



THE TORNADO PROJECT: AUTONOMOUS MOBILITY SERVICES IN RURAL AREAS

- The purpose of the TORNADO project is to define and test technologies and conditions enabling rollout of autonomous mobility services in lightly populated areas.
- It has explored different use cases to address local requirements since it started 36 months ago, in September 2017.
- This research project was jointly led by Groupe Renault and Rambouillet Territoires, with 10 industrial and academic partners.

Boulogne-Billancourt, 5 November 2020 – Autonomous mobility is not exclusive to large cities. Experiments around autonomous vehicles must consider the specificities of less populated areas, where transport solutions are often scarcer, and the challenges specific to rural areas are numerous.

The objective of the **TORNADO** research project, which was completed today, was to identify the communication infrastructure and technologies that will enable rollout of autonomous mobility services in rural and suburban areas. It was based on two use cases, and brought together industrial and academic partners, a territory and local populations.

It conducted two experiments involving autonomous and electric mobility services, including full-scale validation tests in real-life environments:

- An on-demand and shared car service using Renault ZOE to provide a direct link between Gazeran rural train station and Bel Air - La Forêt business park in Rambouillet (southwest of Paris);
- A shuttle service calling at predefined stops within Bel Air business park.

Defining the technologies needed to roll out autonomous transport solutions in rural and suburban areas

The TORNADO project's technical component focused on defining and developing autonomous driving solutions and communication infrastructure and technologies to:

- **Maximise safety:** hardware, software, embedded and remote solutions, vehicle-to- infrastructure communication, etc.
- **Address specific requirements in suburban and rural areas:** *narrow streets, roundabouts, obstacles hampering visibility, lack of road markings and other bearings, changes in roadside configurations, narrow one-lane tunnels, etc.*

The goal for Groupe Renault was to have an electric vehicle drive completely autonomously over a 13 km stretch encompassing all these distinctive features and illustrating a **direct feeder service between Gazeran train station and Bel Air business park in Rambouillet.**

Dealing with the complexity and variety of driving situations in rural and suburban environments involved inter alia:

- Enhancing autonomous vehicles' perception capabilities, enabling them to sense their surroundings within a 360-degree field (type of object, size and distance from the vehicle) in real time.
- Being able to locate and control the autonomous vehicle with 20 cm accuracy to ensure it stays on its path, on roads that can be very narrow, and regardless of the roadside configuration.

- Dealing with temporary loss of the GPS signal or operating with zero visibility, for example when driving through one-lane tunnels.
- Reaching “acceptable” speeds, matching the ones that passengers and other road users are used to in real life, i.e. 70 kph, in autonomous mode.

On this path, the project’s partners were able to conduct experiments on **the role of connected infrastructure components** (connected traffic lights and fixed cameras enabling vehicles to ‘see’ objects beyond their field of perception).

To complete this use case and design a door-to-door service inside Bel Air business park, **an autonomous electric shuttle that can carry up to 10 people was also tested on a circuit connecting the stops in the area.**

To safely transport passengers from one end of the business park to the other, the shuttle integrated new systems supplied by partners enabling advanced perception, the use of infrastructure capabilities to broaden perception, and safety perimeter automation.

The Renault ZOE cars and the shuttle were operated using the same mobile app and synched to provide a continuous, seamless service during the tests.

In touch with residents

The TORNADO project’s second component involved **understanding people’s mobility habits in the area and their perception of autonomous vehicles.** The goal, here, was to **gauge their level of interest** (their expectations and misgivings) regarding the possibility of future autonomous transport services providing targeted, safe, shared and environment-friendly mobility options to complement existing ones.

About 100 people from the community of users of Rambouillet Territoires’ MobiLab **were involved in the various stages of this project.**

These sessions testing autonomous Renault ZOE cars, and the associated co-creation workshops, were aimed at **studying appropriation of autonomous vehicles**, monitoring changes in **feelings towards these new technologies** and **fine-tuning the project** by upgrading and/or adapting the technical components around the expectations of the user community, which was extremely active throughout the project.

For example, the Renault ZOE cars can now drive autonomously at 70 kph (up from 50 kph in 2019), because users expected the service to match real life as much as possible and were therefore keen on an autonomous vehicle that can travel at the speed limit on that particular route.

Addressing communities’ requirements

Electric, autonomous and shared mobility is an opportunity for communities that wish to open up mobility to as many people as possible, especially in lightly populated areas. And it addresses the need for public transport services with safe and environment-friendly vehicles.

Rambouillet Territoires, for whom mobility issues are not only an expectation of its inhabitants but also a challenge for the attractiveness of the area, has been actively involved in the project with the support of other local authorities in the agglomeration and the department.

Beyond addressing regulatory concerns, the development of the road network, and the material implementation of the TORNADO experiments, it was also important for Rambouillet Territoires to include users in the conversations shaping this future service.

Public-private teamwork

The TORNADO project is led by the Fonds Unique Interministériel (FUI) for Regions, and financed by Bpifrance and Île-de-France, Auvergne-Rhône-Alpes and Occitanie regional authorities.

Its wide variety of partners encompassed complementary players who pooled their expertise, skills and innovative capacity to serve a territory.

TORNADO project partners:

- Lead: Groupe Renault

- Co-lead: Rambouillet Territoires
- Industrial: Lacroix City, Avairx, Exoskills, 4D-Virtualiz and EasyMile
- Academic: Gustave Eiffel university, Compiègne University of Technology/Heudiasyc Laboratory, Institut Pascal, INRIA (National Institute for Research in Digital Science and Technology) and UPPA (Pau and Pays de l'Adour university)
- Certifying organisations: Pôles labellisateurs: Mov'eo, ViaMéca and Aerospace Valley

Click [here](#) for more information about the TORNADO project

About Groupe Renault

Groupe Renault has manufactured cars since 1898. Today it is an international multi-brand group, selling close to 3.8 million vehicles in 134 countries in 2019, with 40 manufacturing sites, 12,800 points of sales and after-sales and employing more than 180,000 people. To address the major technological challenges of the future, while continuing to pursue its profitable growth strategy, Groupe Renault is focusing on international expansion. To this end, it is drawing on the synergies of its five brands (Renault, Dacia, Renault Samsung Motors, Alpine and LADA), electric vehicles, and its unique alliance with Nissan and Mitsubishi Motors. With a 100% Renault owned team committed to the Formula 1 World Championship since 2016, the brand is involved in motorsports, a real vector for innovation and awareness.

Media contact

Groupe Renault

Vanessa Loury

Leads Communications Innovation

Tel.: +33 (0)1 76 84 52 94

Mobile: +33 (0)6 86 56 81 33

Email: vanessa.loury@renault.com

Rambouillet Territoires

Fabienne Pernot

Head of communication

Tel.: +33 (0) 1 34 57 58 30

Mobile: +33 (0) 6 22 78 46 23

Email: f.pernot@rt78.fr