):

9 machines in total (7 UK & 2 FRA)

- Instrument Panels Assemblies
- Glove Boxes
- HVAC, Ducting Systems
- Hinges
- Wiring Clips





Engineering

Prototyping

Tooling

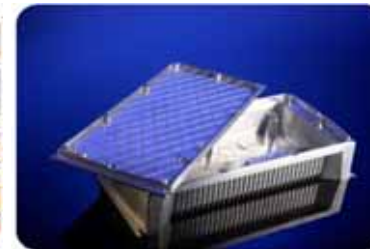
Low Volume Production

Vacuum Casting (PU):

- Prototype Front & Rear Automotive Lighting
- Up to Full Size Bumpers & Front Grills
- Interior Dash Trims
- Speaker Grills
- Glove Box Opening Mechanisms, Boot Liners

CNC Machining:

- Centre Consoles
- Storage Boxes
- Wheel Arch Wings, Side Panels
- Clear Lens Covers, Door Trims





Tooling



Tooling



Simulation, Moldflow
Analysis, Stress Analysis

Project Management

Prototype & Rapid Tooling

Innovative
Production Tooling

Tooling Maintenance,
Modification & Refurbishment



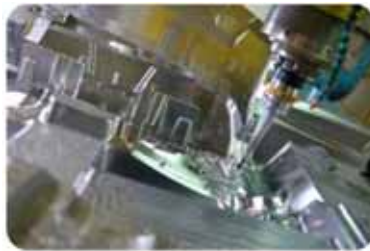
Engineering

Prototyping

Tooling

Low Volume Production

- Injection Mould Tooling:
 - Ranging from small Tools to large Automotive Bumper Sized Tools
 - Precision, Multi Cavity, Twin Shot, Over Moulding Capability
 - SMC Moulds
 - RTM Moulds
- Tool Trials, Modifications, Inspection, Maintenance and Refurbishment Service
- Assembly Jigs and Inspection Fixtures





Engineering

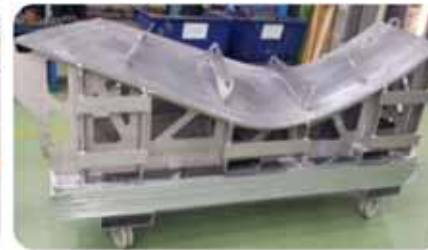
Prototyping

Tooling

Low Volume Production

Composite Tooling and Solutions:

- Pattern and Moulds
- Tooling and Fixtures
- Component Inspection Fixtures
- Assembly Jigs





Low Volume Production (LVP)

Low Volume
Production
(LVP)



Injection Moulded Parts

Composite Components

Low Volume Production
Intent Components

Low Volume Complex
Assemblies

Batch Production Runs :
10 – 000's





Engineering

Prototyping

Tooling

Low Volume Production

Examples of Industries served:

- Automotive
 - Interior – Plastics and Composites
 - Exterior – Plastics and Composites
- Lighting
- Transportation
- Defence and Aerospace
- Marine Industry
- Packaging
- Consumer Products

Additional Services:

- Secondary Operations and Assembly
- Parts Measuring 3D CMM, Tactile or Digital Scanning
- IMDS Registration
- EDI and Logistics
- Project Management based on extensive Tooling and Material Experience





Engineering

Prototyping

Tooling

Low Volume Production

Injection Moulding Machines:

- From 20T to 3200T Injection Moulding Machines
- Injection Machines with Robot
- Dryers, Temperature Controllers, Sequencer Controllers,...

Process:

- Material Homologation
- Functional Tests
- Product / Process Tuning and Optimisation
- Packaging Development
- Assembly Workflow Development

Applied Technologies:

- Ultrasonic Welding
- Vibration Welding
- Industrial Glueing
- Full Finishing applying Soft Painting, High Gloss Painting
- Flocking
- Tampo Printing
- Galvanic Chrome Plating and PVD Coating





Engineering

Prototyping

Tooling

Low Volume Production

Carbon Fibre Reinforced Plastic (CFRP):

Specialist, niche, tailored service providing low to medium production volume quantities for a variety of industries.

Markets we serve:

- Automotive
- Marine
- Leisure
- Special Effects
- Defence & Security
- Aerospace
- Transportation

Some of the technologies & processes we employ include:

- Large scale CNC Machining
- Resin Infusion
- The two water-cooled Scholz autoclaves :
 - 5m long x 2.1m diameter, temp 200C, pressure 14 bar
 - 2.2m long x 1.8m diameter, temp 175C, pressure 20 bar
- Full on / and off site system control allowing for real time monitoring.
- Full cure traceability to automotive and aerospace requirements.



ARRK R & D Activities :

- On-going Process Development

- Technology Research

- Cooperation with Universities

- Collaboration with Government Funded Project

- Material Development

- Client Partnership





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