20 SEPTEMBER 2019

MISSION H24

SPA - FRANCORCHAMPS

FIRST RACE MEETING ENTRY
FIRST HYDROGEN REFUELLING IN A RACE MEETING EVER

A MISSION, A STATION AND ANOTHER FIRST!

PIERRE FILLON

Last September when we launched MissionH24 to promote the use of hydrogen in motor racing, we humbly drew an analogy with the early days of space exploration, which also used hydrogen. Our project is progressing step by step, in much the same way as discovering a new planet.

As pioneers of new technology, we are proceeding in stages, gradually introducing hydrogen to racing. By 2024, the 24 Hours of Le Mans will have a class for hydrogen-powered cars whose sole emission is water vapour. To help safeguard the future of this planet, our ultimate goal is for zero-emission transport to become the norm.

A year after the first demonstration lap, MissionH24 is back at Spa-Francorchamps to present the updated version of the hydrogen-electric prototype, the LMPH2G, under development by H24Racing.

This year, the car will take to the track with the field during the Michelin Le Mans Cup pre-race sessions. Total has designed and produced a mobile hydrogen fuel station especially for the LMPH2G. A world first!

Current political, economic and environmental circumstances render an alternative to fossil fuels a necessity. The small steps made by MissionH24 in the past year thanks to incredible teamwork from the ACO, GreenGT and Total will soon become a giant leap.

President of the ACO
Co-President of MissionH24

CHRISTOPHE RICARD

On Saturday 22 September 2018, GreenGT introduced the world to the LMPH2G at Spa-Francorchamps. The demonstration marked the launch of the MissionH24 programme, a joint venture between GreenGT and the Automobile Club de l'Ouest. On the drawing board only a few months prior, the laboratory prototype, in the expert hands of Yannick Delmas, was put through its paces on a major circuit.

A year later almost to the day, here we are back at Spa-Francorchamps. The LMPH2G is no longer in the initial test phase; it is now under development as a racing machine. Sporting the H24Racing team colours, the car will be taking part in a competitive meet for the first time. We are restricting participation to the practice sessions to gain experience in race conditions, in a field of seasoned teams.

The venue for this experiment is significant: Spa-Francorchamps is one of the most admired and most daunting circuits in the world. This is a new milestone in the MissionH24 programme. The research and development stage is not over, but the sporting endeavour has already begun.

Those involved in this trail-blazing adventure in hydrogen-electric propulsion are conscious that by entering the racing fray, we are venturing into uncharted territory. To the ACO, it's a new way to race. To GreenGT, it's a technological challenge. To Total, our partner, it's a new fuel. To all, it is the way forward. Together we are making history.

President of GreenGT
Co-President of MissionH24

WHAT IS MISSIONH24 ?

Mission H24 aims to introduce hydrogen-powered racing cars to the 24 Hours of Le Mans in 2024, when a special hydrogen class will be created for a zero-emission race. An array of technologies have been launched and tested at Le Mans over the years. This latest challenge seeks to speed up research and development around this new fuel type, with the ultimate aim of taking it from track to the road to achieve zero-carbon mobility.
The ACO has always been driven by its love of racing but the organiser of the 24 Hours of Le Mans never loses sight of its responsibilities. Hydrogen is a public-interest choice: it is a global challenge that addresses some of the major issues of our time, such as urban air pollution and the need to find new sources of fuel to replace conventional hydrocarbons.

Mission H24 is not unlike the Apollo programme launched in the United States in 1961 and which, after a series of test flights, achieved its goal of putting men on the moon in 1969. Similarly, there will be several milestones to reach before hydrogen-powered cars can race at the 24 Hours of Le Mans in 2024. Mission H24 will be officially launched at Spa Francorchamps, the setting for the fifth round of the 2018 ELMS (European Le Mans Series) on 22 September. Introducing hydrogen to the race track is a real challenge – but a tangible and realistic one as the technologies already exist. Mission H24 will help develop less expensive, more effective solutions to sustainable power sources. This project is the first, determined step towards sustainable, responsible zero-carbon mobility. Hydrogen unlocks multi-mobility potential as the technology suits every kind of journey, long or short, by car, bus or truck, or even by train, boat or plane.

After successfully enabling technologies such as front-wheel drive, disc brakes, direct injection, the gas turbine engine, the rotary engine, the turbo, and diesel and hybrid power, the ACO is now committed to hydrogen- powered mobility with Le Mans 2024 its target. We would be delighted if you would join us on this journey.

MISSION H24

PRÉSIDENCE

Pierre Fillon
(Président ACO)
Co-Président

Christophe Ricard
(Président GreenGT)
Co-Président

Comité Stratégique

PF/CR/BN/JMB – Réunions trimestrielles

- Choisir les orientations stratégiques
- Définir les objectifs dont programmes sportifs
- Arbitrer, et en particulier les ressources et affectations financières

PÔLE INNOVATION MISSION H24

Bernard Niclot: DIRECTEUR INNOVATION

Missions
- Etablir les règlements techniques et sportifs 2021-2022
- Définition technique et sportive Garage 56 2023
- Définir les standards d'homologation et sécurité des prototypes de compétition
- Formuler les CDC techniques pour appels d'offre fournisseurs et partenaires techniques
- Garantir les infrastructures de ravitaillement

PÔLE OPERATIONS MISSION H24

Jean-Michel Bouresche : DIRECTEUR OPERATIONS

Missions :
- Rechercher sponsors et partenaires techniques Mission H24
- Organiser communication et Relations Publiques MissionH24 et H24Racing
- Exercer la Direction Générale de l'écurie H24Racing
- Analyser les performances du prototype LMPH2G
- Etablir les budgets et contrôler les finances

Comité de Pilotage

BN/JMB/VB/HL/CC/OLG/FG/HG– Réunions mensuelles

- Partager les informations
- Mettre en œuvre les objectifs définis
- Contrôler leur exécution

Règlements technique et sportif 2021-2022
Vincent Beaumesnil
Bernard Niclot

Garage 56 2023
Bernard Niclot
Vincent Beaumesnil

Homologation et sécurité
Thierry Bouvet
Bernard Niclot

CDC techniques Appels d'offre et partenariat 2021-2022
Bernard Niclot
Thierry Bouvet

Infrastructure Ravitaillement 2019-2022
Hugues Lardy
Bernard Niclot

Performance Prototypes
Hugues Lardy (GGT)

Marketing
Heike Grünwald (ACO)
Jean-Michel Bouresche (GGT)
Responsables Marketing

Communication & Relations Publiques
Carole Capitaine (ACO)
François Granet (GGT)
Responsables Communication

Image de marque et Création publicitaire
Charles Guénant
Responsable de la Création

Ecurie H24 Racing
Jean-Michel Bouresche
Team Principal

Administration, Gestion projet Mission H24
Olivier le Gac
Secrétaire Général Mission H24

LMPH2G

400m D.A
11,0 sec

0-100Km/h
3,4 sec

+300
Km/h

480 kW
@13000 tr/min

Aucune pollution : ne rejette que de la vapeur d'eau
No pollution: emits only water vapour

Pas d'embrayage, de différentiel ou de changement de vitesse
No clutch, no differential, no gear shifting

Ravitaillement complet en 3 min
Complete refuelling in 3 min

Autonomie identique à un moteur à combustion interne
Same autonomy as an internal combustion car

Système de récupération d'énergie au freinage
Braking energy recovering

MICHELIN
Pilot Sport GT
31/71-18
(jante 13X18)

MICHELIN
Pilot Sport GT
30/68-18
(jante 12X18)

740 mm | 2970 mm | 1000 mm

DIMENSIONS (L x l x h) 4 710 mm x 1 970 mm x 1 070 mm

MODULE ÉNERGÉTIQUE ÉLECTRIQUE-HYDROGÈNE GREENGT : 4 MOTEURS ÉLECTRIQUES DE COURSE + 1 PILE À COMBUSTIBLE H2
GREENGT ELECTRIC-HYDROGEN ENERGY MODULE: 4 ELECTRIC RACING ENGINES + 1 H2 FUEL CELL

MOTEUR *ENGINE*
- 4 moteurs électriques de course *4 electric racing engines*
- Puissance max. : 480 kW à 13000 tr/mn (653 ch)
Maximum power: 480 kW @ 13000 rpm (653 bhp)

CHÂSSIS *CHASSIS*
- Châssis LMP en carbone et structure d'acier *LMP carbon chassis plus steel structure*
- Freins en carbone *Carbon brakes*
- Suspensions av. et ar. à triangles et poussoirs
Front and rear wishbone suspension and push rod

TRANSMISSION *TRANSMISSION*
- Transmission directe aux roues arrière (ratio 1:6,3)
Direct drive to rear wheels (ratio: 1:6.3)
- Système électronique de gestion variable du couple GreenGT *GreenGT variable torque vectoring system*

PRODUCTION D'ÉNERGIE *ENERGY PRODUCTION*
- pile à combustible à membrane électrolyte polymère à de 250 kW constants *Fuel cell with polymer electrolyte membrane of 250 constant kW*
- 4 stacks *4 stacks*

SYSTÈME DE RÉCUPÉRATION D'ÉNERGIE AU FREINAGE
ENERGY RECOVERY SYSTEM UNDER BRAKING
- batterie de 750 V en nominal *Battery 750 V nominal*
- capacité de 2,4 kWh *Capacity: 2.4 kWh*
- 250 kW délivrés pendant 20 s *250 kW transmitted for 20 s*

STOCKAGE DE L'HYDROGÈNE
HYDROGEN STORAGE
- capacité de réservoir : 8,6 kg *Fuel tank capacity: 8.6 kg*
- Pression de stockage : 700 bars *Storage pressure: 700 bars*

POIDS (VERSION DE ROUTE) *WEIGHT (STREET VERSION)*
- 1420 kg en ordre de marche *1420 kg in running order*
- répartition des masses: av. 39,8% / ar. 60,2 %
weight distribution: front 39,8% / rear 60,2%
- Variation du poids au ravitaillement : + 8,6 kg
weight variation during refuelling: + 8.6 kg

PERFORMANCES *PERFORMANCES*
- vitesse maximale : 300 km/h *max speed 300 km/h*
- 0 à 100 km/h : 3,4 s *0 to 100 km/h: 3.4 seconds*
- 0 à 400 m : 11 s *0 to 400 m: 11 seconds*

FROM SPA 2018 TO SPA 2019

MissionH24, a joint venture between the ACO and GreenGT, was launched on 22 September 2018 at Spa-Francorchamps with the aim of promoting the use of hydrogen in motor racing and, ultimately, to introduce a category for hydrogen-powered cars at the 24 Hours of Le Mans in 2024. The first step was to prove that hydrogen is safe, simple and promising. Four-time Le Mans winner Yannick Dalmas had the honour of introducing the world to the LMPH2G in a demonstration lap at the Belgian round of the European Le Mans Series (ELMS).

Pierre-Gautier Caloni of Total Sponsoring & Competition witnessed the scene: "*Once again, the racing world serves as a superb testing ground to develop and boost the technology and the energy of the future and their applications.*"

FIA WEC and ELMS General Manager Gérard Neveu commented: "*We are delighted and very proud that Spa and the ELMS will serve as the launchpad for MissionH24 and a testbed for the hydrogen-powered racing car. The European Le Mans Series, a competition set up by the ACO, is part of the international endurance scene and is underpinned by the ACO's beliefs. We believe in hydrogen.*"

Nathalie Maillet, Managing Director of the Spa-Francorchamps circuit: "*We're honoured that Spa is the venue for this world première. We were eager to see the demonstration of a hydrogen racing car. It's great that Spa is the launch pad for MissionH24.*"

A year has gone by since then. MissionH24 has progressed, step by step. Thanks to H24Racing, the LMPH2G has moved from the design stage to the testing stage, gradually becoming a car capable of racing with the best. The hydrogen-electric prototype was part of the opening ceremony at the 2019 24 Hours of Le Mans, taking the opportunity to complete a lap before the field was released.

On 20 September at Spa-Francorchamps, the LMPH2G will be back on track to vaunt its progress, this time in race conditions, as a participant in the two practice sessions of the Michelin Le Mans Cup. ELMS spectators will have the privilege of witnessing the prototype enter the fray for the first time.

The LMPH2G will refuel at the world's first mobile hydrogen filling station, designed for the racetrack by MissionH24 partner Total. A world first!

Nathalie Maillet, Managing Director of the Spa-Francorchamps circuit: "*We are flattered to be celebrating the first anniversary of MissionH24 with the ACO and GreenGT. A year ago, the ELMS 4 Hours of Spa-Francorchamps was chosen as the backdrop for the project launch and we were delighted to welcome the LMPH2G to our circuit for its first demonstration lap. This is a long-term project and we are pleased to play host to the car once again, this time for its first time on the track among competitors, during the Michelin Le Mans Cup pre-race sessions. The first anniversary of the launch also sees another premiere: the LMPH2G will refuel at the world's first mobile hydrogen filling station, designed by Total especially for racing. We are honoured that it is happening here at Spa. I must admit we are proud to have been chosen and would like to thank the ACO for coming back to us with the updated project. Our circuit has a leafy setting and our research and development efforts are particularly focused on green, environmentally friendly technology. With this hydrogen project, we are breaking new ground and therefore have to anticipate situations and think hard about how best to adapt to conditions, especially where safety is concerned.*"

On Friday 20 September 2019, drivers Olivier Lombard and Norman Nato and the team from Total will be adding a new chapter to the tale of MissionH24.

MAKING THE GRADE

How do you go about introducing a new prototype, using new technology to employ a new fuel to a field of hardened competitors? H24Racing, the FIA, the ACO, and in particular hydrogen project manager Bernard Niclot, have set themselves that very task. The aim of the exercise is for the demonstration machine-turned-racing prototype, to be acknowledged as such and be accepted in competition. Testing behind closed doors or alone on track is one thing; racing with a field of competitors is quite another. Before the project could progress to the competition stage, there were a few hurdles to clear, in particular safety requirements to be met. The FIA has recently rubber-stamped the vital documentation, the key to the track.

H24Racing chose the Michelin Le Mans Cup as the backdrop for the LMPH2G's introduction to the racing environment. The competition is for FIA-spec GT3 sportscars and LMP3 prototypes run according to ACO LMP3 rules. Eager to promote technological progress, along the same lines as the Garage 56 slot at the 24 Hours of Le Mans, the Michelin Le Mans Cup committee reserves the right to invite a team fielding an innovative vehicle. The criteria are as follows:

• The car must have been designed as part of an innovative project, as judged by the Selection Committee.
• The ACO obtains guarantees regarding the car's safety, performance and reliability and any other criteria deemed necessary.
• The car is not classified.
• Compliance with the competition's Sporting Regulations (entry, driving times, qualifying times etc.). Depending on the car's technical specifications, the ACO may waive certain requirements, e.g. refuelling procedure. (Art 3.2.4)

To obtain FIA authorisation, the LMPH2G has recently undergone and passed several crash tests, assessments and inspections and is now in possession of the required documents. The hydrogen-electric prototype will take to the track on Friday 20 September for the practice sessions of the Michelin Le Mans Cup at Spa-Francorchamps.

Olivier Lombard and Norman Nato share the driving duties. "*We've been working towards this for a year now. We meet all FIA standard requirements and the crash criteria were adapted to take account of the weight of the car,*" says Bernard Niclot. "*We worked closely with the FIA to ensure we fulfilled all criteria. We performed post-crash tests on the hydrogen tanks to ensure they stayed in place on impact and that there were no leaks. We tested crashes at a standstill and in movement and we carried out the same battery deceleration test as the LMP1 hybrids and Formula E cars. We comply with FIA safety standards and with the rules that apply to hydrogen production cars (GTR13). The tanks we use are road legal. ENSOP, the fire fighters training school in Aix en Provence – a leading light in responding to hydrogen risks – provided valuable information on response to fires and we drew on the experience of ACO and SDIS 72 staff to draft the track intervention procedures. Being able to rely on a partner like Total for the refuelling station is also a hallmark of quality. We are pioneers in introducing hydrogen to the racetrack and are therefore helping to shape procedures for the future.*"

Now, more than ever, racing is driving progress.

THE H24RACING TEAM

H24Racing was founded in the spring of 2019 when the time came for the GreenGT engineers to hand over the LMPH2G to be developed as a racing prototype.

Based in Signes, near the Circuit Paul Ricard in the south of France, the team of young engineers and mechanics headed by Jean-Michel Bouresche also comprises experts in state-of-the-art racing technology.

H24Racing set to work on the LMPH2G straight away with private tests on European circuits offering a variety of surfaces, weather conditions and grip. The programme proceeds in stages, gradually improving the key elements of a racing car's performance: aerodynamics, mechanical efficiency, weight, balance etc.

At Spa, test driver Olivier Lombard, the man who boasts the most kilometres at the wheel of a high-performance hydrogen-electric prototype, will share driving duties with the incredibly fast Norman Nato, currently racing in Formula E with Venturi and in the WEC with Rebellion Racing.

H24 Racing:
Team Principal: Jean-Michel Bouresche
Technical Coordinator: Hugues Lardy
Team Manager: Pierre-Lou Fleury
Logistics: Isabelle Le Gac
Admin and Accounts: Olivier Le Gac
Communication: François Granet, Charles Guénant

MOBILE HYDROGEN FILLING STATION BY TOTAL

Total has been working alongside the ACO since 2018 as fuel supplier to the World Endurance Championship, and the European and Asian Le Mans Series. It was therefore only natural for the energy supplier to get involved in MissionH24. The technological and sporting aims of the programme are perfectly aligned with Total's strategy and commitment to a sustainable future and responsible energy. This partnership has also given Total the opportunity to break new ground in designing and developing safe, efficient modular hydrogen filling systems.

To meet the needs of the MissionH24 programme and the LMPH2G's introduction into a race environment, Total has developed the world's first mobile hydrogen station. This station will refuel the prototype with hydrogen, safely and reliably. The H24Racing team will therefore be able to transport it from circuit to circuit, whenever the car undergoes private testing or races at tracks that are yet to install hydrogen refuelling facilities.

Like all hydrogen filling stations, the mobile system developed by Total consists of three main components: a compressor, two intermediate reservoirs and a distribution device connected to the vehicle. The compressor increases the hydrogen pressure to 450 bar. It is then stored in buffers (intermediate reservoirs) and injected into the car's tanks at 350 bar (the pressure drop from 450 to 350 bar enables filling).

The hydrogen refilling operation is similar to a tradition fuel top-up. The only difference is that the nozzle is locked on to the vehicle so that the operation can be completed under pressure (the same as on a production vehicle). Once the required amount of hydrogen has been transferred, the valve is uncoupled and the fuel hose hung up.

While conventional fuel is stored at filling stations in underground tanks, the hydrogen supplied to the station is delivered in a rack containing a set of cylinders installed upstream.

The Michelin Le Mans Cup meeting at Spa-Francorchamps is the perfect testing ground for Total to trial its mobile hydrogen filling station for the first time in an actual racing context. The LMPH2G will take part in both free practice sessions, stopping to refuel at the mobile station installed in the pits. A team of Total technicians will be on hand to perform the operation.

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