

## AIRPOD 2.0

Live a new experience in urban mobility





**MDI Group Team**

«Because ecology must be accessible to all»

Guy NEGRE - Founder of MDI SA

Motor engineer, Guy Nègre worked mainly on increasing power of the engines and on rotary distribution.

He proposed, in the 70s, this mode of operation in light aviation engines and afterward, at the end of the eighties, an engine for formula 1.

Very committed to the human dimension of companies, Guy Nègre was a visionary with meticulous attention to detail and an ingenuity out of the ordinary.

His work brought MDI SA to the forefront of technology through the compressed air engine. His wife, his son, all his family and the MDI SA team are keen to achieve his project: see the compressed air cars cruising the roads very soon.



Motor Development International SA (MDI SA) was created in 1991 by Guy Nègre, with the objective of running vehicles powered with compressed air.

Guy got convinced that it was possible and profitable to develop this technology, because his extensive experiments in Formula 1, light aviation and all his engine work, proved it to him.

For all these years, MDI SA and its team of engineers and application technicians had designed, tested, developed and improved the concept of the compressed-air vehicle, and with it, energy storage.

### **Active supporters and an immense potential market.**

More than 500 shareholders and major players in the automobile and environment industry have been supporting this innovative ecological vision.

The automotive manufacturing company, Tata Motors, has bought the exclusive license for India.

Veolia has entrusted MDI with the design and motorization of its silent and non-polluting urban collection trucks.

Other partners have tested and supported MDI technology and work such as Air-France, KLM, and Eiffage.

In 2018, the first European plant of Air-Mobility will open at Sardinia, Italy. In the meantime, while the company AirVolution is deploying in Australia and New Zealand, other countries are already embracing our concept.

MDI proposes licensing deals to partners and customers, providing the know-how and technology for production and sale of mobility and energy related product, with turnkey factories corresponding to catchment areas.

Thanks to this support during all these years of work and research, despite the death of the founder, the motivation has not weakened and has brought the project to the next level.

### **Rethinking mobility**

The release of the prototype AirPod 2.0, dedicates the culmination of all these efforts and intends to show how it is now possible to consider a different envisage of the relation to the mobility and storage of energy.

Current ecological news impose on us, inhabitants of this planet, a new way of thinking about our energy consumption.

### **A geo-political situation to anticipate.**

The choice of clean cars, mostly electric cars, has been very popular. Plus, their purchase is supported and encouraged by proactive policies. The traction batteries of these vehicle are made of lithium and other rare raw materials.

Europe does not have any mines or rare metal resources. This situation obliges the countries to remain dependent on external producers almost exclusively located in Asia or South America.

Solutions for the total recycling of lithium are just emerging.

The scarcity of the mining supply confers on our concept another remarkable asset.

The tanks used in MDI technology are inert, causing no danger to the environment, whether at extraction of their raw material or for their recycling.

The independence of supply of raw materials will be assured here.

### **Position yourself in front of the choice all electric.**

MDI is registering a growing number of countries that wish to invest and deploy its vehicles and industrial concept.

In the interest of the common good, it is time for the industrialists and leading political players to contribute to enable and deploy this technology.

This document is intended to enlighten you about MDI general technological concept, and for you to discover the AirPod 2.0.

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## ABOUT THE COMPANY

**Because Ecological products must be accessible to all.**

General organization of the company - Values & philosophy / Production concept & business model / Production at the point of sale / Sale at the point of production / Engine technology / Compressed air storage / International partners & United Nations support / Our licenses & licence reservations areas / Multiple & wide ranging applications.

2

## THE AIRPOD PRODUCT

**New urban mobility Xperience.**

Exterior Design / Exterior Details / Interior Design / Media & Interfaces / Customization / AirPod Variations

3

## TECHNICAL ASPECTS

**A vehicle redesigned around lightness.**

Technical sheet & Exterior Dimensions / Body in Composite Materials / Energy & Tanks / Chassis & Undercarriage / More ecologically friendly / Totally clean / Production line / Production of parts on the basis of moulds / Preparation & assembly of the vehicle / Exit from factory into the showroom/ Technology for our times/ Towards a sober future

# 1 ■ ABOUT THE COMPANY

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- International partners & United Nations support
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- Multiple & wide ranging applications

# GENERAL ORGANISATION OF THE COMPANY VALUES & PHILOSOPHY

Skills & activities of group companies.



**MDI SA**  
Ownership & Management of  
Intellectual Property

**17 rue des Bains  
L-1212 Luxembourg  
LUXEMBOURG**



**CQFD AirSolution**  
Research & Development Centre

**4<sup>ème</sup> Avenue  
BP 547  
06516 Carros Cedex  
FRANCE**



**MDI Prod**  
Production unit  
& tooling

**4<sup>ème</sup> Avenue  
BP 547  
06516 Carros Cedex  
FRANCE**

*“Making ecology accessible to all,  
to have a real impact on our planet.”*

## HUMANISM

Humanism is at the heart of the whole MDI process. Each entity of the group is considered on a human scale. The open management permits the liberation of creativity of employees. Furthermore, the manufacturing concept promotes a circular economy with local production for local consumers.

## INNOVATION

Technical simplicity, high technological performance, original products, modes of production and distribution.

The global MDI concept represents a leading technological and economic breakthrough in the world of transport and energy storage.

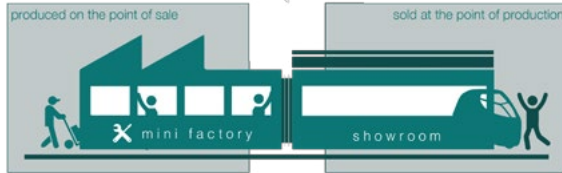
## ECOLOGY

Environmental awareness is only useful if ecological products are affordable to everyone. We can no longer consider ecological products are a luxury since it is a vital need and a compelling economic growth driver.

MDI products meet these imperatives in their production, use, and recycling.

# PRODUCTION CONCEPT & BUSINESS MODEL

Our licensees produce in small units & sell in their local area.



## Business model

MDI SA does not intend to manufacture vehicles but to sell its operating licenses and manufacturing rights to all those who adhere to its economic and ecological concept.

The manufacturing plants will produce these vehicles with our know-how, innovation, support, and developments.



## Multiple advantages of the production concept.

							
universal energy reversible compression	energy independence	small people-oriented factories	flexible manufacturing process with composite materials	local production & distribution	low water consumption	fast recharge	affordable for everyone



## MANUFACTURED AT SELLING LOCATION

### A new industrial era.

The use of composite materials and the development strategy are profitable because MDI has created an innovative production concept. We could call it the «economies of the “de-scale” (miniaturization) where compressed air vehicles are produced in small units, about 5000 m<sup>2</sup> of building for 5,300 vehicles delivered per year.

This concept reduces environmental pollution related to transportation, storage, supply, and distribution.

The vehicles will be eighty per cent manufactured at their point of sale, in local factories employing local labor and then delivered from the factory door.

In a short and fast decision-making chain, customers can tailor their order according to countries adaptation (climate or temperatures) and people preferences (colors, modes of use).

The assembly line of AirPod 2.0



## SELL AT THE PLACE OF PRODUCTION

**From the factory where we manufacture, sell and deliver.**

The manufacturing partners will be able to manage the supply of resources and deliveries to customers.

This disruptive concept permits the reduction of the manufacturing and distribution costs avoiding the expense of parallel production costs in large volumes such as the distribution and transport of finished expensive and polluting vehicles.

Our business model consists in selling operating licenses of a new generation of compressed air engines, with all the tools, and the manufacturing process.

**Delivery takes place at the end of the manufacturing process.**



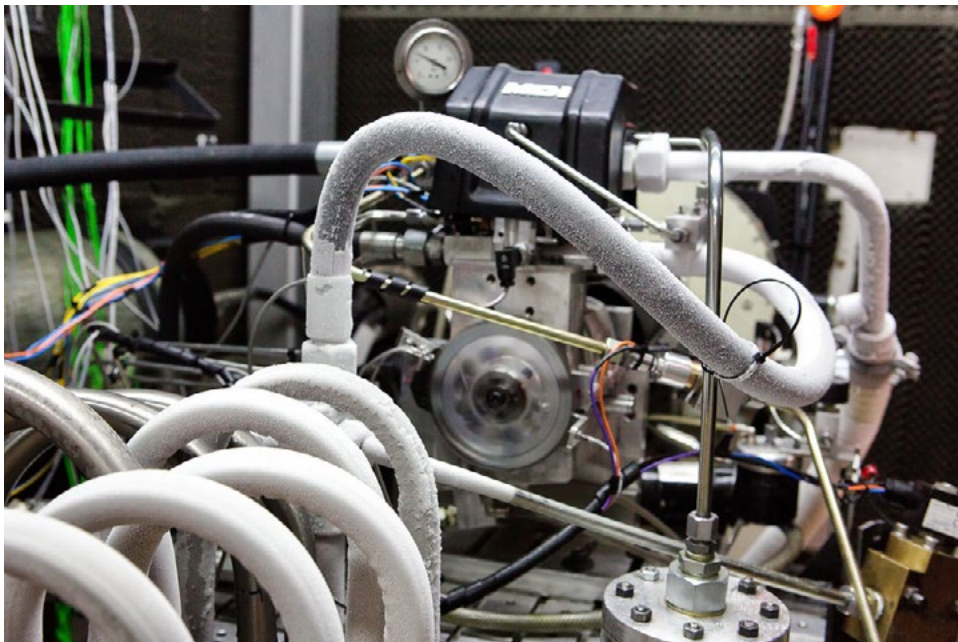
# TECHNOLOGY ENGINE

## Innovative technology for key issues.

Global energy challenges require the choice of new paradigms for energy production and storage. The accumulation of the energy from a primary source, then destocking it with a very good performance return, is the challenge that our concept of compressed air motorization resolves.

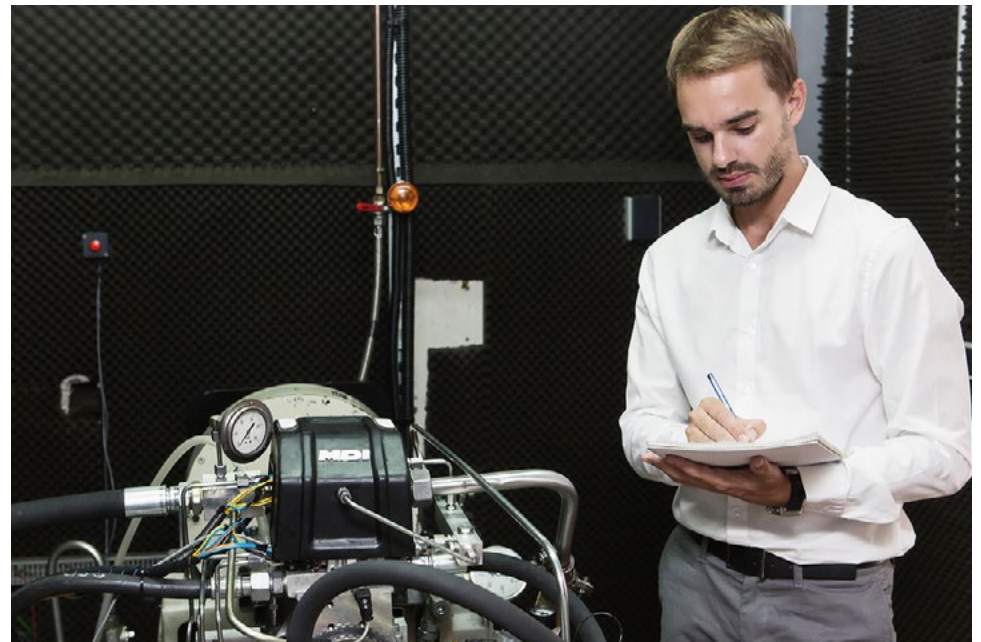
Our high-tech reversible motors compress ambient air in approved tanks of different capacities at a pressure of 248 bars.

The expansion of this stored energy in the form of movement will allow the replacement of all heat engines and will cover a variety of application.



As a result, this procedure will get on with the movement of vehicles or the storage and reuse of electric energy.

Power test on MDI test bench



## COMPRESSED AIR STORAGE

### The air is everywhere.

The Air itself does not contain intrinsic energy. But, when the compression phase starts, as stretching a spring, this air can be expanded on demand.

One of the strengths of this energy storage principle estate that, stored energy will remain available without deterioration. On the contrary, an electric battery loses its charging power and ability to recharge over time.

Each tank has an estimated lifespan of 20,000 theoretical cycles, which consequently, assures a longevity equivalent to that of the vehicle itself. The recycling of these tanks poses no chemical no physical problem.

Our generators are designed to produce from a few kilowatts to megawatts. This potential offers the opportunity of energy storage in large caves or other dedicated storage.

Thus, during the peaks of electricity consumption, our ecological concept of using stored energy will allow a flexible response adapted to the demand, without pollution nor tension in relation with the irregularity of the conventional systems.

Carbon fiber compressed air tank



## INTERNATIONAL PARTNERS

Global industrial partners.



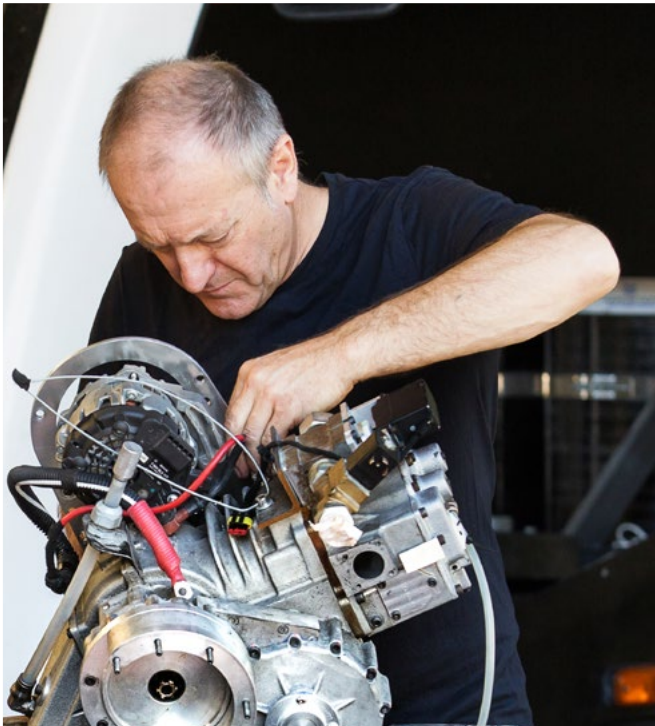
TATA Motors has acquired the exclusive license of the MDI technology, limited to Indian territory. This license covers all possible applications of compressed air engines.



MDI, in collaboration with Veolia, brings its expertise in design and production of vehicles and non-polluting systems.



During the development of the AirPod, KLM conducted a pilot test in its Schiphol airport infrastructure.



# UNITED NATIONS SUPPORT

Technology and the concept of MDI supported by international organizations.



The United Nations have recognized MDI leadership in the sustainable transportation sector at the «Powering the Future We Want» program held in New York on December 2016.



Technology and the concept of MDI are parts of the «Global Goals» of the United Nations for sustainable development.



MDI has been invited by the United Nations to the World Economic Forum Davos 2018



MDI at United Nations “Awards 2016” with Secretary-General Mr. Ban ki Moon



Cyril NEGRE participated in the Sustainable Development Goals Lab conference at Davos World Economic Forum

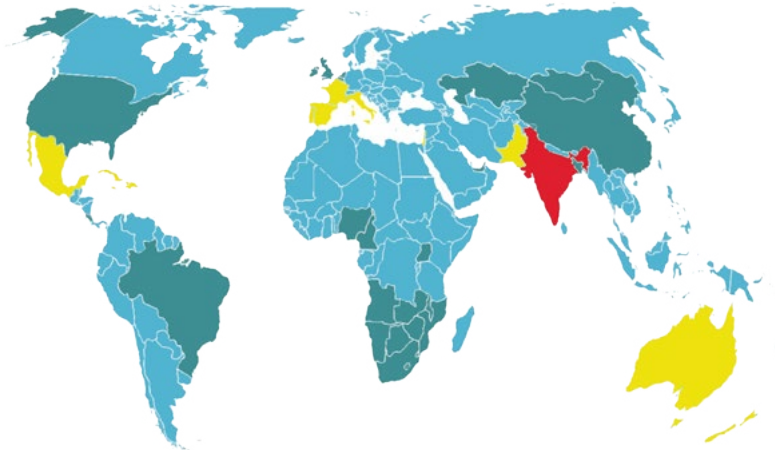
## OUR LICENSES & LICENSE RESERVATION AREAS

### A first factory in Sardinia (Italy).

The Italian company Air Mobility will soon be our first licensee to assemble & sell AirPod 2.0.

Located in Sardinia, Air Mobility will produce 20 vehicles per day. During the last months, several employees of Air Mobility came to MDI Prod factory for training sessions on the making of fiber body parts.

Throughout the world, we are accruing licensing deals for MDI products. Here is the geographical breakdown of these active bookings and those under negotiation.



- No contract established in the country.
- Advanced discussions, but no contract has yet been signed.
- Some licenses already retained in the country.
- No licenses available in the country.



The Sardinian factory before equipment.



Paint booth in Sardinia.



Personnel from Air Mobility in training at MDI Prod factory.

# MULTIPLE APPLICATIONS & RANGE OF APPLICATIONS

## Innovative technology for key issues.

Our technology not only enables the motorization of a variety of modes of transportation but also the production of energy outside of the usual power networks.

This concept offers the opportunity of storage of energy resources with compressed air.

When destocking, the expansion of the gases gives back the energy and allows the production of fresh air.



AIRPOD 2.0 & CARGO



AIRONE & AIRCROSSONE



AIRPOWER



AIRWALL



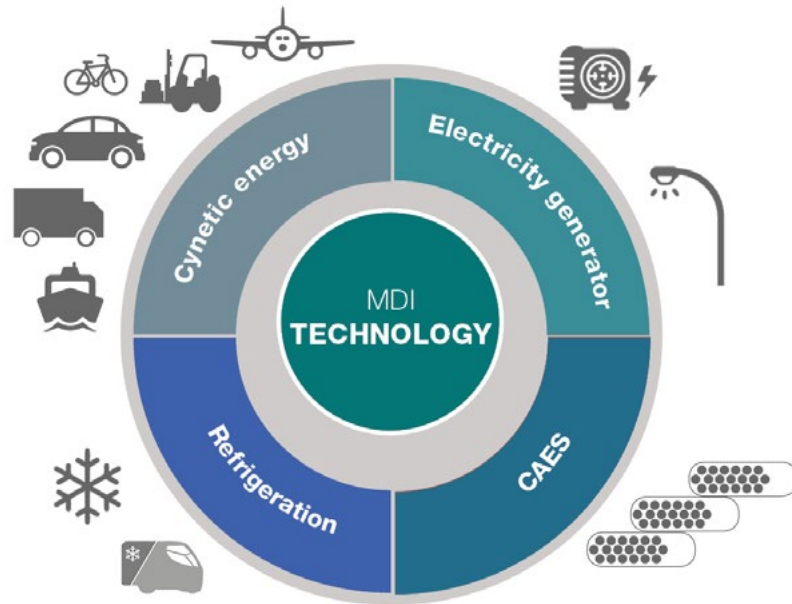
AIRLIGHT



AIRBIKE



AIRSTREAM





# 2 | THE AIRPOD PRODUCT

New urban mobility Xperience.

- Exterior Design
- Exterior Details
- Interior Design
- Media & Interfaces
- Customization
- AirPod Variations

# EXTERIOR DESIGN

Live a new experience in urban mobility.

With our disruptive high tech compressed air-based engine, the AirPod 2.0 reaches a maximum speed of 80km/h for a range of about 100 km.

Comfortably conditioned for two people, the AirPod 2.0 offers you the best solution for your daily transportation and our environment.

## Lightness and Manageability



2 seats



300 kg



80 km/h ou  
45 km/h unlicensed



500 l



100-120 km  
300-360 km dual energy

2.13m, an optimal size to sneak into the city



## EXTERIOR DETAILS

### Purity of shape

Adopting the shape of a drop of water, the AirPod 2.0 slips on the road as it sneaks into town. Its design, both sought-after and sophisticated, bet on modernity and simplicity.



# INTERIOR DESIGN

## An embracing experience

Sense of security, well-being & practicality are the key concepts used in the creation of the cabin. As in space design, the interior layout creates a unique atmosphere close to the present stylistic codes in the habitat.

The wide front opening allows easy access to the vehicle. The AirPod benefits from a panoramic windshield and a sidewalk glass. Its elevated driving position makes it possible to dominate urban traffic while conferring a vision at 180 °.

Original & comfortable interior space



# MEDIA & INTERFACES

## Intuitive

The first contact from which the driver feels his vehicle is through the steering wheel. Whether in terms of ergonomics, touch or readability information, this first impression must be perfect.

The AirPod 2.0 counts with two separate control devices: the steering wheel and its centerpiece. In this way, the user can centralize the driving information. The range, the engine speed, and the road speed appear at the first glance. Air conditioning, sound system & all other elements of comfort are positioned in the second axis of readability within the steering wheel.

## Connect

A vehicle has to meet the expectations of the market which it covets. Technology is an integral part of our lives.

It is therefore essential the integration of Bluetooth connection for any smartphone and additionally a USB port for charging distinct types of connected devices.

### Readability at first glance



# CUSTOMIZATION

## Colors & Trims

The standard AirPod 2.0 is customizable according to the buyer wishes.

Customization intentions for the choice of model, engine, and colors are recorded when ordering.

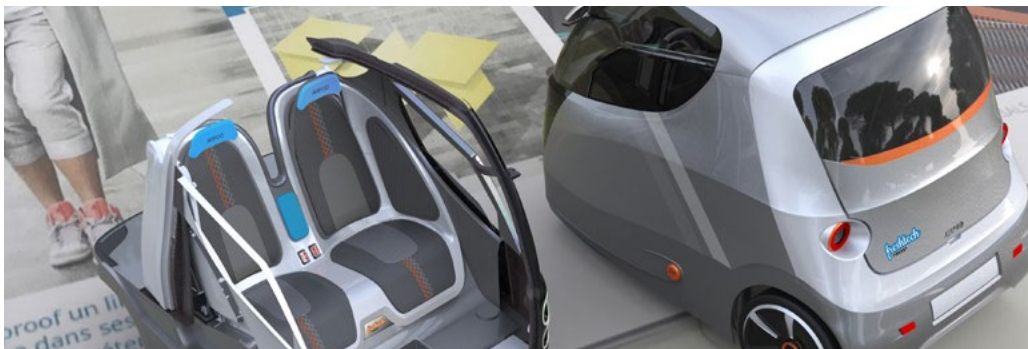
colors combinaisons 



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## AIRPOD VARIATIONS

### Pick your model

When manufacturing their vehicle, the buyers can tailor their AirPod 2.0 into three variants: standard, pickup, and cargo

### Multi-clients.

The buyer will direct his or her choice intended to cover any need from professional use to daily activities.

There will be different types of urban usage for these clean vehicles. The individual will use it every day.

Companies will be able to equip their fleets. Car sharing will also be concerned.



# 3 ■ TECHNICAL ASPECTS

A vehicle redesigned around lightness.

- Technical datasheet & external dimensions
- Body made of composite materials
- Energy & tanks
- Chassis & undercarriage
- Even more ecological
- Totally clean
- Easy charging both outside and from your home
- Air station
- Production line
- Production of parts based on molds
- Preparation & assembly of the vehicle
- Exit from the factory in the showroom
- The technology for our times
- Towards a sober future



# TECHNICAL DATASHEET & EXTERNAL DIMENSIONS

## Engine

Engine type	Reversible compressed air engine, one cylinder included active chamber, variable valve timing, crankcase and head in aluminium.
Cylindrée	430 cm <sup>3</sup>
Max. power - @ rpm	10.2 cv (7 kW)- 1500 tr/min
Max. torque - @ rpm	from 250 to 1500 rpm

## Transmission

Transmission type	Transmission to rear wheels through Gearbox with an electronic management of a kinetic energy recover during deceleration phases
Gearbox	Automatic gearbox with paddle behind the steering wheel

## Frame / steering

Frame and structure	Technical basement (composites sandwich glass fibre / polyurethane foam) integrating 35 functions (i.e. seats structure)
Vehicle type	Light quadricycle (L7e)
Number of passengers	2 seats (facing the road)
Direction	With mechanical reduction
Brakes	4 discs brake
Rims	Av: 2.5 x 10 Ar: 15 x 3.5 Aluminium
Tires	Av: 3.00 x10 Ar: 135/65 x 15

## Energy tank

Type	Type IV, thermoplastic liner and carbon fibre wiring
Volume/Pressure	2 x 125 litres / 248b
Based on EC norm	ECE R 110

## Weight

Kerb weight	280 kg
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## Performances

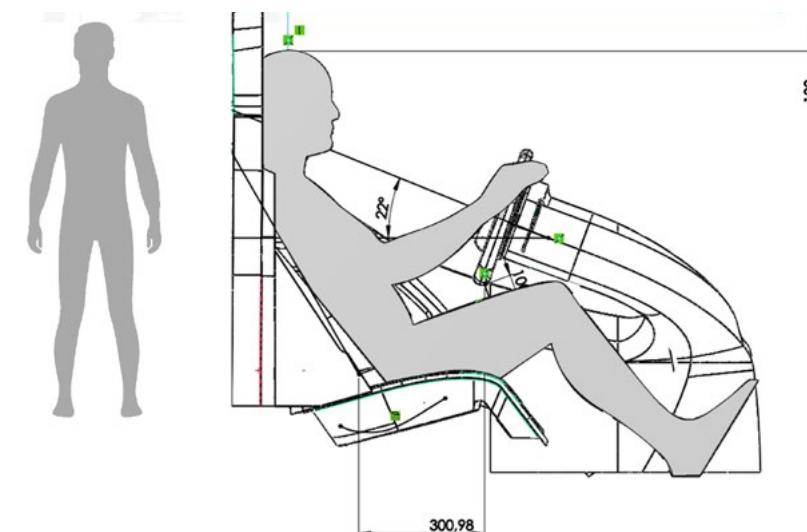
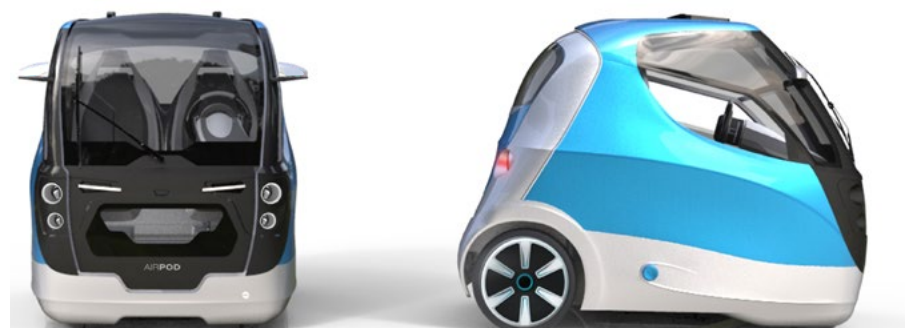
Max speed	80 km/h
Urban cycle range	100 – 120 km
Urban cycle range (dual energy)	300 – 360 km

Length 2130mm

Width 1500mm

Height 1710mm

Wheelbase 1490mm



# BODY MADE OF COMPOSITE MATERIALS

## Composite technology.

For efficiency and manufacturing purposes, conventional automobile industries produce heavy vehicles based on the assembly of heavy materials such as steel or aluminum, and a variety of sub-components .

The construction strategy that we are undertaking is different from that of the main car manufacturers. Based on an Innovative Production Concept, the construction strategy allows the use of high-tech materials derived from the Formula 1.

MDI builds lightweight vehicles made of «composite» materials which were reserved till now for very sophisticated vehicles produced in small quantities like Ferrari, Lamborghini or McLaren.

This composite material is an assembly of several components that do not mix (fiberglass, vegetable resin, foam polyurethane, all immiscible but having a solid bonding capacity) and whose properties complement each other.

The new, constituted heterogeneous composite material presents features which the components alone do not have.

This selection improves the quality of the material: lightness, rigidity, resistance to stress, fractures and thermal amplitudes, resistance to twisting and compression, shocks and vibrations absorption, sound insulation.

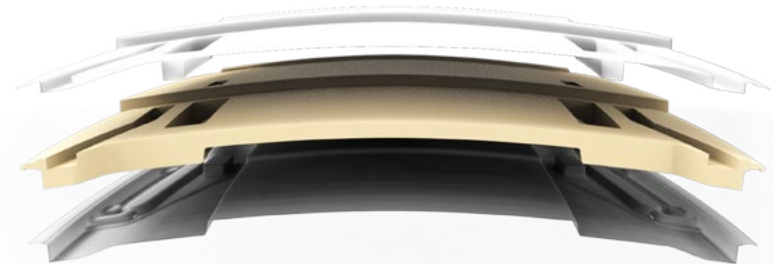
For perfecting the ecological footprint of our products, the assembly is optimized by using flax fiber. Particularly resistant and aesthetic, this material makes it possible to define our project in a circular economy trend since the flax fiber we are currently using is a by-product not highly valued.

## Characteristics of the material

Fiberglass or vegetable (linen type): 3 mm

Polyurethane foam: 20 mm

Fiberglass or vegetable (linen type): 3 mm



# ENERGY & TANKS

## A reliable ecological concept, safe and natural.

The AirPod 2.0 is designed to reach a range of 100 km to 120 km in mono-energy, running with compressed air and rejecting only cold air. Storage of compressed air into a carbon fiber tank is carried out under a pressure of use of 248 bars.

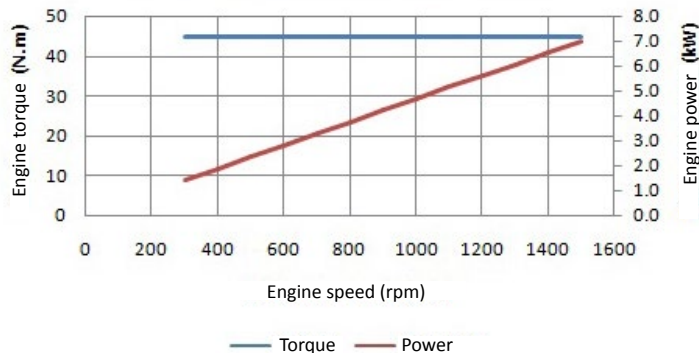
To reach 300 to 360 km with a full of compressed air we can run the engine on its dual energy alternative.

Autonomy of the vehicle increases by means of a burner that heats the air outside the engine.

With the alternative of fuel consumption, bioethanol or any other fuel hydrocarbon content, the air expansion will multiply by three the autonomy of the vehicle with a consumption of 0.5 l per 100 km.

As a hot-air balloon effect, and a gas stove in continuous combustion, this air heating is carried out at 600 ° with a virtually zero amount of dangerous emissions of nitrogen oxides (NOX) and unburned hydrocarbons (HC).

The very high technology management of the expansion of the air allows MDI engines to achieve real yields of up to 68 % between the tank and the engine output.



By way of comparison, conventional thermal vehicles have a yield of around 10 % in the urban cycle.

Our technology can adapt to all needs currently served by thermal engines of all sizes and all uses.

This solution is both very economical and very ecological.



## CHASSIS & UNDERCARRIAGE

### Innovative technology for key issues.

Our engineers worked on an integrated 3D designed chassis. We use each form of the materials for multiple uses, in and out of the cabin. In the chassis of the AirPod 2.0, the pedal block will fit in dwellings already molded for this purpose.

Other seat molding shapes will serve as a passage for electrical wirework. Another small recess cut into the structural shape houses the lock closing the door. This concept of integration of functions is declined on all the components of the vehicle.

As a result, by using fewer materials, the vehicle saves outstanding space and has a much lighter but rigid and resistant structure than a classic assembly of different pieces and several fasteners. This lighter body increases the energy efficiency of the vehicle and decreases its consumption.

The AirPod 2.0 has a running gear equipped with a classic double triangulation. The front wheels are only just visible under the skirt of the vehicle but easily accessible for changing tires.



## EVEN MORE ECOLOGICAL

### Linen fiber body.

MDI is working with Van Robaeys to create bodywork loaded with linen fibers. From motorization to external parts, the AirPod is part of sustainable development: an eco-designed lifecycle from manufacturing to recycling.



Flax harvest on the French territory

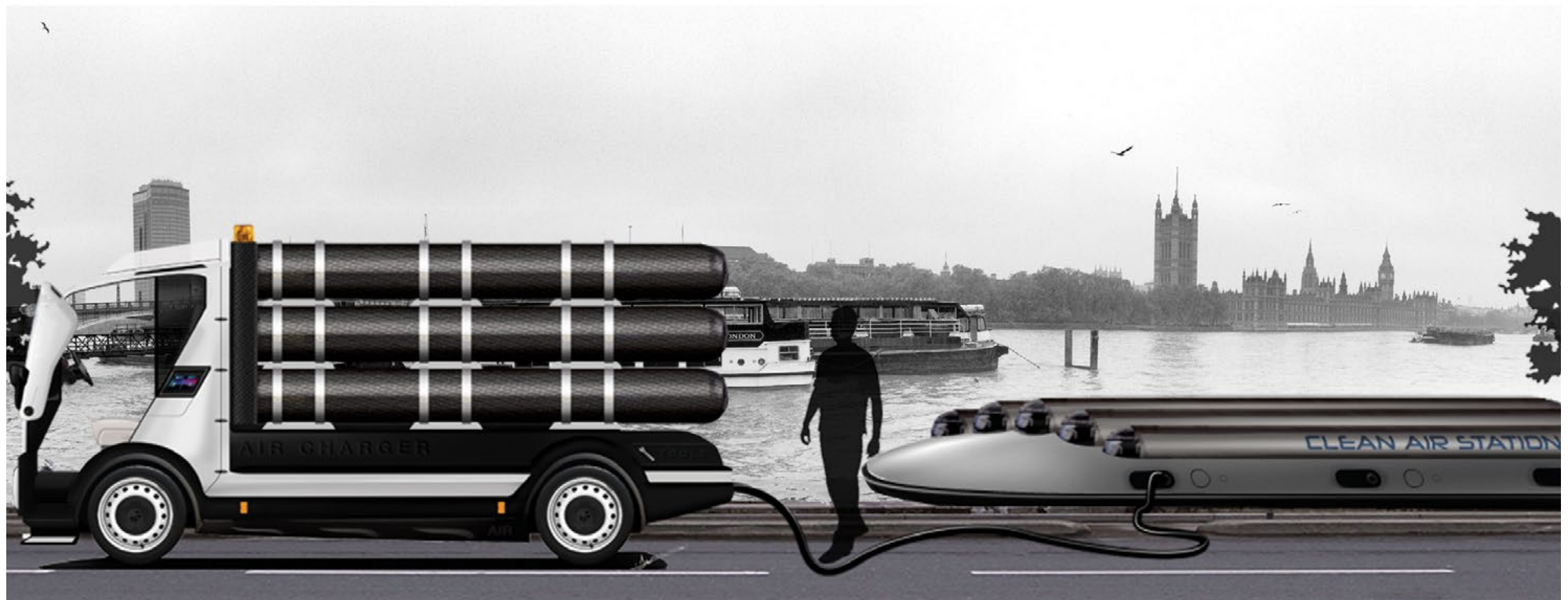


## TOTALLY CLEAN

### A recharge thanks to renewable energy.

Thanks to the flexibility of energy storage in the form of compressed air, MDI has adapted totally clean, economic refueling solutions to its vehicles by using renewable energies.

Optimize the use of clean energies



## EASY CHARGING BOTH OUTSIDE AND FROM YOUR HOME

**A connection to existing electrical terminals.**

Some alternatives to recharge MDI vehicles are, at home from an electric plug of 16 or 32 amps for 7h or 3h30, or in town on the terminals for electric charging.



Recharge in 3h30 on electricity network



# AIR STATION

## Fast charging on air station.

Customers of MDI vehicles will be able to fill the tank of their vehicle at the air station supplying high pressure compressed air to fill the tanks in 2 minutes.

Rechargeable in 2 minutes



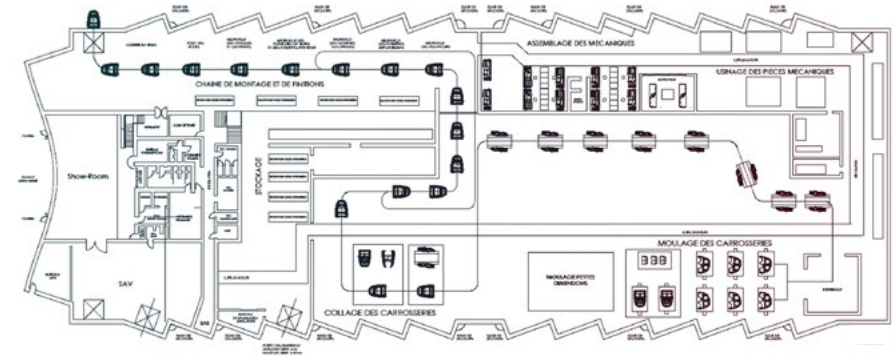


# PRODUCTION LINE

## A simple assembly line.

The assembly line of the AirPod can be installed in a directly dedicated building, or in a brownfield in rehabilitation. In process «u» or any other process, manufacturing requires robots for the paint line and CNC machines.

Following the manufacturing principles of Formula 1, many components of the AirPod 2.0 are fabricated manually.



AirPod 2.0 assembly line



## PRODUCTION OF PARTS BASED ON MOLDS

### **The transmission of MDI's know-how to its licensees.**

For its licensees, MDI Prod is responsible for the production and testing of the molds for manufacturing of vehicle parts.

The employees of the various factories spread around the world will train at Carros for the production procedures issued from our know-how.

They will have to set up the molds, add the foams and fibers. Afterward to obtain the composite material, they will inject the resin into the molds until filled. While drying the resin will fix the different parts.

Loading of body panels by hand



## PREPARATION & ASSEMBLY OF THE VEHICLE

### A glued body

The design of the AirPod 2.0 follows the manufacturing principles of Formula 1.

The different body parts are assembled by gluing, just as the airplane wings. This process gives the body parts both the desired lightness and aeronautical quality resistance.

Installation of the body elements on the shaper



## EXIT FROM THE FACTORY IN THE SHOWROOM

### A customer relationship closer to the production

To avoid the costs incurred by the stocks of finished products, as soon as the vehicle is finished, the customer will be invited to pick it up directly at the production site.

In the first stages of operation, as long as our network of small mechanics for maintenance is not yet duly constituted & expanded, the after-sales service will be ensured directly on the production site.

Presentation of the AirPod 2.0 in the showroom



## THE TECHNOLOGY FOR OUR TIMES

**A vehicle as a new art of living.**

The relationship to mobility is changing and will continue to change.

Inspired by the "Igen" spirit, emerging generations expect a simple-use vehicle, practical on a daily basis, easy to park, easy to handle and even shareable.



## TOWARDS A SOBER FUTURE

### **Adaptation to economic constraints.**

The economic constraints and their perception are changing for most social classes. It is better to avoid investing substantial amounts of capital into a heavy and greedy car.

For both purchase and use, the compressed air vehicle combines economic sensibility with everyday practicality.

*Let's ride the light spirit.*



**AIRPOD 2.0**  
the new urban mobility Xperience

## ECONOMIC AND ECOLOGICAL ISSUES, AN INNOVATIVE PROJECT

**A team of passionate people invested in the future.**

The relationship to mobility is changing and will continue evolving.

The research and development center of CQFD Air Solution and the manufacturing and machining workshop of MDI Prod combine multiple skills and know-how. From design to engine assembly and engineering of mechanical systems, everyone is driven by a common idea.

The idea of an energetically different future combined with new products and a mobility system in tune with the economic and ecological challenges of the 21st century.





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