

**‘Six of the Best’
*Demonstrating the Innovation Capabilities of
the UK Niche Vehicle Sector***

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LCV 2011 – 7th/8th September 2011

Who are the UK Niche Manufacturers?

- There are at least 108 niche vehicle manufacturers in UK, making cars, commercial vehicles, buses, coaches, taxis & motorcycles
- The largest UK niche manufacturers include Bentley, Lotus, Aston Martin & Triumph Motorcycles – each producing several thousand vehicles per annum
- At least 30 of these manufacturers produce significant numbers of vehicles per annum, such as McLaren, RR, Morgan & LTI

What is the NVN CR&D Programme?

- Funded by Advantage West Midlands in 2009, 2010
- Funded by AWM & Technology Strategy Board in 2011
- Run as a competition with regular 'calls'
- Competition themes are based on low carbon propulsion and lightweight vehicle structures
- Typically projects receive funding of circa £100k over 6 months
- Each consortium comprises 3 or more organisations
- Each project is led by a niche vehicle manufacturer
- 14 projects have received funding support to date
- The programme is managed by Cenex in association with NVN
- The programme is part of the TSB LCV Innovation Platform

Project 1 – Westfield iRacer

The concept

- Intended to be the world's first single-seater race-car EV
- Development route for a road-going Westfield EV
- Technology platform for raft of innovations
- Pure electric drive
- Unique aero bodywork & wheel fairings
- New battery pack & motor controller products
- Stimulate a market for affordable EV sports cars

Project 1 – Westfield iRacer

The partners

- Westfield – niche sports car manufacturer
- Potenza Technology – technology & vehicle integration
- Delta – design and engineering
- RDM – electronics & control
- Coventry University – vehicle dynamics

Project 1 – Westfield iRacer

The vehicle



Project 1 – Westfield iRacer

The project challenges

- Designing a race-ready EV sports car with minimal carry-over content from donor vehicle
- Achieving performance and range targets – equivalent performance to Westfield 1600 race car and 25 minute operation under race conditions
- Development of twin-motor technology
- Development of new battery pack / BMS / controller
- Development of aerodynamic body with differential styling
- Achieving weight target of circa 750kg

Project 1 – Westfield iRacer

The outcomes

- First to market and adopted as the standard product for EV Cup (Sports EV class)
- 770kg weight, includes 320kg of batteries
- Uses 2 x 80kW Oxford YASA motors
- Equivalent performance to ICE equivalent – 115mph, sub-6 seconds 0-60 acceleration
- Can complete a 13 lap race at Silverstone (35km)
- Road variant developed for TSB demonstration trials
- Has led to major strategic alliance with overseas partner
- Huge media interest and explicit support from FIA

Project 2 – E-Vito Taxi & Minibus

The concept

- All-electric taxi conversion with 4-wheel steer
- 70kW motor & controllers packaged in engine bay
- Under-floor battery installation
- Purpose-built 2-speed gearbox (minibus only)
- Taxi designed to satisfy London (PCO) requirements
- Vehicles suitable for urban and extra-urban operation

Project 2 – E-Vito Taxi & Minibus

The partners

- Zytek – motor and controllers
- Penso – vehicle conversion & integration
- Vocis – gearbox design and engineering
- Valance – battery technology
- Mercedes Benz UK – donor vehicle & support
- One80 – rear wheel steering system

Project 2 – E-Vito Taxi & Minibus

The vehicle



Project 2 – E-Vito Taxi & Minibus

The project challenges

- Packaging the motor, controller and ancillaries as a direct replacement in the existing engine bay
- Achieving OEM engineering and manufacturing requirements
- Ensuring that the base vehicle conversion requires minimum rework / maximum carry-over content
- Designing and optimising a 2-speed gearbox

Project 2 – E-Vito Taxi & Minibus

The outcomes

- Feasible UK conversion of a high-volume OEM base vehicle with several body variants
- Distribution & retail route through Eco City (taxi)
- Can be sold & warranted as a Mercedes product
- High UK production content
- UK-driven innovation
- Consortium partners continuing with joint technology development

Project 3 – Morgan 3 Wheeler

The concept

- Lightweight, retrospective, fun, low emissions
- Utilise and develop the UK niche supply chain
- Create a new market niche
- Exploit market trend for retro vehicles
- Twin-cylinder motorcycle-derived engine
- Low risk technology route
- Inspire a new generation with an interesting alternative

Project 3 – Morgan 3 Wheeler

The partners

- Morgan – vehicle design & integration
- ABT - chassis
- PTP - powertrain
- Premier – body
- MES – electrical system
- Caparo – braking system
- Other UK suppliers appointed from NVN Supplier Event

Project 3 – Morgan 3 Wheeler

The vehicle



Project 3 – Morgan 3 Wheeler

The project challenges

- Clean sheet design
- No reference points or competitor vehicles
- 9 months from concept to prototype
- Sourcing a suitable engine
- Primary safety / dynamics
- Minimising tooling cost & other investment
- Managing technology risks
- Minimise impact on core business
- Maximise supply chain responsibility

Project 3 – Morgan 3 Wheeler

The outcomes

- Unique product with its own niche
- Huge media interest
- Unprecedented customer reaction – 2 year order book
- Production target of 500 cars per annum
- Value to UK suppliers circa £5m per annum
- Tie-up with ‘Superdry’ to attract younger buyers
- New Morgan subsidiary created
- New jobs at Morgan and in supply chain

Project 4 – Microcab H2EV

The concept

- All-new ‘Mark 2’ vehicle – replaces technology demonstrator
- Sheet bonded aluminium chassis
- Semi-structural polypropylene body
- Package-protected for pure EV and fuel cell propulsion
- 3 variants – Light delivery van, 4-seater car, wheelchair-accessible taxi
- Design for series production
- Vehicle suitable for fleet demonstration

Project 4 – Microcab H2EV

The partners

- Microcab – emergent manufacturer of niche urban light-duty vehicles
- Delta Motorsport – vehicle design and engineering
- Lotus Lightweight Structures – chassis manufacturer
- Coventry University – innovation & fuel cell technology
- RDM – electronics and electrical system

Project 4 – Microcab H2EV

The vehicle



Project 4 – Microcab H2EV

The project challenges

- Aggressive timing to support production of vehicles for participation in TSB demonstration trials
- Packaging constraints – no increase in vehicle size but required to accommodate alternative propulsion systems
- Design and manufacturing partners achieving ‘right first time’ chassis build
- Minimising tooling investment costs

Project 4 – Microcab H2EV

The outcomes

- Fully engineered prototype formed the basis of pilot production of demonstration fleet
- Package design allows fuel cell and pure EV installations to be achieved with only one chassis variant
- Three body types can be installed on the single chassis variant
- Market for light-duty low carbon vehicles can be exploited after demonstration programme

Project 5 – Agility Electric Motorcycle

The concept

- Urban sports motorcycle
- Monocoque chassis/body construction
- All-electric drive
- UK design, development & manufacture
- Accelerate UK electric motor development
- Exploit new market opportunity

Project 5 – Agility Electric Motorcycle

The partners

- Agility Global Ltd – newly-formed UK green motorcycle manufacturer
- Reap Systems Ltd – lithium-ion battery pack and Battery management system
- Lynch Motor Company – electric motor & control

Project 5 – Agility Electric Motorcycle

The vehicle



Project 5 – Agility Electric Motorcycle

The project challenges

- Electric motor development
- Powertrain optimisation for ‘ride-ability’
- Vehicle integration and packaging constraints
- Reach prototype stage in a 6-month development timescale, minimise time to market
- Cost control to achieve market price expectations (sub £15k)
- Leapfrog the competitors – Zero, Brammo, Quantya, KTM

Project 5 – Agility Electric Motorcycle

The planned outcomes

- 65-81% CO₂e saving over ICE competitors
- Comparable performance to conventional motorcycles
- Highly innovative product with state of the art technology
- Product to be UK sourced and manufactured
- Exploit market potential – independent research indicates a global market of 10 million electric motorcycles by 2014
- Support the re-emergence of the UK motorcycle industry

Project 6 – Sandwich Panel Chassis

The concept

- Chassis ‘tub’ manufactured from flat metal-skinned polypropylene sandwich panels
- Bonded click-fix joints
- Flat-pack assembly with no tooling
- Modular construction
- Significant weight reduction
- Significant cost reduction
- Recycled & recyclable

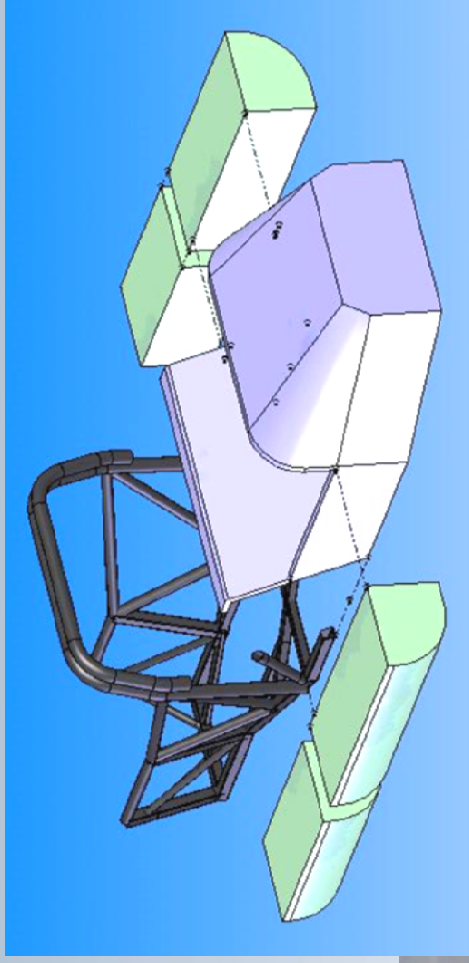
Project 6 – Sandwich Panel Chassis

The partners

- Gardner Douglas – specialist niche sports car manufacturer
- Inrekor Limited – design, manufacture and applications engineering of novel structural sandwich panels
- Nottingham University – structural analysis & optimisation, materials and adhesives expertise

Project 6 – Sandwich Panel Chassis

The vehicle



Project 6 – Sandwich Panel Chassis

The project challenges

- Timing - concept demonstrator to be ready in 2 months, prototype chassis to be ready in 6 months
- Characterising the material properties
- Designing joints to be stiff and durable
- Understanding the material's engineering possibilities & limitations
- Developing suitable FEA methodologies
- Designing for EURO NCAP crash protection standards
- Improving chassis stiffness whilst significantly reducing weight

Project 6 – Sandwich Panel Chassis

The planned outcomes

- 30% weight saving compared to tubular steel chassis
- 90% reduction in parts count
- 70% reduction in labour content
- Efficient assembly process with applicability to a wide range of niche vehicle types
- Flat-pack supply to maximise export potential
- Fully recyclable chassis assembly
- Use of recycled materials
- Exploit the growth potential of SME partners

Finding out more

- All 6 of these projects are showcased on the Niche Vehicle Network stand here at LCV 2011
- Come and see the vehicles and hardware and talk to the companies behind the technology
- If your company would like to join the Niche Vehicle Network, we would like to see you on our stand

Thank you for your attention

NICHE
Vehicle Network

