

Geneva Motor Show 2006

P R E S S R E L E A S E

BlueCar, from drawing-board to reality

Designed by the French Bolloré group, the small French electric car has passed its dynamic tests with flying colours

C O N T E N T S

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The 2006 Geneva Motor Show marks the BlueCar's road debut

The BlueCar, which made its worldwide premiere as a concept car when it was shown at the 2005 Geneva Motor Show, will be exhibited again from the 3rd to the 12th of March 2006, but this time as a road going prototype.

This ultra-compact vehicle, designed by the Bolloré Group is the first truly electric car, as opposed to the various "electrified" ones (cars built for either petrol or diesel combustion engines and later modified, after they have been designed, for electrical power) proposed on the market up to now.

After having been one of the stars of the 2005 show, the BlueCar is coming back to Geneva having covered hundreds of kilometres on different French tracks. These tests essentially validated the BlueCar's remarkable performances:

- > A range between charges of around 250 km.
- > A top speed of 120 to 125 km/h.
- > Acceleration of 0 to 60 km/h in 6.3 seconds.
- > A fast recharging (around 6 hours, but a few minutes are enough to travel around twenty kilometres)

What makes these performances, unique for an electric car, is the Lithium Metal Polymer batteries developed by BatScap.

Six further examples of the BlueCar will be built in 2006. 150 million euros will be invested in the construction of a new production site in Brittany with, eventually, a production capacity of 10,000 batteries a year. The application for planning permission will be submitted in March 2006.

The Lithium Metal Polymer battery

The result of nearly fifteen years of work in Research and Development, LMP batteries are made by extruding films which are reeled to form elements which are then connected together:

- > The anode is a film of lithium metal (the lightest and most high energy metal).
- > The electrolyte is a polymer additive film for aiding the passage of lithium ions
- > The cathode is a polymer film containing an insertion compound which receives the discharged lithium ions.
- > A metal sheet collects the current.
- > An integrated electronic board takes care of the thermal and electronic control of the battery

So the whole battery assembly is made up of elements which are lightweight (the density of lithium – 0.53 – is just over half that of water) and solid; there is no liquid electrolyte.

Consequently, the BatScap LMP battery is:

- > Light - it supplies five times more energy than a lead battery of an equivalent weight.
- > Pollution-free - it contains no heavy metals or toxic liquids and its recycling has been studied as part of the European Brite programme.
- > Powerful and long-lasting - apart from its high performance due to its superior energy density, the BatScap battery is designed to have a lifetime equivalent to the vehicle it will power, around 150,000km.

Intensive trials

Since its presentation on the world stage at the 2005 Geneva Motor Show, the BlueCar has undergone a complete programme of dynamic tests on several French circuits, including the very modern Centre d'Etudes et de Recherches Automobiles at Mortefontaine, north of Paris.

The vehicle's performances, as well as its reliability, autonomy and various technical characteristics have all been tested. The numerous laps driven with on-board measuring and inspection equipment have validated all the data before its first public appearance on the road, at the Brittany site of the Bolloré Group, on January 24 2006.

This first phase of tests has been extremely conclusive. The wound rotor synchronous motor in front wheel transverse position has turned in excellent performance figures. It doesn't need a gearbox which has meant that, at the design stage, crumple zones have been created, in compliance with European norms, without needing to increase the length of the front compartment.

The 240 kg Lithium Metal Polymer battery is positioned at the centre of the car, under the seats and in front of the rear axle, so lowering the centre of gravity. And this choice, which has a major significance for road behaviour, has been tested and confirmed over the last few months as have the control electronics, also positioned under the floor, under the feet of the driver and the front passengers.

Even though it is a 'city car', the BlueCar nevertheless has a suspension system that makes it difficult to find fault with its comfort and road holding. The front suspension is of the McPherson type and the back has trailing arms, shock-absorbers and coil springs.

Quite apart from the comfort and the pleasure of the ride, the BlueCar is completely silent, vibration-free and powerful.

The testers have emphasised the great pleasure afforded by the 30 KW electric motor, which supplies its maximum torque from the very lowest speeds. They also found that expectations in terms of performances were not disappointed, with a top speed of between 120 and 125 km/h, acceleration from 0 to 60 km/h in 6.3 seconds, autonomy of 200 to 250 km depending on the terrain and a complete recharging time of six hours.

A choice which respects the environment

Since the first attempts at an electric car, which date from the beginning of the automobile age, all the designs have suffered from the impossibility of storing enough energy for the car to have acceptable speeds and autonomy. Consequently, their use has been very marginal.

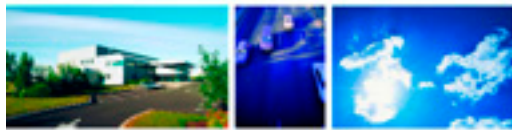
However, the electric car, if it meets the needs of its users, is by far the best answer to the tricky problem of car pollution.

Even though all the big manufacturers have made considerable efforts toward measures which reduce the pollution generated by the internal combustion engine - new diesel engines with particle filters, direct injection petrol engines, hybrid propulsion units - none of these get near to zero pollution or a solution to the problem of petrol supply.

The electric car – with high energy battery – is a perfectly feasible and natural alternative to these other propulsion systems. Aimed at precise markets, the urban, suburban and local car user, it boasts major advantages such as being pollution-free, silent, equipped with electronic automatic transmission, energy recovery during braking, reliability, extremely low consumption costs / km (estimated at 1 euro for every 100 km).

BlueCar, really electric

BlueCar has been designed as a vehicle which is completely and exclusively electrically powered, in order to maximise its qualities and performance.



BATTERIE LITHIUM MÉTAL POLYMÈRE
LITHIUM METAL POLYMER BATTERY



The low-dimension battery which fits neatly under the floor takes up very little space and considerably lowers the centre of gravity which therefore guarantees manoeuvrability and stability. The small bulk of the electric motor and its reduction gear (no gearbox) have meant that crumple zones in compliance with European norms are possible while retaining a real compactness.

With three passengers, the BlueCar has a loading volume of 810 dm³. Two folding seats mean two extra people can be accommodated. This multi-use is also a key element which will attract customers who these days are looking for a vehicle which can adapt to all circumstances.

BlueCar, main features

The first impression given by the BlueCar is both pleasing and fun and its fluid design which gives it an innovative and stylish look is already turning heads.

The types of uses it was designed for mean that it is a very compact car which can manoeuvre easily in restricted spaces. The BlueCar has a very tight turning circle for easy handling and, at 3.05m long, the BlueCar is as short as the classic Mini.

The BlueCar makes use of the “high architecture” of the new generation of cars, guaranteeing easy access and increased visibility. With a height of 1.61m and a width of 1.71m, the BlueCar has three seats at the front and a rear carrying capacity of 810 dm³.

The car's design gives it great modularity:

- > The tilting back of the bench seat for the two front passengers allows a loading length of 2.35m and 2.3m³ carrying capacity.
- > If, on the other hand, it's the number of passengers that is the priority, the rear can be fitted with two folding seats (adapted to children) and five people can be accommodated.

General characteristics:

- > Front wheel drive
- > 3 seats + 2
- > Length: 3.05m
- > Width: 1.71m
- > Height: 1.61m
- > Total weight with batteries: 1070kg
- > Tyres: Michelin Energy 3 Pax System (195/630 R 42).

Technical characteristics:

Maximum useable horsepower	50 kW
Useable horsepower at constant speed	30 kW
Maximum torque	170 Nm
Maximum motor speed without derating	10,000 rpm
Maximum battery voltage	374 V
Minimum battery voltage	243 V
Air cooling maximum temperature	40° C
Variable speed drive dimensions	330x300x189 (without brackets)
Variable speed drive weight	15 kg
Motor weight	65 kg
Differential reduction gear weight	20 kg
BatScap battery pack: Lithium-Metal-Polymer	28 kWh
Battery weight	< 240 kg
Recharging time to 100%	6 hours
Express recharging time	A few minutes for 20 km
Front suspension	McPherson strut
Rear suspension	Trailing arms
Bodywork	high resistance steel aluminium recyclable composite
Vehicle conforms with the latest safety standards	
Maximum speed	125 km/h
Acceleration 0-60km/h	6".3
Average autonomy	200-250 km

The electric car today

The difficulty of selling an electric model

The rise in petrol prices and the increase in town centre pollution had already encouraged a resurgence of interest in the electric car in the 80s.

In effect, the California Clean Air Act restarted research in the United States. The European Union has followed suit with the Avere programme (European association for electric road vehicles). On France's initiative, European towns interested in the electric vehicle have established the Citelec association. The big car manufacturers have responded to the growing demand with vehicles which are nothing more than "electrified" conventional cars.

If their poor performance isn't a major discouragement, their very limited autonomy and high prices have led to total lack of interest from the public. The three French car manufacturers had at least one model in their catalogue, Renault Clio, Peugeot 106, Citroën AX and Saxo as well as the small Peugeot/Citroën Partner/Berlingo utility vehicles. But they have disappeared from the catalogues for lack of customers.

So it is no surprise that this market is far from booming. In 2003, it reached 113 registrations in France, 0.01% of the whole French car market.

Today, the trend is toward hybrid vehicles. Despite the real advance of this system in terms of pollution it is not, and never will be, completely free of CO₂ emissions. But the BlueCar has taken up the challenge.

A potentially big demand

But there is strong interest in vehicles with a design which prioritises ecology and economy. This comes particularly from companies and public utilities like EDF, GDF and La Poste, in France, who have fleets for use in urban and suburban environments. The growth of the market in 2004, 460 registrations, is principally due to them.

A certain number of individual road users, sensitive to concerns for the environment and travelling within a limited radius, are ready, if it is offered to them, to try a car which is powerful, silent and manoeuvrable and, what's more, is economic. The low cost becomes an even stronger motive with the tax benefits which are available with the purchase of this type of vehicle: anyone who buys an electric car receives a 3,000 Euros grant provided the purchase is accompanied by the destruction of a vehicle registered before 1st January 1997.

A very favourable context for a purpose-built electric car. A bright future for the BlueCar for example.

A new factory for the manufacture of 10,000 batteries a year

A new factory situated in Finistère (Ergué-Gabéric) is soon to be built. In effect, the Bolloré Group plans to invest 150 million Euros in this plant which is expected to go into production at the end of 2008. The factory will be devoted to the manufacture of Lithium-Metal-Polymer batteries with a final production target of 10,000 units / year. The objective of this investment is to respond to the development of the electric BlueCar designed by the group.

In the beginning, the BatScap research centre

BatScap, a subsidiary owned 80% by Bolloré and 20% by EDF, was founded in December 2001 to exploit the results of the major research programme in the field of Lithium-Metal-Polymer batteries run by Bolloré in collaboration with EDF and several French laboratories for more than twelve years. In parallel, BatScap has been carrying out research on supercapacitances.

Based at Ergué-Gabéric, the original site of the Bolloré group since it was founded in 1822, the BatScap company today has 80 researchers, engineers and technicians, a team which brings together all the skills required for the design and construction of these very high technology products.

BatScap has now submitted over 20 patents which protect the innovative aspects of the Lithium-Metal-Polymer battery and supercapacitances as well as the production processes which have been devised and which are responsible for the battery's quality, reliability and low cost.

Questions to Vincent Bolloré

Vincent Bolloré, President of the Bolloré Group

Are you thinking of building the electric vehicles yourselves?

V. B. : This was not our original intention; we are, above all, manufacturers of very high performance batteries! If, however, there was real demand on the part of public bodies, the fleets of large corporations and also individual consumers, but no car manufacturer takes the initiative, then our confidence in the qualities of our battery is such that we envisage very seriously the possibility of reviewing our position, possibly in partnership with one of them.

Which manufacturers are interested in your technology?

V. B. : Today, the Europeans, as they are more motivated by the reduction in CO₂ emissions and saving on the consumption of fuel (the biggest manufacturer of electric vehicles world-wide is still Peugeot/Citroën). But there are also all those who are trying to acquire an ecological brand image!

What would be the price of a vehicle?

V. B. : A figure of 20,000 Euros has recently been given for the perceived average price in France for a conventional combustion engine vehicle. We think that we can match that, particularly with the grant of 2,000-3,000 euros (assuming the previous vehicle is destroyed). And don't forget the extraordinarily low running costs of the BlueCar: electricity consumption 10 times cheaper than petrol, savings on maintenance, parking costs...

Who are your competitors?

V. B. : We have no competitors with this technology applied to cars (a Canadian company is manufacturing lithium polymer batteries but with a different industrial process and only for non-mobile applications which don't require the same level of performance). The other batteries are either more expensive or have a lower energy density and so are more adapted to hybrid vehicles or uses which are less demanding than the car.

Questions to Philippe Guédon

Philippe Guédon, President of Espace Développement

How do you position yourselves in relation to the hybrid vehicle?

Ph. G. : We think that the hybrid vehicle is an inadequate response to the problems of pollution, CO₂ emissions and reducing fuel consumption! In practice, these vehicles only offer an autonomy of a few kilometres when in electrical mode and basically they run on petrol. Moreover, it's a more expensive solution as there are two engines, batteries and a petrol tank and what is saved in consumption is lost again with the accumulated weight of the juxtaposition of these two technologies! The all-electric vehicle is the best solution! It's up to us to sell it and to prove our industrial know-how. France has talented researchers and also the entrepreneurs to make the most of the new technologies.

What thinking is behind your decision to build the “BlueCar”?

Ph. G. : The BlueCar is a concept-car designed around a battery. With its autonomy of more than 200 km and a lifetime of more than 150,000 km it is intended to rehabilitate the image of the electric car. The BlueCar will also give us the chance to reply to the manufacturers' big question whether there really is a market for this type of car. We expect this vehicle and the new models which we are building to be able to attract a certain clientele which demands performance from a car but which is also sensitive to the problems of the environment. The results from the tests we conducted at the CERAM were very positive. The tests confirmed all our expectations: a top speed of 120-125 km/h, acceleration from 0 to 60 km/h in 6.3 seconds, an autonomy of around 250 km and six hours recharging time.

These are figures which show that this vehicle has a future!

Questions to Jean-Marc Métais

Jean-Marc Métais, Director of the Plastic Films Division.

If you decide to manufacture this car, what would be the distribution and maintenance network?

J-M. M. : In France there are very large independent networks which have already promised distribution. As electric vehicles need hardly any maintenance, a telephone help and breakdown service would be totally feasible. We are, in fact, already looking at proposals along these lines!

Is the battery clean?

J-M. M. : Yes, because Lithium-Metal-Polymer batteries are made up of three types of component:

- > Electronic components which manage the working of the battery (transistors, resistors, microprocessors). These can be easily recycled by the existing channels for high-street electronic products.
- > Metal components (copper, aluminium). These can be recovered and recycled for reuse.
- > Chemical components (including the Lithium Metal). BatScap has been studying the different recycling possibilities as part of a programme lead by the European Community (the Brite project).

Nor should it be forgotten that, over a year of use, the replacement of 10,000 combustion engine vehicles with electric cars would save 12 million litres of petrol and reduce CO₂ emissions by 20,000 t and also a significant quantity of other polluting particles.

What are the advantages of LMP batteries compared to lithium/ion batteries?

J-M. M. : There are a number but these are the main advantages:

- > Safety as they contain no liquids.
- > Cost as lithium/ion batteries contain cobalt which is expensive.
- > Weight as their high specific energy means they can be relatively light.

Bolloré Group's partners in the BlueCar project

> Architect : Philippe Guédon / Espace Développement

To bring together all the advantages of the association of the high performance Lithium-Metal-Polymer battery developed by BatScap and an electric car specifically designed for its optimum use, Vincent Bolloré, President of the Bolloré Group, has, from the start of the project, looked to Philippe Guédon. Talented, but above all pragmatic, as demonstrated by his major achievement – the Espace –, built and sold by Renault but designed by his team at Matra Automobiles, Philippe Guédon today is president of the consultants Espace Développement, having formerly been the head of Matra.

> Prototype : 3D, subsidiary of Pininfarina

> Battery : BatScap, subsidiary of the Bolloré Group (80 %) and EDF (20 %)

> Engine and reduction gear : Matra Auto Engineering, subsidiary of Pininfarina

> Style : Espace Développement, 3D, Bolloré

Contact BatsCap

Jean-Marc Métails, “Arts et Métiers” Engineer, Director of the Plastic Films Division, is in charge of the operational management of BatScap.

Press Contacts

DGM Conseil: tel: +33 1 40 70 11 89 - fax: +33 1 40 70 90 46

Michel CALZARONI: m.calza@dgm-conseil.fr

Ghislaine CALZARONI: g.calza@dgm-conseil.fr

Tarick DALI: dali@dgm-conseil.fr