STRMTG

THE TECHNICAL SERVICE IN CHARGE OF SAFETY
FOR ROPEWAYS AND GUIDED TRANSPORTS

MINISTÈRE
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TRANSPORTS

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ACTIVITY REPORT 2022

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EDITORIAL

Daniel Pfeiffer, director of STRMTG.

I WOULD LIKE TO EMPHASIZE THE IMPORTANCE OF INNOVATION

It is obviously impossible to mention all the projects that have kept STRMTG busy in 2022, but I would like to emphasize the importance of innovation. In order to meet the specific challenges involved in handling innovations, the service has conducted a review that affects many aspects of our work, including updates to reference guides, internal skills management, approved organization skills management, coordination of office/head office activities, relations with manufacturers, operators and our scientific and technical partners.

To give a few examples, a lot of work has been done by the Department for Automated Public Transport (DTPA) of the STRMTG to adapt the general texts adopted in 2021 and to produce initial guides such as:

- the GAME demonstration guide for ARTS[1];
- the guide concerning the duties of the approved organization for the safety assessment and the operational safety audit for ARTS;
- the guide on cybersecurity for ARTS.

These guides are an important first step in supporting upcoming projects and the emerging ecosystem. However, given the changing state of knowledge in this field, we will have to update them in the years to come.

In the field of guided transport, too, a number of "very light rail" projects aim to offer innovative solutions that will make it possible to revive operations on certain rail lines that are currently out of use, with lower maintenance costs. These projects are intended to be eventually covered by the STPG Decree (safety of public guided transport systems). STRMTG is therefore working with manufacturers and considering new technical and legal approaches.

Innovation can also be found in more concrete projects, such as the commissioning of the Rennes metro Line B and the installation of a remote operating center for 4 mountain resort travelators, 1 funitel and 1 gondola lift. The organization set up by STRMTG, involving the local office and department, allows these kinds of projects to be examined under the best possible conditions.

I'll finish on innovation by mentioning two studies:

the EVEREST project led by STRMTG and carried out by Gustave Eiffel University in order to facilitate the development of image analysis algorithms dedicated to chairlift problems.

Participation in the study on the "possibilities for improving signs and signaling at tramway track pedestrian crossings". The study has led to the development of new markings and specific guiding elements to be tested at 4 test sites.

2022 also saw the development of a whole number of regulations, standards, and guides. The appointment of Christophe SION as chairman of CEN/TC 242 confirms the driving role of STRMTG in the field of standardization.

In addition, STRMTG has adopted a formal management charter based on the discussions and group reflection held during the management seminar held in June 2022. It outlines the values shared by our management team, as well as associated principles and practices.

Significant work has also been carried out in the area of communication with the total overhaul of our intranet and internet sites, which have been modernized and updated with new and enriched content.

2022 ALSO SAW THE DEVELOPMENT OF A WHOLE NUMBER OF REGULATIONS, STANDARDS, AND GUIDES.

In conclusion, I would like to mention the "Eco-responsible public services" initiative launched by STRMTG in 2022. This is the local version of the initiative launched at the ministerial level, and backed up by the energy conservation plan initiated this fall. The department now has a "technical committee" made up of volunteers from the department, which aims to create a more participatory approach to developing actions and reduce the environmental impacts of our activities. This committee notably organized a discussion and awareness-raising day on the challenges of biodiversity in mountain environments and how to take them into account in ropeway system projects.

[1] : ARTS automated road transport systems

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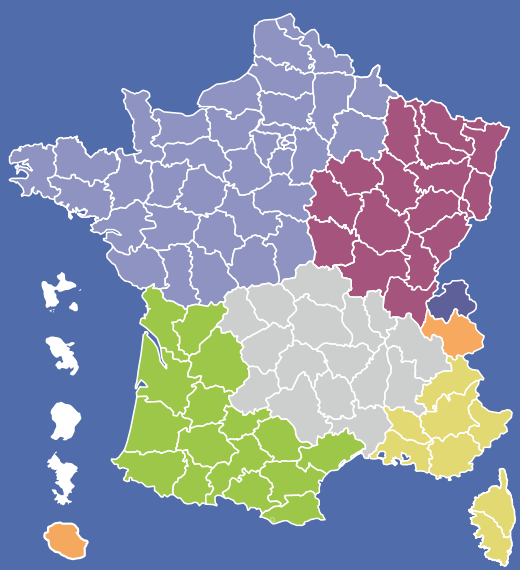

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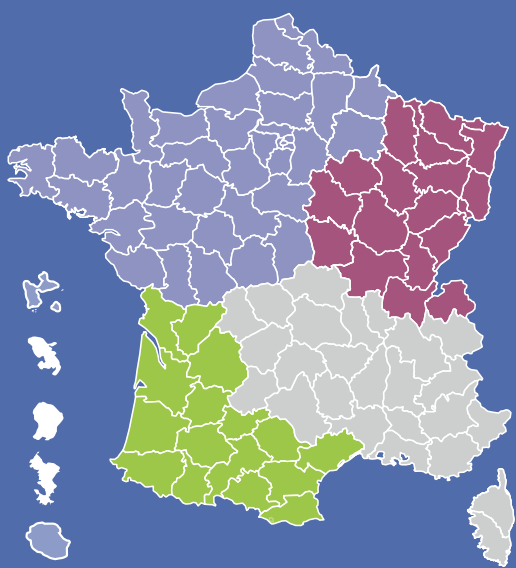
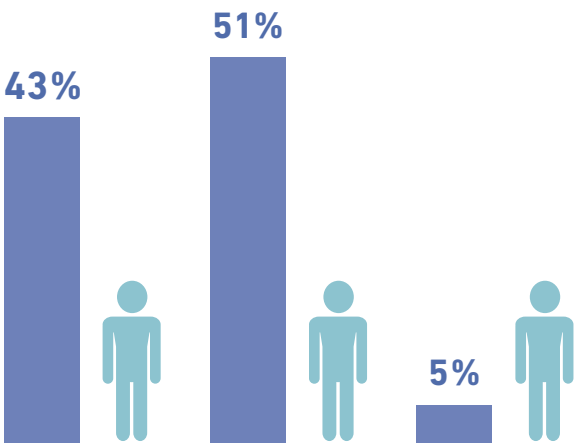
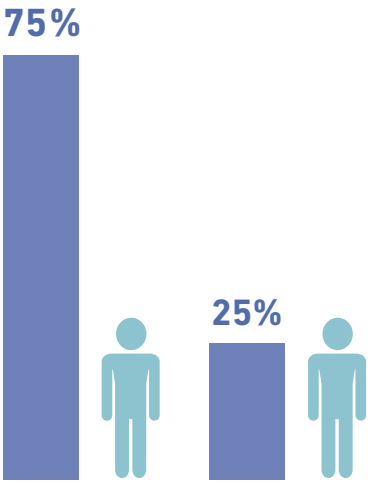


Areas managed by STRMTG head office

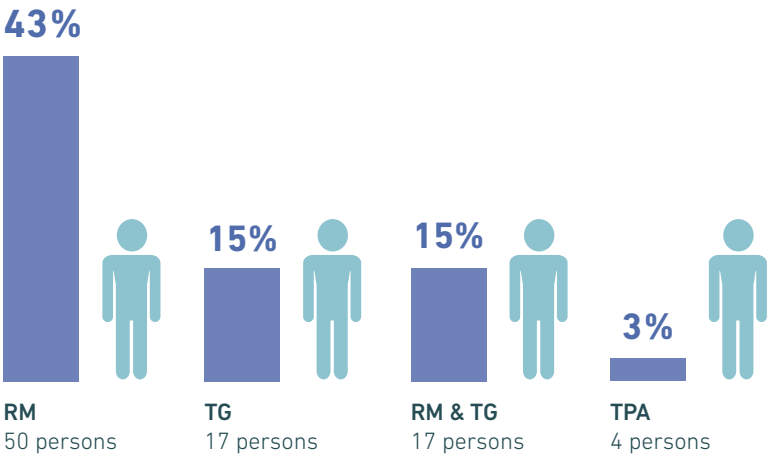
BREAKDOWN OF STRMTG STAFF BY GRADE AND AREA OF EXPERTISE



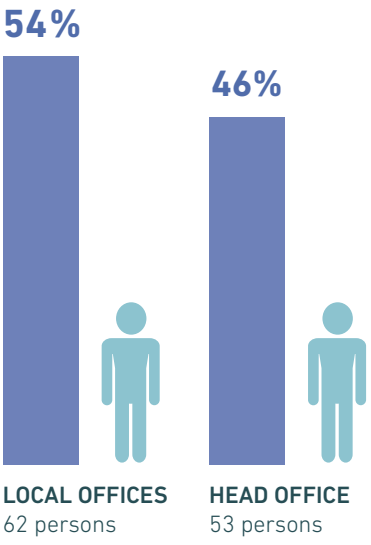
WORKFORCE BY MACROGRADE



GENDER DISTRIBUTION



WORKFORCE BY TRANSPORT SYSTEM



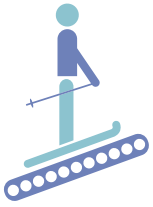
LOCAL OFFICES AND HEADQUARTERS BREAKDOWN

RM: cable cars / TG: guided transport / TPA: automated public transport

SYSTEMS MONITORED BY STRMTG, KEY FIGURES JANUARY 1, 2022

1911 ski lifts

1095 aerial ropeways



478 travelators

34 other installations*

ROPEWAYS PARK

Units: 3,518

83 trams

31 metro **/ 2** regional express network

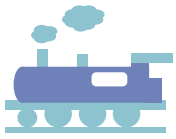
3 light rail system

4 railway systems commuter

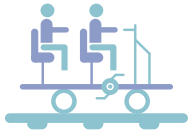
URBAN GUIDED TRANSPORT NETWORKS

Fleet: 123 lines

5 metre-gauge railways



62 tourist and heritage railways



63 rail bike**

LOCAL RAIL NETWORKS AND RAIL BIKE

Fleet: 130 lines

Rail bike are not subject to guided transport regulations. However, the STRMTG provides assistance to prefects at their request, within the framework of their general police powers.

*Other installations» include rack trains, funicular railways and inclined elevators. **Of which 14 networks are mixed Tourist and heritage railways and rail bike.

1 - REGULATIONS AND STANDARDS

Before building a ropeway, a guided transport system or an automated public transport system, you need to be familiar with the rules governing this type of construction, particularly in terms of safety. These rules include regulations in the strict sense (laws, decrees, orders, European regulations and directives), technical guides and standards.

REVISION OF RM1 AND RM2 GUIDES

In 2021, STRMTG launched major work to revise the RM1 and RM2 technical guides.

This revision was necessary to address the following issues:

- taking into account several recommendations made to STRMTG by the BEA-TT following major incidents that have occurred within the French fleet; in some cases, completed draft texts that have already been discussed with the industry;
- integration of changes to the design rules for cables and civil engineering, announced during the previous revision of the RM2 guide in 2019;
- alignment of certain provisions with current European standards;
- integration of the 2020 changes to the French aerial ropeways decree.

The review process also identified other areas where the industry wanted to adapt or clarify the guides.

A working group was set up, bringing together professionals from the sector, including manufacturers, approved project manager and approved inspectors, the Ministry of Labour, CARSAT, as well as inspection offices, and groups and departments from the STRMTG head office.

Due to the difficult health context in 2021, the work was initially carried out exclusively by videoconference. Then, hybrid face-to-face/remote and face-to-face only formats were held in 2022, allowing for more fluid discussions.
Given the large number of meetings and stakeholders involved, targeted thematic meetings were organized, particularly for the control and command and civil engineering aspects.

In addition, some specific topics required specific working groups in 2022, sometimes involving additional actors:

- meetings of a working group on civil/structural engineering, which contributed to the plenary sessions on the subject,
- specific working group on cable/rope management;
- creation of a working group on fire risk management, with the aim of defining the expected content of specific risk analyses, taking into account feedback from the first urban projects;
- working group on the management of dynamic effects.

RM1 and RM2 aerial ropeways guides

PROHIBITING THE USE OF CERTAIN DEVICES THAT CAUSE A DISTRACTION WHILE DRIVING

An important factor in the safe operation of guided transport and ropeway systems is the attention of the operators' employees responsible for driving them.

In practice, the use of devices that cause distraction, in particular smartphones, is largely prohibited by various operating documents. However, there were no restrictions at the regulatory level. While an article of the French Highway Code prohibits the use of phones while driving, it does not cover the drivers of guided transport and ropeway systems.

In accordance with a recommendation made by the BEA-TT, DGITM and STRMTG prepared a draft order aimed at prohibiting the use of any devices with a screen as well as headphones/headsets/earbuds.

Very limited exemptions are possible in the event that these devices are used as a driving aid or for operational reasons. In addition to drivers, this ban will also apply to employees in charge of monitoring ropeway installations.

The text will provide a regulatory basis for the ban, with the operators' internal documentation specifying how it will be applied, and in particular any exemptions within the strict limits provided for by the orders.

UPDATE OF IMPLEMENTATION GUIDES
FOR URBAN GUIDED TRANSPORT AND SECONDARY RAIL SYSTEMS

Since the publication of Decree No. 2017-440 on the safety of public guided transport (STPG) of March 30, 2017, a process of updating all STRMTG reference materials, and in particular the implementation guides, has been launched in order to make them consistent with the new regulations.

As part of this process, the following implementation guides were revised:

- Globally at least equivalent principle (GAME);
- Safety File (DS), Safety Review File (DRS);
- Acquisition or modification of vehicles: safety design file (DCS), safety file (DS).

These revisions take into account changes in the STPG Decree and its associated orders. In addition to the main changes implemented under the new decree, this work also enabled certain expectations to be specified and clarified on the basis of experience acquired over the years. The revisions were made in collaboration with the entire department and the industry.

These application guides are available on the STRMTG website

GLOBALLY AT LEAST EQUIVALENT PRINCIPLE (GAME PRINCIPLE)

CONTENTS OF THE SAFETY FILE (DS) AND THE SAFETY COLLECTION FILE (DRS)

ACQUISITION OR MODIFICATION OF VEHICLES

RAIL BIKES ARE BECOMING A FULLY-FLEDGED GUIDED TRANSPORT MODE.

In collaboration with the DGITM, STRMTG worked in 2022 on drafting regulations concerning the safety of rail bike activities. The principle is to apply regulations similar to those of tourist rail operations to these activities.

This legal framework, proven by many years of practice, has shown it provides a sound basis for ensuring the system's level of safety while allowing it to be implemented in small-scale entities, as is often the case with rail bike operators.

The aim of the future decree is to deal with all rail bike networks, whatever their geographical extent (one or more municipalities) and whatever their technical characteristics (pedaling with or without electric assistance or even electric motorization).

In practice, new (as well as substantially modified) rail bike activities will be subject to the following authorization procedure:

- approval of a preliminary safety file by the prefect, when the project involves construction work or substantial modification of the infrastructure;
- the authorization to open operations issued by the prefect, based on a safety file.

This is accompanied by safety operating regulations, also approved by the prefect, as well as an intervention and safety plan.

In both cases, the files will be accompanied by an evaluation by a qualified organization approved for tourist guided transport systems. This provides a second qualified opinion, independent of the project developer.

In addition, the decree ensures that the level of safety is maintained during the life of the system, and provides the government with several tools for taking action on these lines.

Finally, some specific provisions are included in order to take into account the particularities of rail bikes compared to other tourist guided transport systems. Manufacturers of rolling stock will therefore have to request type approval from STRMTG. This type approval will provide operators acquiring new rolling stock with a guarantee of safety and information on the limits of use and maintenance.

The draft decrees and orders reflecting the information above were presented to industry professionals, in particular at the Fédération des Vélos-rails De France, at a consultation meeting in December 2022 where the main principles were approved. The adoption process will continue into 2023, in coordination with a broader amendment to Order no. 2017-440 on guided transport safety.

At the same time, STRMTG will begin work on updating the technical reference guide on rail bikes.

STANDARDIZATION FOR TRANSPORT SYSTEMS

As part of standardization for transport systems, STRMTG continued to work throughout 2022 to present and defend its safety policies through the following working groups:

URBAN GUIDED TRANSPORT

- Tramway driver's cabs: in France, the design of cabs must comply with the STRMTG technical guide, "Safety in tramway driver's cab". This guide has inspired current standardization work and STRMTG has ensured that there has been no decline in safety at the national level. The three parts of EN 16186-5, -6 and -8 should be published in early 2023.

- Braking systems for urban and suburban public transport: STRMTG continues its involvement in the revision of standard EN 13452.

- Digital simulation: STRMTG is participating in the work initiated in 2020 to write a technical report on digital simulation as an alternative to physical tests. This technical report, CEN/TR 17833, was approved in 2022. Work on transforming this report into a standard began after the adoption of a preliminary work item in June 2022.

- Operational safety of software: the STRMTG is participating in the work of TC9X/WG 28 to merge standards EN 50128 and EN 50567 which cover software for railway control and protection systems and software on board rolling stock.

- Platform barrier systems: the STRMTG is contributing to the international work to migrate standard EN 17168 "Platform barrier systems", published in 2021, to the ISO.

- Cybersecurity: STRMTG is participating in international work to migrate European technical specification CLC/TS 50701 "Cybersecurity", published in 2021, to the IEC.

ROPEWAY INSTALLATIONS

- Worker's safety: the work led by STRMTG, aimed at supplementing and harmonizing worker's safety, has resulted in proposed amendments to existing standards for ropeway installations. The working groups in charge of standards concerned by these proposals have provided their feedback, which is being taken into account before the official amendment process is launched.

MOUNTAIN RESORT TRAVELATORS

The work on the revision of European standard EN 15700 "Safety for travelators for winter sport or leisure use", initiated in 2018, was completed in 2021 within the framework of the working group led by STRMTG (TC242/WG13 of the European Committee for Standardization). The draft standard passed the formal vote of CEN/CENELEC national members in 2022, the final step in the revision process. The revised standard is therefore expected to be published in early 2023. In particular, it will incorporate high-speed travelators (up to 1.2 m/s), tunnels and additional requirements to better protect worker safety (maintenance mode, etc.).

IMPROVE WORK SAFETY STANDARDS FOR ROPEWAY INSTALLATIONS - WG15

STRMTG led the last meeting of CEN/TC242 working group WG15 on the subject of worker safety on ropeway systems. This meeting, held at the end of 2022 in Bolzano, led to the finalization of proposed changes to the standards, which provide a significant improvement in attention to worker safety.

Feedback from the other working groups in charge of the impacted standards was gathered in 2022, and then discussed during the meeting to arrive at a version that is now consolidated. The next step will be the official publication of these proposals during the revision of the impacted standards or by amendments.

ARTS AQO: PUBLICATION OF TWO ORDERS AND A GUIDE

The commissioning of automated road transport systems is subject to a favorable opinion from an STRMTG-approved qualified organization (ARTS AQO). In 2022, STRMTG led a working group dedicated to the duties of these organizations, which included actors from the automated road transport sector.

The work of this group led to the publication of two orders relating to the AQOs provided for in the French Transport Code: one on the AQO approval procedure and the contents of approval application files (Order of 2 August 2022), and the other on the content of AQO assessments issued at the ARTS safety demonstration file stages (Order of 5 August 2022).

The work of the working group also contributed to the implementation guide "ARTS AQO duties", published on October 29, 2022 on the STRMTG website. This guide explains the expected duties of AQOs for the safety assessment of new ARTS, for the annual operational safety audit of these systems, as well as for the safety assessments and analysis of accident reports that may be requested by the Prefect.

Approved qualified organisations

ARTS GAME TECHNICAL GUIDE

Decree No. 2021-873 on automated road transport systems (ARTS) sets the requirement for a level of safety that is "globally at least equivalent" (GAME) to that of systems providing similar services or functions. As a supplement to the GAME implementation guide published in December 2020, the first version of the "GAME" demonstration technical guide for ARTS was published on August 31, 2022.

This guide specifically covers ARTS systems integrating innovative equipment or functions and for which there are no applicable regulatory or technical standards/guides or acceptable reference systems. It specifies the approach to develop the safety demonstration of a system, through a detailed risk analysis. It outlines the principles of risk estimation, defines the analysis frameworks and provides the input information to be taken into account.

This guide was developed by the "GAME" working group led by STRMTG, which includes various actors in the automated road transport sector. The work of this working group is already underway to complete certain aspects of the demonstration with a view to the second version of this guide scheduled for the end of 2023.

Technical Guide for "GAME" demonstration for ARTS

PUBLICATION OF THE IMPLEMENTATION GUIDE ON CYBERSECURITY FOR ARTS

As with other types of systems under the supervision of STRMTG, the assessments performed by ARTS AQOs cover a number of technical areas related to safety. However, the ARTS regulations, which took effect in 2022, introduced a new area: cybersecurity.

Following discussions with the National Cybersecurity Agency of France (ANSSI), STRMTG launched a working group in January 2022 made up of actors from the automated road transport industry, cybersecurity experts, and government representatives (including ANSSI). STRMTG was in charge of steering the project and was assisted by a specialized consultant to conduct the meetings and produce the deliverables.

Automated transport on road

The working group met ten times, which led to the writing of the first version of a guide published on December 21, 2022 on the STRMTG website.
It defines the cybersecurity requirements applicable to the responsible entities: designers, transport authorities, operators. It specifies the following for a given system:

- The scope of risks to be covered,
- Applicable methodologies for modeling the system, risk assessment and definition of cybersecurity assurance levels,
- Cross-functional and continuous cybersecurity activities,
- Requirements applicable throughout the life cycle.

Given the timeframe, priority was given to the description of the scope and the exhaustive identification of the activities to be covered. As some subjects deserve to be explored in greater depth, the participants expressed their strong expectation that the work should continue.

The working group is therefore expected to resume its work in 2023 with the aim of drafting a second version with the following goals:

- Detail the cybersecurity assurance levels and the process for allocating assurance levels,
- Identify threat sources and threat scenarios to be considered,
- Define scales and matrices for risk components, as well as scoring methodologies,
- Show a practical application of the methodologies.

Implementation Guide on cybersecurity for ARTS

2 - INNOVATION

Against a backdrop of increasing innovation in transport systems, STRMTG encourages and supports innovation, ensuring that safety is taken into account right from the start of development.

INNOVATIVE TOPICS TG

The year 2022 was a busy one for innovative projects in the field of guided transport systems. As a reminder, regulations have evolved, opening up possibilities for the development of rail and guided transport systems by the regions, and confirmed the Ministry of Transport will to act for small local lines.
Continuing the exchanges initiated in 2022, the STRMTG has held regular technical meetings for the Urbanloop project, with the aim of putting a test line into service in the St Quentin en Yvelines municipality for the Paris 2024 Olympic Games. This system is innovative in most of its sub-systems, and requires the construction of a specific administrative and technical reference system, which is in progress,.This reference will specify the demonstration of safety and the safety files that will be necessary to authorize the operationof the system.

National railway company (SNCF) innovation branch is also working on two innovative projects, Draisy and Flexy. The first one is an innovative system in the light rail sector, designed to potentially use exclusive conventional tracks or mixed with other rolling stock. The second one is a roadway gauge system that can use both conventional railway lines and roadways to cover the last mile, therefore having wheels that are road (tire) and rail compatible. Discussions with the STRMTG and the French national railways safety authority (EPSF) have clarified the regulations to be applied to each system, as well as the frameworks for carrying out tests, and have confirmed the need for vigilance points on specific topics (level crossings, crossing lines, etc.).
These exchanges also confirmed the benefits of having

a shared view of technical approaches, and even parallel instructions, between the two authorities EPSF[1] and STRMTG (National safety authorities), on systems that could be both interoperable and part of guided transport systems. It should be noted that the call for expressions of interest launched by the Ministry of Transport and the French Agency for Ecological Transition (ADEME[2]) has designated a dozen winners, and identifies different safety stages on which the two national safety authorities will have to take action.

Lastly, as part of the Ministry of Transport scientific and technical network, the STRMTG had the opportunity to present and co-lead these topics on innovations, dealing on their challenges regulatory, normative or technical challenges, and also their safety, as part of the Mobility Days organised in Rouen in 2022.

[1] Public establishment for rail safety

[2] Ecological Transition Agency

RENNES METRO LINE B, AN INNOVATION OF MUCH GLOBAL INTEREST

On September 20, 2022, the Rennes metropolitan area inaugurated its second automated metro line, the NeoVAL system, 20 years after Line A opened.

Line B is 14 kilometers long (including 11 kilometers in tunnels and a 2 kilometer viaduct) and has 15 stations. It crosses the city from southwest to northeast, linking Saint-Jacques-de-la-Lande to Cesson-Sévigné in 21 minutes, and includes two major transfer stations to Line A, the Gares and Saint-Anne stations.

With the new Line B, three quarters of the population of Rennes will live within a 10-minute walk of a metro station. In addition, Rennes Métropole has completely overhauled the bus service so that the most remote municipalities are connected to the metro.

It has been a major land-use planning project that will allow a strong modal shift from cars to public transport.

Rennes is the first city in the world to operate the NeoVAL system, the new automated metro designed by Siemens, which features many innovations.

It is equipped with a central monorail guidance system, inherited from the Lohr guidance system used on several tramways in France, communication-based train control technology,

Second automatic line in Rennes: line B.

and will eventually allow trains to run every 80 seconds during rush hour. The fleet of rolling stock for this new line consists of 25 CityVAL trains, a new light-weight vehicle on pneumatic tires compatible with the central monorail guidance system.

The STRMTG Northwest office has been following this large-scale project since 2011. It examined the numerous safety files with the support of the STRMTG metro & rail systems and tramways & rolling stock departments, particularly in view of all the innovative aspects of this project.

KEY FIGURES

- **Project Cost:** €1.342 billion (2010 value)
- **Number of passengers per day** (end of 2023): 120,000
- **2001-2003:** opportunity studies
- **2003-2007:** feasibility studies
- **2008-2013:** project studies
- **2013-2021:** design and construction
- **2021-2022:** testing and dry run
- **September 20, 2022:** opening of Line B

REMOTE CONSOLES FOR THE SUPERVISION OF 6 DEVICES

Some ropeway systems are automated without requiring staff on site at all times. The various safety devices installed by the manufacturer ensure the safety of users. In this case, the device is supervised from a remote console usually located in the room of another device located nearby, with an operator.

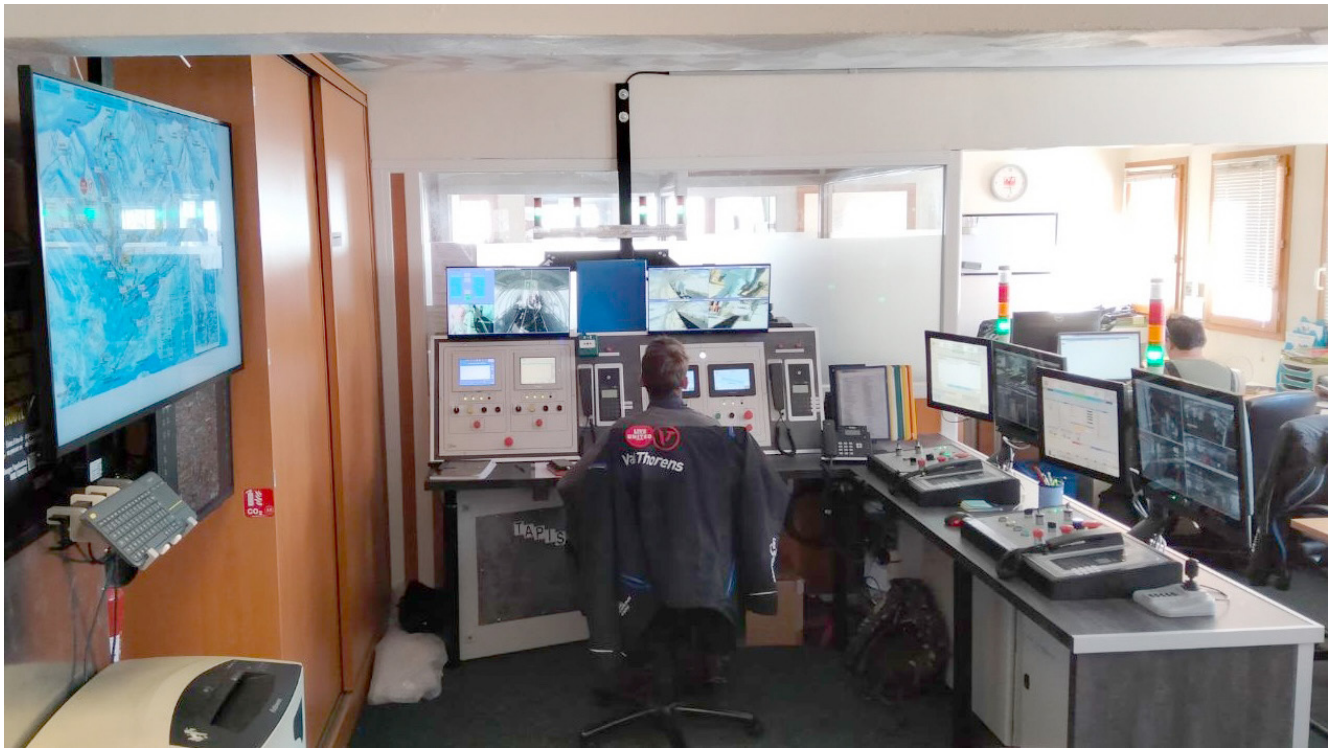
In 2022, SETAM (Val Thorens ski resort) innovated by grouping together the remote operating consoles of 6 machines operating in this mode in its offices: 4 mountain resort travelators, a gondola lift and a funitel (which was modified specifically for this purpose).
If the system stops automatically, the operator assigned to the remote consoles is warned by an audible message and/or visual alarm depending on the type of error. They then have error reports, cameras and intercom systems that allow them to visualize the situation and communicate with the passengers.

After analysis, the remote operating consoles allow the operator to reset certain errors and put the system back into service.

If necessary, an employee is ready to quickly step in and work on one of the systems, at the request of the operator.

Link to the article relating to the transition to unmanned operation of the Funitel des 3 Vallées in Val Thorens

Monitoring station with 6 remote control panels on SETAM premises.




EASY MILE

3- NEW PROJECTS

3.1 NEW ROPEWAY PROJECTS

Once the regulations, standards and procedures are known, it is then possible to design and build new transport systems or modify existing ones. The organizing authority will then take all the necessary steps to apply for authorizations for its transport system. The STRMTG is responsible for the technical appraisal of the files required by the regulations, before they are put into operation.

CONSTRUCTION OF A CHAIRLIFT WITH DETACHABLE GRIPS AT VARS

In 2022, the chairlift with detachable 6-seater chairs, nicknamed the "Speed Master", was opened at the Vars ski resort in the Hautes-Alpes.

Built by LEITNER under the supervision of the prime contractor ERIC, the Alpes du Sud Office oversaw the assessment of the authorization files for the system, which were more complex than expected.

CONSTRUCTION WAS SLOWED DOWN BY GEOTECHNICAL PROBLEMS

At an altitude of 2700 m, in the middle of the construction phase, 15 cm settlements appeared in the foundations of the top station.

After analysis of the event by a geotechnical engineering firm, the decision was made to abandon the original foundations. This involved sawing the existing posts.
A new footing, common to both station bases, was then made to avoid differential settlements. The depth of these new foundations was also reduced.

In case of fresh settlements, spacers are now in place on the last 3 pylons, in order to ensure that adjustment is possible.

A SPECIFIC EVACUATION PLAN:

This 14-pylon aerial ropeway crosses a major rock face. One of the spans has a slope of around 97%.

As early as the construction permit phase, a specific study was conducted on the vertical evacuation of passengers. Its particularity lies in the technique and equipment used.

Firstly, IMMOOS SS1 equipment, which is becoming more and more widespread, allows aerial rescue workers to be autonomous when moving along the cable.
Then, once the user is on the ground, two procedures are implemented.
Below the rock face, the person is taken down to the base station in the conventional way, by gravity.
Above the rock face, however, passengers are taken on foot to the top station.
In this case, rescuers are assisted by mechanical traction from a winch secured higher up, which makes it easier to move the users.
These scenarios were demonstrated in real-life situations, which the Southern Alps office was able to attend.

The system operated by SEM SEDEV has now been open to the public since the 2022-2023 winter season.

TRANSITION OF THE 3 VALLÉES FUNITEL TO "ESO"
UNMANNED LIFTS (VAL THORENS)

The 3 Vallées funitel (formerly Bouquetin) is a aerial ropeway built and put into service in 2003 by the manufacturer Poma. It is a double-loop system with arms on the vehicles attached to two parallel carrying-hauling ropes, providing more stability in high winds. The location of the system is highly exposed and the technology used allows it to operate in winds of up to 30 m/s. The back and forth operation with a train of 3 cabins of 33 seats each (on each side) provides a good flow of 2000 p/h for an operating speed of 8 m/s.

After the first year of operation, and given the low number of downhill passengers, systems were put in place in the uphill station to allow unmanned operation in the station.

This type of operation was then extended to other installations in the ski area, and in 2022 the operator decided to modify the funitel to allow unmanned operation in both stations, with the creation of a remote operating center shared with other systems. In the same year, the system was completely renovated.

This modification was examined and approved by the Savoie local office with the support of the DITC and the Automation and Control group. The process was based on a safety analysis specific to the unmanned operation mode carried out by the manufacturer (Seirel), the approved project manager (ERIC) and the operator. The management of certain dangerous situations has naturally required the implementation of additional safety measures, mainly based on optical sensor technologies for the surveillance of pits and platforms.

Safety gates at the end of the platform have also been installed to manage improper boarding situations, and video surveillance cameras provide a reliable and precise view of all passenger areas from the remote operating center. The equipment already located in the uphill station has been replaced to improve reliability and have the same systems at both stations.

The changes made to the system have therefore taken into account safety requirements, while meeting the operational and availability objectives of the funitel, which should be confirmed from feedback after the operating season.

MONT BLANC TRAMWAY COG RAILWAY

Stretching over 12.4 km, the Mont-Blanc tramway (TMB) cog railway is the longest and highest cog railway in France. Its summer terminus is at the Nid d'Aigle at 2366 m. The TMB line was authorized in 1904, the work started with a first section starting from the Fayet station (584 m) with the objective of reaching the Aiguille du Goûter located at an altitude of 3863 meters. In 1914, the line reached an altitude of 2366 m. Until 1954, the TMB line was only operated with steam trains. That year, the decision was made to electrify the line. Three electric trains named Anne, Jeanne and Marie began operating in 1957.
A few steam locomotives continued to be used until the early 1980s.

From 2012 to 2022, over €30 million was invested to renovate the line. The ballast, sleepers, rails, rack, switches, catenary posts, track equipment, and contact line were refurbished. The Saint Gervais station and main stops also underwent renovation work. At the same time, the rainwater drainage system was completely overhauled and the engineering structures reinforced. Rockfall protection systems were also built to make the line safer.

In 2018, the departement also launched the project to renew the rolling stock. It also plans to increase the frequency of service by adding a fourth train to the TMB. The Swiss company "Städler Rail", was chosen to build the trains. The first Marie train set was delivered in the spring of 2022. The qualification tests were carried out on the machine, to obtain the second look. Marie, Anne and Jeanne, were accepted in November 2022 by the prime contractor and the Haute-Savoie office of the STRMTG. Finally Marguerite, the 4th train, was accepted on December 8, 2022.

The driver remains active, but with this new rolling stock, the automated system provides continuous assistance and plays a greater role in overall safety. The installation of beacons at specific points along the line (change of drive mode, switches, speed limit changes), which automatically check that speed limits are being followed, is a major development in the safety of the line's operation.

The brakes are also very effective, providing unparalleled reassurance on the many steep sections with gradients of up to 25%.

Since December 16, 2022, following the approval of the prefect, an Authorization to Operate (ATO) was issued on a provisional basis. The initial operating method was maintained, i.e., 3 trains operating at maximum speeds of 16 km/h uphill and 14 km/h downhill.

For the summer of 2023, safety issues related to the switch to 4-train operation with increased operating speeds following a rail safety analysis still need to be incorporated. Mitigation measures will be proposed to achieve acceptable risk levels.
The operator will be responsible for implementing these measures in the documentation of its Safety Management System.

The track will eventually be extended by about 300 m in order to improve safety and arrival conditions for users at the Nid d'Aigle terminus.

RENOVATION OF THE "ARC-EN-CIEL" FUNICULAR LINE

With a length of 2,875 m and a 810 m climb, the Arc-en-Ciel funicular has been connecting Bourg-Saint-Maurice to the resort of Les Arcs since 1988. In 2020, the municipality of Bourg-Saint-Maurice, owner of the funicular, initiated a review of the infrastructure with the assistance of Achard Conseil Ingénierie and the DCSA firm, a approved project manager for funiculars.

The review led to a major work project to repair and reinforce the line, focusing on three main areas:

STABILIZATION OF THE STRUCTURE'S FOUNDATIONS

The slope is prone to deep ground movements and locally insufficient bearing capacity which could lead to relative movements of the piers. To counter these movements, 18 out of 156 piers were consolidated by widening their footings or by injecting concrete through drilling. To allow for monitoring over time and better safety, 13 piers were equipped with instruments in the most sensitive sectors for continuous monitoring and to alert the operator in case of movement.

REHABILITATION AND IMPROVEMENT OF STRUCTURAL WORK

While the structural work was still in good condition after 30 years, the relative movements of the structures required a revision of the geometry and positioning of certain elements supporting the track. In addition, concrete spot repair work was also carried out.

New expansion device in place on the track.

Installing an expansion device.

REPLACEMENT AND REPOSITIONING OF TRACK EXPANSION DEVICES

Due to rising temperatures, the original track configuration was no longer suitable to ensure safe operation in summer and winter. There was a risk that the expansion devices would close or open completely, which could lead to geometric defects. Following on-site measurements, a law was established for track behavior in relation to temperature.

This was used to define a new distribution of track elements, expansion devices, rail fasteners and fixed points. The track work proved to be particularly complex due to the gradient of up to 39%, the work on the viaduct several meters above the ground, and the extreme heat of the summer of 2022, which limited the hours of the day when rail welding could be carried out.

Work began in 2021 and will be completed by the fall of 2023. The work carried out by the municipality of Bourg-Saint-Maurice over the past two years has improved the geometry of the tracks, providing better safety for users.

MONOCABLE AERIAL ROPEWAY WITH DETACHABLE CHAIRS AND CABINS A TREND OR A MODEL?

Between 2004 and 2022, in Isère, 10 systems of this type were built, including 2 detachable 6-person chairlifts that have been upgraded to this technology.

AT THE END OF 2022, THREE SUCH SYSTEMS WERE EXAMINED BY THE SOUTHEAST OFFICE

- the Diable TSCD at Les Deux Alpes
(combining 6-person gondolas and chairlifts),
- Les Sures TSCD in Auris-en-Oisans
(6-person chairlifts and 10-person gondolas).
- Vallée Blanche TSCD at Les Deux Alpes
(6-person chairlifts and 10-person gondolas),

Other projects are already in the works for next year.

Commercially referred to as Telemix by Poma and Combined Lift by Doppelmayr, this technology combines the principles of a gondola lift and chairlift with detachable grips in the same system.

GENERAL PRINCIPLE AND SPECIFICITIES

Two distinct boarding areas (chairlifts and gondolas) are accessible by completely separate accesses that each take up half of the contour: a snow-covered track for the chairlifts and a vehicle-height platform for the gondolas.
The speed can sometimes be differentiated, with boarding and disembarking of gondolas at around 0.3m/s and around 1m/s for the chairlifts.

The first hybrid lift of Isère built in 2004: Le Grand Cerf at 7 Laux

For cost reasons, chairlifts often make up 3/4 of the vehicles, sometimes more.

AREAS OF IMPORTANCE

- Management of the different flows / Pedestrians / Skiers / Boarding / Disembarking / Ascent / Descent,
- Visibility / materialization of the areas where chairlifts cross the platform,
- Installation of "operator" and "attendants" work stations allowing simultaneous surveillance of the entire chairlift embarking/disembarking area and the gondola embarking/disembarking platform,
- Embarking (uphill):

- The layout must encourage skiers to act quickly so that they can position themselves in the starting area,

- Embarking (descent):

- End of platform system that responds to different problems (location / closing of doors, passing chairlifts, management of areas with unwanted user presence),

- Disembarking:

- Consideration should be given to the characteristics and proper positioning of the No Disembarking System,
- Difficulties with the "10 cm" No Disembarking System detection requirement under the lowest point of the lifts when the seat swings,

- Evacuation:

- Need for specific equipment (in "gondola" operation only) with specific rope lengths with larger spacing between gondolas. The longer chairlift suspensions also require additional devices to facilitate access for aerial crew.

BENEFITS

- Transport conditions adapted to the users' varying needs and to atmospheric conditions (gondola comfort and protection from the elements),
- No obligation to remove skis,
- If operated in the summer, allows easy access for a specific clientele, such as mountain bikers or other leisure equipment,
- Smoother embarkation operations for pedestrians, children under 1.25m or groups of children (no adult presence required) with easier supervision for drivers and attendants compared to a chairlift.

The most recent device accepted on December 14, 2022 by the south-east local office (BSE): the Vallée Blanche TSCD at Les Deux Alpes

This last point, directly related to transport safety, is particularly and certainly the most important element taken into account by transport operators in choosing this technology.
Considering the number of falls from height every year, particularly of young children, some of which can be attributed to improper boarding, TSCD technology offers an undeniable solution by improving and enhancing the safety of ropeways.

ACCEPTANCE OF NEW ROLLING STOCK AT THE RHUNE COG RAILWAY

In the renovation of the metric cog and pinion track of the Train de la Rhune at Sare (64), the Pyrénées-Atlantiques département has acquired new rolling stock.

It includes an automated dual-power diesel rack-and-pinion locomotive (Stadler) and specialized carriages adapted to ongoing track rehabilitation and maintenance operations (Metalliance).

The platform carriage is also designed to accommodate three compartmentalized cars for passenger transport.

With a total capacity of 60 seats, the locomotive/emergency carriage assembly will be used to repatriate users in the event of a loss of power on the overhead contact line or an obstacle down the line.

As this assembly is likely to carry the public, it has been subjected to acceptance tests, defined by the prime contractor (empty/loaded braking), in the presence of the STRMTG south-west local office in 2022.

SAINT LARY SKI RESORT: TWO NEW CONSTRUCTIONS

As part of the modernization of its Espiaube ski area, the Saint Lary ski resort has embarked on a huge investment program including the creation of an aerial ropeway with detachable 6-person chairs and 10-person gondolas, both accepted in 2022.
The completion of these new systems has eliminated 3 chairlifts, 1 gondola lift and 1 surface lift.
The operator contracted MND to build the two new lifts.

FIGURES FOR THE ESPIAUBE CHAIRLIFT WITH DETACHABLE GRIPS:

- 60 gondolas in a row
- 724 m elevation gain, 1862 m length
- Min/max altitude: 1597 m / 2321 m
- Number of pylons: 12
- Speed: 6 m/s
- 100 % uphill and downhill capacity

(50 % temporarily going downhill for winter 2022-2023

FIGURES FOR THE TOURETTE CHAIRLIFT WITH DETACHABLE GRIPS:

- 65 chairlifts
- 292 m elevation gain, 1390 m length
- Min/max altitude: 2029 m / 2321 m
- Number of pylons: 9
- Speed 6 m/s
- 100% uphill and 50% downhill capacity

Special features: This chairlift with detachable grips has a landing travelator, a first in the Pyrenees.

3.2 NEW GUIDED TRANSPORT PROJECTS

EXTENSION OF GENEVA'S TRAMWAY NETWORK ONTO FRANCE.

In 2021, the first extension of the Geneva tramway network onto French soil was inaugurated, with a 2.1 km section of Line 17 linking Geneva to Annemasse. In 2022, a new milestone was reached.

The preliminary safety file (DPS) for the extension of Line 15 linking the Swiss border to the Saint-Julien-en-Genevois station was approved by the Prefect of Haute Savoie on October 5, 2022 following a favorable opinion from STRMTG. 4 stations are planned for the 1.5 km section of the line in France. Work will begin in 2023 and the project is expected to be commissioned in 2025.

Two other projects to extend the Geneva network are already underway. The first involves extending the network in the direction of Ferney Voltaire (Ain département) with the submission of the Safety Definition File in October 2022.

The second project involves the continued extension of Line 17 in the center of Annemasse, for which work meetings on detailed designs are underway.

First extension of Geneva's tramway network into French territory: line 17 linking Geneva to Annemasse.

T13 EXPRESS TRAMWAY, A NEW LINE

A NEW LINE LINKING THE STATIONS OF SAINT-CYR L'ÉCOLE (RER C) TO SAINT-GERMAIN-EN-LAYE (RER A)

11 vehicles operated in single units were initially delivered.

The DRIEAT IF's Guided Transport Safety Department has been working with this new Parisian operator to complete the safety files, supported by STRMTG's tramway and rolling stock department, since July 2022.

2022 was marked by the opening of Express tramway line 13 between Saint-Cyr l'Ecole-RER and Saint Germain en Laye-RER. The line is operated by SNCF Voyageurs and began operating on July 6, 2022.

This 18.8 km long project, with 12 stations, uses a large part of the existing railway tracks of the Grande Ceinture Ouest line. It serves seven municipalities in the Yvelines département: Saint-Germain-en-Laye, Mareil-Marly, L'Etang-la-Ville, Noisy-le-Roi, Bailly, Saint-Cyr-L'École and Versailles. The entire line is fully accessible to people with reduced mobility. The line will eventually be extended to Archères via Poissy.

It connects the two terminus stations in approximately 30 minutes (compared to 60 minutes before it began operating) with trams every 10 minutes at peak times. Nearly 21,000 passengers are expected to use the line daily. The rolling stock is tram-trains from the Alstom Dualis range. They are 42 meters long and 2.66 meters wide.

ADMINISTRATIVE STEPS RELATED TO PROJECT SAFETY:

- June 6, 2014: PRIF (Préfecture de la Région Ile-de-France) opinion of the DDS[1]
- February 3, 2014: declaration of public utility
- June 30, 2016: approval of the PRIF on the initial DPS[2], authorizing the start of work
- August 25, 2017: PRIF opinion of the updated DPS
- November 12, 2020: approval of the supplementary DPS for Dualis rolling stock
- November 19, 2021: PRIF approval of the DAE[3] authorizing the start of dynamic testing on the public domain
- July 1, 2022: PRIF approval of the DS[4]
- July 6, 2022: commercial operation

[1] DDS: Safety Definition File (Dossier de définition de sécurité)
[2] DPS: Preliminary Safety File (Dossier préliminaire de sécurité)
[3] DAE: Test Authorization File (Dossier d'autorisation des tests et essais)
[4] DS: Safety File (dossier de sécurité)

THE PARIS METRO NETWORK CONTINUES TO INCREASE AUTOMATION: LINE 4

The Paris metro network is getting a third automated line, with the first fully automated shuttles on Line 4 running since September 12, 2022, which have been integrated with the current trains (MP89 with drivers).

Line 4 began operating in 1908 on the Porte de Clignancourt - Châtelet section. Over the years, it has been extended several times to the south. It currently runs from Porte de Clignancourt to Bagneux - Lucie Aubrac over 14 kilometers and includes 29 stations.

In terms of rolling stock, at the end of the automation process, three generations of automated rolling stock will run on Line 4:
- MP89s and MP05s from Line 14;
- the new 6-car MP14s from the current MP14s for a total of 20;

Île-de-France Mobilité's current goal is for all shuttles to be automated by the end of 2026. By then, 52 shuttles will transport the 700,000 daily passengers who use the line.

This ambitious and complex automation project began in 2013 and has had successive launches:
- platform barriers along the entire Line 4, the last of which was installed on the non-extended section running to Bagneux in 2020;
- a new modernized central command center at Porte de Clignancourt in 2020;

- the Line 4 southern extension with two new stations to Bagneux on January 13, 2022.

Automation of Line 4 will increase its transport capacity in response to a growing increase in passenger traffic. It will also offer increased safety and regularity, thanks to the automated train operation system (ATO system) developed by Siemens and currently in operation on Lines 1 and 14. The ATO includes all the equipment that automatically manages the trains on the line.
The DRIEAT's guided transport safety department has contributed to the examination of the numerous safety files submitted in view of the gradual commissioning of the various subsystems and the extension, with the support of the STRMTG metro & rail systems, and tramways & rolling stock departments.

FORTS D'UXEGNEY TRAIN IN VOSGES

The Train des Forts made its first trip on the weekend of May 26 to 29, 2022 after approval of the Safety File by the Prefect of Vosges based on the favorable opinion of STRMTG.
This network is operated by the ARFUPE association, connecting the forts of Uxegney and Bois l'Abbé, which were part of the stronghold of Épinal during WWI. The 1.5 km long line has a narrow gauge (60 cm) and crosses 7 level crossings. A DECEAUVILLE locotender steam locomotive is used to transport passengers.

4- URBAN AERIAL CABLE TRANSPORT NEWS

In 2022, two new urban cable car projects were completed.
The Papang gondola lift in Saint-Denis on Reunion Island and the 3S Téléo aerial ropeway system in Toulouse were commissioned on March 15 and May 13 respectively.
As far as future projects are concerned, the preliminary safety files (DPS) for the Grenoble Métrocable, the Créteil Cable 1 in the Paris region and the Ajaccio aerial ropeway projects have been submitted and are currently being examined. Finally, a new project has been officially launched with the submission of the Safety Definition File (DDS) for the Nice aerial ropeway system.

CABLEWAY TRANSPORT ACCESSIBILITY WORKING GROUP

Several urban cable transport projects have been completed in the last two years or are due to be completed in the coming years. When regulatory authorization files are examined for this mode of transport, which has until now been mainly located in mountainous areas, the discussions and questions concerning accessibility issues have prompted the government to look into how it can provide better support to project developers in this area.

The decision was therefore made to set up a working group at the end of 2021, co-supervised by the Ministerial Delegation for Accessibility (DMA) and the Group of Transport Authorities (GART), and bringing together the entire industry (manufacturers, operators, project manager), as well as local authorities, inspectors and user associations in order to create a guide of good practices and recommendations that could serve as a basis for discussion for current and future cable transport projects in our cities. STRMTG and CEREMA were asked to assist the DMA in this initiative.

The draft guide was worked on throughout 2022 and numerous discussions took place on topics such as the operation of the systems and their implications for accessibility, platform/vehicles car interfaces and their interior design, station accessibility and the management of user traffic.

The guide "For universal accessibility of aerial cable transport in urban areas" was published in June 2023

TÉLÉO, TOULOUSE'S URBAN AERIAL ROPEWAY SYSTEM

The project to create an urban aerial ropeway system in Toulouse dates back to 2012. It is a gondola lift system with «3S» (three-cable) technology. The ropeway system was inaugurated on May 13, 2022.

SIX YEARS OF ASSESSMENT BY STRMTG

- Starting in 2016, STRMTG assessed the first documents that make up the safety definition file (DDS), followed by the other safety files allowing commissioning.
- Acceptance took place from January to April for commercial launch on May 14, 2022.

Tisséo Voyageurs is the operator.
Tisséo Collectivités is the transit authority.
POMA is the manufacturer.

The route connects the Oncopôle sector to Paul Sabatier University, with a stop at Rangueil University Hospital. It improves access to the university hospital, offers an alternative to personal vehicles and reduces travel time from 30 to 10 minutes.

A "3S" URBAN AERIAL ROPEWAY SYSTEM

The "3S" aerial ropeway system is a tricable system with a hauling rope for moving the vehicles and two carrying ropes (on each side) that provide the rail function.

"3S" technology provides the ability to:

- adapt to the topography (pass over the hill, the Garonne River and a nature area);
- fly over a pyrotechnic waste area;
- provide better wind resistance.

CHARACTERISTICS OF TOULOUSE'S URBAN AERIAL ROPEWAY SYSTEM

This aerial ropeway system covers 2.8 km and includes:

- 5 pylons: from 40 to 70 meters in height,
- 3 stations: one at Paul Sabatier University, an intermediate stop at the university hospital and a turnaround station at Oncopôle,
- 15 cable cars with space for 34 passengers,
- operating speed: 7.5 m/s,
- Capacity: 1500 p/h,
- 17-second stops for boarding and disembarkation at each station,
- a garage to store the vehicles.

Particularity of the system: it is built to allow passengers to be retrieved by bringing the vehicles back to the station in all potential malfunction scenarios. This avoids vertical evacuation of the vehicles via aerial rescue.

5- STUDIES AND RESEARCH

STRMTG conducts important studies and research work, essential to maintaining and building the system knowledge and skills of its employees. STRMTG therefore oversaw around twenty studies in 2022, some of which were conducted with partners from the scientific and technical network of the Ministry of Ecological Transition and Territorial Cohesion, and others by consulting firms.
In addition to the areas presented below, other themes were explored, including glacial and periglacial issues or batteries and fire risks.

MAGNETIC ROPE TESTING (MRT) USING THE "HALF-REEL" METHOD

Following pathologies on the carrying ropes of two-cable aerial ropeways in the 1970s, the decision was made to introduce Magnetic Rope Testing (MRT) into French regulations. While the most widely used method is the "full-reel" method, which is identical to the method used today, a second method called the "half-reel" method was proposed to avoid lifting or moving carrying ropes at certain specific points.

The "half-reel" method designed in France aims to cut the MRT device in two (or at least the measuring part, a U-shaped magnetizing part for example, can be kept whole), in order to pass these specific points of the line, where the cable rests on a support (sheave, pulley or even roller chain) The measuring part no longer completely surrounds the cable, but usually only goes halfway round. There are no performance requirements for these "half-reel" devices, other than what is required for the whole device, i.e. "Full-reel", i.e. standard EN 12 927:2019.

Since its introduction and the first analyses of its effectiveness by the Technical Service in Charge of Safety for Ropeways (STRM) in 1983, the "half-reel" method has been highly controversial. The Technical Service in Charge of Safety for Ropeways and Guided Transport (STRMTG) has therefore decided to launch studies on the issue in order to obtain quantified information to assess its performance and try to put an end to the controversy. This report presents the results of the STRMTG 2013 MRT II and 2017 MRT III studies on the performance of MRT devices used in the "half-reel" method. Each of the studies seeks to assess performance through a test derived from the test proposed in Standard EN 12 927:2019 standard for MRT devices used in the "full-reel" method, but adapted to the specificities of the "half-reel" method, for example by taking into account the fact that it is used for cables resting on sheaves.

MULTIAXIAL FATIGUE ON ROPEWAY SYSTEM COMPONENTS

To predict the service life of components of ropeway systems, the Eurocode (NF_EN_1993-1-9) is commonly used. This standard is based on a major assumption: the uniaxiality of stresses.
However, for some components, this assumption has not been verified (e.g.: chairlift attachments subjected to horizontal tightening and vertical loading stresses, or loaded chairlift arches subjected to gravity and shaken laterally when passing a pylon). It therefore seems important to use a fatigue criterion taking into account the multi-axiality of stresses, such as the Dang Van criterion.

The fatigue results obtained are compared to the Eurocode SN curves representing a huge experimental database for uniaxial fatigue, which we propose to use for multiaxial fatigue through appropriate recalibration.

This recalibration is theoretically justified. It ultimately allows unprecedented use of the entire database of the Eurocode detail classes, by generalizing their use for components subjected to multiaxial fatigue.

Work developed as part of N. POYET's M2R internship, co-supervised with the the National Engineering School of Saint-Etienne (ENISE) and STRMTG/GM.

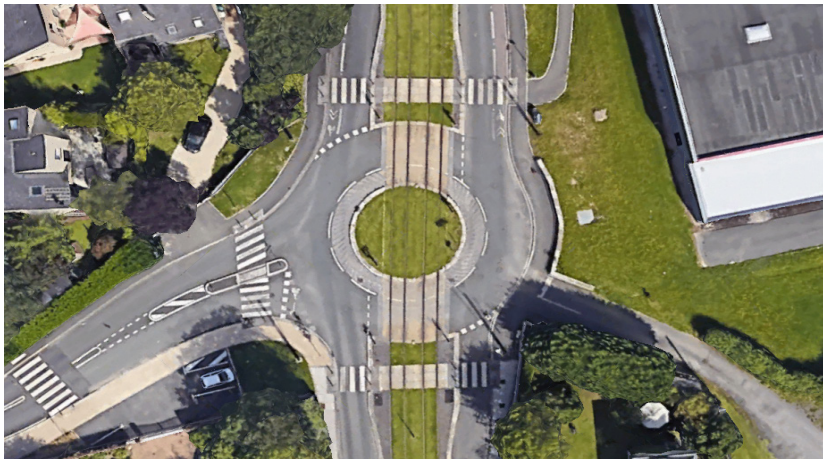
ROUNDABOUTS AND TRAMS

The "Roundabouts and Trams" guide published in 2008 was updated in mid-2017. However, several roundabouts were identified as requiring further analysis.

At the end of 2017, STRMTG tasked Cerema with a study to specify the influence of the guide's criteria on accidentology for these roundabouts.

The study confirmed the relevance of existing recommendations. It specified certain criteria that contribute to the safe operation of trams in roundabouts.

Roundabouts and tramways study



The results of the study will be integrated into a consolidated version of the "Roundabouts and Trams" guide in 2023-2024.

EVALUATION OF THE PERFORMANCE OF VIDEO SYSTEMS FOR THE SAFETY OF GUIDED TRANSPORT IN SKI RESORTS (EVEREST)

The EVEREST project was launched in 2016 and aims to contribute to the development of systems using automatic video image analysis to assist operations during boarding (detection of retention bars that have not been lowered or wrong positioning of passengers on chairlifts) and disembarking (detection of passengers on a chairlift beyond the disembarking point) phases of chairlifts.

For this, videos were acquired from several installations. The various images were then annotated whenever they contained an abnormal situation.

Some of the annotated images were then provided to the scientific community within the framework of a challenge, with the aim of facilitating the development of image analysis algorithms for chairlift problems. This challenge brought together two participants: Bluecime and SIA Partners.

At the end of the work, a half-day feedback session for the industry was organized at STRMTG on Thursday May 12, 2022.

This session was an opportunity to present the work of the participants in the challenge, to evaluate the algorithms in view of their results on unpublished annotated images, and to discuss the perspectives and difficulties with the analysis techniques.
In summary, this evaluation showed encouraging results from the solutions developed by the participants, although they could be improved with further optimization of the algorithms in relation to the test images.

CAM 1: 3/4 front view

CAM 2: Front view

CAM 3: Profile view

Following this challenge, STRMTG hopes that the work undertaken will be continued by the two participants, and even extended to other anomalies to be detected, potentially through partnerships with operators and/or manufacturers, so that operating assistance tools can eventually be implemented in the field.

In addition, the various “test” video databases remain available to potential future developers wishing to work on these issues.

EVEREST study: Evaluation of the performance of mountain guided transport safety video systems

6 - PATHOLOGIES AND ACCIDENTS

Accidents and incidents can occur throughout the life of a system. The STRMTG monitors and analyzes these events, and learns from them to improve safety.

MODIFICATION RECOMMENDATION LOSS OF SUB-CASH OBJECT

Following the derailment of a Marseille metro train in December 2018, caused by the loss of a wiper in a switch core, the STRMTG had launched a survey of operators of networks with rubber-tyred metros. This investigation had shown that friction losses had occurred on other lines in France, so it appeared necessary to measure the occurrence of this phenomenon.

In October 2019, the STRMTG issued an initial recommendation on friction loss on rubber-tyred metro networks. This recommendation asked operators to report any negative friction loss to the STRMTG, and to specify any damage.

At the same time, BEATT conducted a technical investigation, the conclusions of which contributed to the modification of the STRMTG recommendation on the loss of wipers in May 2022.

This became the recommendation relating to the loss of under-case objects, and comprises 3 main actions:

- Metro and RER operators must compile an inventory of sensitive objects identified by the manufacturer or by feedback from recent years. A sensitive object is a component of the rolling stock whose fall could cause a derailment and/or whose dimensions are similar to those of a negative rubrail.
- The loss of an object not yet referenced leads to an assessment of the associated risk. These assessments may then lead to the updating of the inventory of sensitive objects.
- Statistical monitoring of any falls of these sensitive objects, as well as the preventive and corrective actions implemented, are capitalized in the annual operating report.

This recommendation replaces the previous one and takes effect from 2022.

It will make it possible to identify components that may present a risk, and to obtain operating and maintenance feedback on the loss of objects underneath the cash register.

CONI'FER LINE ACCIDENT

Accident on June 4, 2022 on the Coni'fer tourist railway network

On the Chemin de Fer Touristique du Coni'fer line in Doubs (25), an accident occurred on Saturday, June 4, 2022 around noon, slightly injuring eighteen people and seriously injuring one person, out of around thirty passengers.

This accident resulted from the runaway of a boxcar and restaurant car, stopped on a 19/1000 gradient. They hit the steam locomotive Decapod 150Y, which, after being detached, had gone to the station to bring a water tank car to the convoy.

The impact occurred at an estimated speed of approximately 10 km/h.

A BEATT investigation, in conjunction with STRMTG, was launched following this event.

Accident on the Coni'fer tourist railway

ANNUAL REPORT ON THE "FLEET - TRAFFIC - INVESTMENTS - INCIDENTS"

FOR ROPEWAYS AND MOUNTAIN RESORT TRAVELATORS

For the 2021/2022 season, STRMTG merged two of its annual reports on ropeways and travelators. Initially, the "Fleet - Traffic - Investments" report was published in September and preceded the "Ropeways and Travelator Accidents" report by several weeks. This merger brings together the two aforementioned publications in a single annual report, "Fleet - Traffic - Investments - Incidents".

It contains the following information in a single document:

THE FLEET OF ROPEWAY SYSTEMS AND MOUNTAIN RESORT TRAVELATORS

- fleet composition
- multi-year changes
- fleet distribution by mountain range

TRAFFIC

- 2021/2022 season
- multi-year changes
- by category of system
  - by mountain range

INVESTMENTS

- in new systems in 2022
- the multi-year change in new systems

INCIDENTS

- the distribution of accidents with serious injuries according to different criteria
- distribution of serious injuries by equipment family and age
- falls from height on chairlifts with or without injury

It is available on the STRMTG website: annual report

Annual reports on the fleet, traffic, investments and events for ropeway installations and mountain resort travelators

RECOMMENDATION: "UPGRADE MOUNTAIN RESORT TRAVELATORS IN OPERATION SINCE BEFORE 2004"

On February 14, 2004, a fatal accident occurred on a travelator linking the center of the Val Cenis winter sports resort (Savoie) to its ski area.
In 2004, to prevent this dramatic accident from occurring again, the Ministry of Transport worked with the industry to establish a set of technical requirements for the design, installation and operation of these mountain resort travelators and ensure their safety.
New rules concerning these systems took effect in the 2004/2005 winter season for new travelators.
However, mountain resort travelators that were already in operation before 15 September 2004 were only partially brought into line with these requirements.

Considering that these travelators have a lower safety level than travelators put into service after September 15, 2004, Article 5-IV of the amended Order of September 29, 2010 requires that they be compliant with all the requirements applicable to new travelators by September 15, 2024 at the latest.
A recommendation reiterating this regulatory requirement has been sent to the operators of mountain resort travelators that have been in operation since before 15/09/2004

The operators concerned have until September 15, 2024 to bring these travelators into compliance with the provisions of the aforementioned Order of September 29, 2010.

RECOMMENDATION FOR "SIDE GUARDS" ON TRAVELATORS

Mountain resort travelators are equipped with a travelator which users (skiers, pedestrians, etc.) step onto at the boarding point.

They are then transported to the top where they disembark either in the direction of travel (front) or to the side.

This travelator forms a loop, where the return part passes directly underneath the travelator structure. This part of the belt is supported by rollers which can create a trapping hazard for someone accessing the side of the travelator.

Since 2016, new mountain resort travelators have been equipped with permanent vertical side guards (rigid panels or tarps) down to the snow-free ground, to prevent access to these moving parts along the line.
For travelators in operation since before 2016, it was accepted that the rotating parts would be protected by maintaining a sufficient level of snow on both sides of the conveyor line during operation.
Feedback from STRMTG inspections has shown that this operating measure does not fully protect against access, especially in periods where there is a lack of snow.

In light of these findings, STRMTG has issued a recommendation to extend the requirement to all mountain resort travelators for permanent vertical side protection (rigid panels or tarps) along the line, down to the snow-free ground. Compliance must be achieved before the 2024/2025 season.

INVESTIGATION OF THE CONNECTIONS BETWEEN THE SUPPORT ASSEMBLY AND HAULING ROPE OF SOME BICABLE ROPEWAY SYSTEMS

In May 2021, an accident occurred on a reversible bicable aerial ropeway in Stresa, Italy, in which 14 people died when the cable car they were in fell. The Italian authority in charge of the administrative investigation, the Direzione Generale per le Investigazioni Ferroviarie e Marittime (DIGIFEMA), issued an interim report in May 2022 confirming that the cable car fell as a result of the hauling rope snapping at the metal capping on the top of the vehicle while the vehicle's brake had been disabled.

STRMTG decided to launch an investigation into the methods of inspecting and monitoring the connections between the support assembly and hauling rope provided by end fittings (metal capping, dry cappings, attachment drum, etc.), present on some French aerial ropeway systems.

This investigation ensured, before the start of the 2022 Christmas holidays, that the issue of these specific end attachments is generally clear and well-managed by the operators of the systems concerned.

Technical investigations are still underway on the Italian side to determine the cause of the cable break at the metal capping.

ROPEWAY PATHOLOGIES

When significant incidents or accidents affect ropeway systems, the operators concerned are required to report the events to the prefects, via STRMTG local offices.
Depending on the type of event, some are analyzed in detail, in order to identify the causes, the potential of them occurring on other systems, the related safety issues and the possible actions to be implemented on the fleet.

In 2022, STRMTG coordinated these analyses in collaboration with the partners concerned (manufacturers, operator representatives), and it was possible to end some monitoring activities that had been underway for several years.

In 2022, STRMTG issued three recommendations requiring the replacement of safety components or parts of safety components (e.g. replacement of old two-person chairlifts). **No recommendations were made for other analyses, which can be tracked in the CAIRN database.**

7 - DISCUSSIONS AND TRAINING

The STRMTG works to develop its own skills and those of all those involved, through training initiatives and its links with the Scientific and Technical Network. It involves the industry in drawing up rules to ensure that safety issues are properly taken on board.

STRMTG IN THE DAY ON HUMAN AND ORGANIZATIONAL FACTORS ORGANIZED BY EPSF

Human and Organizational Factors (HOF) are now clearly identified as an important part of safety. Based on this observation, in 2022, STRMTG began to explore how these factors could be better taken into account in operator safety management systems.

This meant that STRMTG employees first had to increase their expertise in this area. To do so, the department approached the French public railway safety authority (EPSF), which is already involved in the same initiative. Four employees from the department were invited to participate in a day of discussions on HOF organized by EPSF for its employees.

The day provided an opportunity to discover the work of EPSF's HOF working group, learn about the importance of these factors and discuss ways of integrating this theme into the activities of a national safety authority (ANS). The day was productive and informative, and the points discussed were largely applicable to STRMTG's own work.

In 2023, the STRMTG will continue this initiative and plans to organize similar days for its employees.

STRMTG events and major projects

DAY OF DISCUSSIONS ON OPERATING FEEDBACK FROM URBAN INTEGRATION OF TRAMWAYS

The day of discussions and feedback on the theme of urban integration (UI) of tramways is organized by STRMTG and led by the tramways and rolling stock department (DTMR), in association with Cerema. It is usually held every year, with the participation of various targeted professionals from the tramway sector:

- Approved or accredited qualified bodies specialized in urban integration of tramways;
- Tramway operators;
- Cerema;
- STRMTG inspection departments.

The purpose of the day is to meet with professionals in the sector, to share and communicate feedback on issues related to urban integration of tramways.

In 2022, the day was held on October 13, 2022 at the Pavillon de la Soie near Lyon (Vaulx-en-Velin), with 72 participants.

WHY ARE THESE DAYS OF DISCUSSION AND FEEDBACK IMPORTANT?

The purpose behind these days, the first of which took place in 2011, - was to respond to the requests of approved or accredited qualified bodies specialized in urban integration of tramways (AQO UI).

These AQO UI regularly work on tramway system design or modification projects. However, they do not systematically receive feedback about the systems seen in the design or modification files. Operators gain real field experience and can therefore collect feedback. The day provides an opportunity to bring these two dynamics together.
For STRMTG, the day provided an opportunity to expand feedback and discussion methods. This meeting is therefore a response to regular requests from AQOs, but especially offers the chance for the three groups of actors in attendance to share thoughts and ideas.

STRMTG has been organizing this day every year since 2011 (except during the Covid pandemic), and it remains an opportunity to bring together the dynamics of AQO UIs and operators, and to communicate this national scale feedback to AQO IUs, as well as operators, Cerema and STRMTG inspection departments.

8- ORGANIZATION AND MANAGEMENT

STRMTG's organization is based on a high-performance ISO 9001-certified quality management system. It is also based on a multi-year service project whose priorities are validated by the DGITM.

STRMTG HAS ADOPTED A MANAGEMENT CHARTER

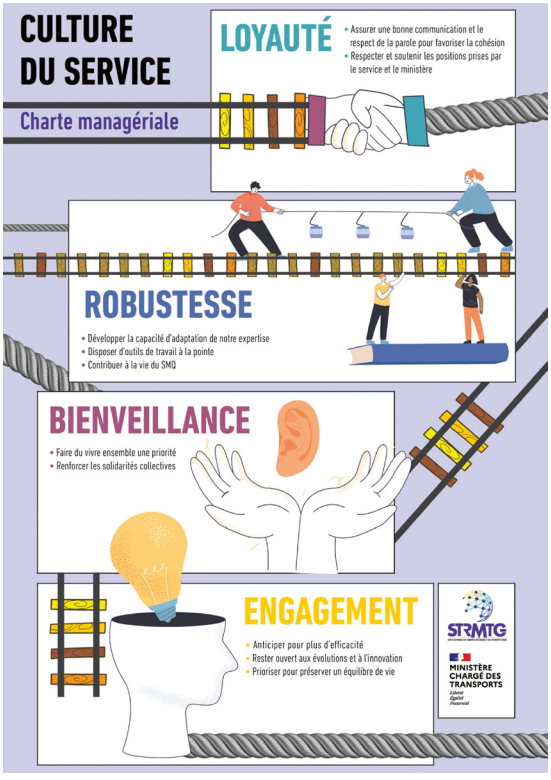
As planned in the 2022-2025 service project, a management seminar was held on June 16, 2022. The aim was to share a set of values for the service and for relationships within the management team.

The work carried out during the seminar led to the development of a management charter. It outlines the values shared by our STRMTG management team, as well as associated principles and practices.
Prior to the seminar, the managers completed a values survey, which identified the following four core values:

- Kindness
- Loyalty
- Robustness
- Commitment.

During the seminar, each of the values was discussed in smaller groups in order to associate principles with these values. Participants were then asked to identify behaviors that demonstrate these principles, i.e., expected concrete attitudes that put values into practice on a day-to-day basis.
The day ended with a graphic work session in order to provide our service provider with the building blocks for designing a visual.

Following the latest internal consultations, our management charter was approved at the end of November 2022.



Next step the next step is the 2023 seminar with all STRMTG staff, on the service's mission and values.

INCREASED ECO-RESPONSIBLE ACTIONS

In 2022, STRMTG created an internal organization designed to offer a more participatory approach to developing actions to reduce the environmental impacts of its activities.

In practice, this has led to the creation of a "technical committee" made up of employees from the department who volunteer to work on these issues. The purpose of this body is to develop new measures and contribute to the development of actions already underway to:

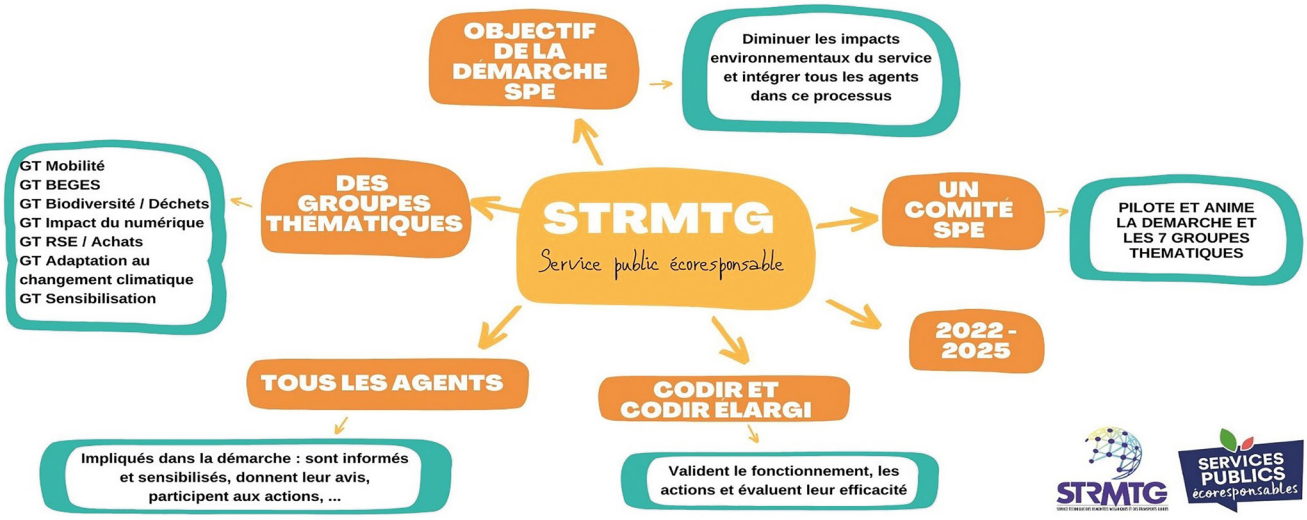
- reduce greenhouse gas emissions from STRMTG activities;
- reduce the impacts of the department on biodiversity loss and pollution;
- promote internal actions concerning CSR (through responsible purchasing, contribution to the circular economy);
- improve employee knowledge of the issues associated with these topics.

This framework led to the organization of an awareness and discussion day on mountain biodiversity. The event was held on November 22, 2022 and brought together a group of economic, scientific and institutional actors who work in mountain areas.

Work has also been launched on mobility, starting with a diagnosis to clarify the available data about travel generated by the department's activities, both work and home-to-work-related. The aim is to establish a plan that identifies relevant measures to reduce the impacts of this travel.

New ideas will be added in 2023. For example, the exploration of climate change adaptation issues for the transportation systems overseen by the department, and solutions to be implemented to make the buildings managed by the department more energy efficient.

The goal of this work is to better integrate the policies of our ministry in response to societal demands and the changing international context, which make reducing environmental impacts, climate issues and saving resources a priority.



9 - INTERNATIONAL

The STRMTG shares its expertise with various international bodies. It provides training, exchanges and assistance to control authorities abroad. Finally, it takes part in international meetings on transport safety.

URBAN TRAM FORUM 2022

Photo taken at the 2022 UTF in Paris

The Urban Tram Forum (UTF) is a network of European experts created following COST Action TU1103 - Operation and safety of tramways in interaction with public space.

The group is dynamic and has grown since COST Action, with experts from Europe and the United States, and even Australia (in videoconference sessions).

In June 2022, the UTF was held in Paris and the surrounding region. Meetings took place in the Sequoia Tower of the Ministry of Ecological Transition and Territorial Cohesion (reserved by BEA-TT).

Île-de-France Mobilités received UTF members for a tour of the T4 tram line north-east of Paris, linking Bondy to Hôpital de Montfermeil and Aulnay-sous-Bois.

Then, the RATP welcomed UTF members on the T3b tram line. The RATP presented the T3a and T3b lines, the accidentology of the line, and then accompanied the UTF on a tour of the maintenance and storage site and the T3b line.

UTF - Urban Tram Forum (from the COST TU 1103 programme)

RESCOR 2022 IN COPENHAGEN

The 2022 edition was held on June 2 and 3 in Copenhagen, Denmark, with around 15 participants.
The first day was devoted to a meeting with the operator of Copenhagen's automated metro, a visit to the central command center (which operates 24/7) and a tour of the M4 line, the latest line to be commissioned, in March 2020.
A plenary meeting was held on the second day. A wide variety of topics were discussed, including:

- the organization and work of our Danish and Irish counterparts in terms of safety management and monitoring for trams, light rail and metro systems;
- a Swiss study on passenger accidentology;
- a runaway vehicle incident during testing on the metro network of Barcelona;
- regulations concerning the operation of work trains/service vehicles.

RESCOR is the European Network of Services in charge of the Oversight and Regulation of Urban Public Transport Safety.

OITAF SEMINAR AT THE MOUNTAIN PLANET

As part of the Mountain Planet 2022 trade show in Grenoble, OITAF traditionally organizes a seminar led by one of its study commissions. After postponements due to the Covid-19 pandemic, the show was held in April 2022, and a seminar was led by Committee No. VI: "Optimization of operation of ropeway systems". The theme chosen was: "Ropeway transport - top safety".

Committee VI includes members from European countries with various positions: operators, manufacturers, preventionists and supervisory authorities.

The theme of the seminar allowed each of the committee's actors to present one aspect of the topic according to their areas of expertise. The seminar consisted of a series of short presentations by the members of the committee, covering the history of ropeway transport, technology and standards, the training of operators, inspection and maintenance operations, the use of operating feedback, and finally accident statistics.

STRMTG participates in Committee VI, and one of its agents spoke three times at the seminar: on the implementation of safety management systems, on the new measures for wind and gauge management, and finally to explain the official figures on ropeway transport accidents in relation to other modes of transport.

OITAF (STUDY COMMITTEE): STRONG STRMTG INVOLVEMENT

This year, STRMTG resumed nominal participation in the various bodies of the International Organization for Transportation by Rope (OITAF).

The department's experts are involved in five of the organization's six study groups (ropeway techniques and technical recommendations, ropeway characteristics, electrical components, legal and economic matters, and operations) and have worked alongside their partners to develop international policy on ropeway systems in the ten or so committee meetings held in 2022.

This is a strategic area for the STRMTG which is positioned as a major contributor to the development of safety rules for ropeway systems at the international level.

DELEGATION FROM INDIA

On November 18, 2022, STRMTG met with a delegation from India, which included 4 people representing authorities in the state of Sikkim, in northeastern India.
The meeting was initiated by POMA which builds ropeway systems in the region.

In this context, STRMTG presented the regulations for ropeway transport systems (French and European) concerning authorization procedures, the main technical standards, system monitoring, the organization of operators (safety management systems), the use of independent approved bodies and the organization of inspections.

The meeting was an opportunity to promote the organization and know-how of the French ropeway industry throughout the life cycle of ropeway systems.

ARGENTINEAN DELEGATION IN FRANCE

On April 20, 2022, STRMTG received a delegation from Argentina at its Saint Martin d'Hères office.

The meeting was initiated by a former executive project manager. The Argentine delegation included three technical representatives of EAMCEC (Ente Autárquico Municipal Cerro Catedral). This entity performs similar work to STRMTG in San Carlos de Bariloche, Argentina. However, its supervisory work is not limited to ropeways but also includes ski slopes, the organization of rescue services, food service in the ski area, etc.

The presentation began with the general organizational structure of STRMTG and its organization in relation to the work it carries out (both at the national level and on behalf of prefects). The work of the Notified Body and the CE marking of safety subsystems and components was then presented. The meeting then ended with a presentation of the assessment and inspection work carried out by STRMTG offices on behalf of the prefects, with a focus on the follow-up of periodic inspections and major inspections, as well as "operational inspections" activities.

The afternoon ended with a discussion time that was highly enriching for all the participants.

FRANCO-MEXICAN COOPERATION IN RAIL TRANSPORT

The STRMTG was asked by the European and International Affairs Directorate (DAEI) to participate in a working group on rail transport issues led by the regional economic department of the French Embassy in Mexico City. A working meeting was organized in August 2022 during which Alexandre Dusserre and Ludovic Brun represented STRMTG.

The Ministry of Transport (Mexican Railway Agency) introduced the session by presenting the challenges that Mexico faces.

The meeting continued with:
- a brief presentation of STRMTG;
- an explanation of the main principles of the two major rail systems in France: interoperable rail and the decree on the safety of public guided transport systems (STPG);
- a more detailed presentation of the STPG approach and its advantages, in particular the possibility of using reference guidelines and standards adapted to the safety issues of the system in question.

The meeting ended with a productive discussion with the Mexican partners, which allowed us to answer their questions directly.

In addition, after this meeting, we put our contacts in touch with French public railway safety authority (EPSF) for a more detailed presentation of the rules applicable to interoperable rail lines.

10- NOTIFIED BODY

STRMTG is also a notified body under European Regulation (EU) 2016/424 on cableway installations and, as such, assesses the compliance of cableway installation safety components and subsystems with the regulation's essential requirements on behalf of manufacturers.

GMM TSF4 CHANGEOVER TO EUROPEAN REGULATIONS

The manufacturer GMM has entrusted STRMTG-ON with the EU compliance testing of its 4-person fixed-grip chairlift. This was a changeover to Regulation (EU) 2016/424 for this historic chairlift range, which had already been CE labeled by STRMTG-ON under the previous Directive 2000/9/EC.

GMM has retained much of its design, which directly complies with most of the requirements of the European CEN/TC 242 standards. The few deviations from limited aspects of the standards have been justified by GMM both technically and by analysis of the largely positive feedback on its existing lifts.

The STRMTG-ON worked with the manufacturer throughout the process between 2020 and 2022, assessing compliance with the regulation for most of the safety components and subsystems, such as subsystem 4 "Vehicle" (see diagram below). The last safety components of subsystems 3 (mechanical devices) and 5 (electrotechnical devices) were approved in the last quarter of 2022 for the first GMM system to receive "Chairlift 7+" certification.

The "Bosses" TSF4 system was therefore commissioned in Gourette (Pyrénées-Atlantiques) in December 2022 (photo above).

Véhicule TSF4 GMM
Essais extensométriques GMM/CETIM & Contre calcul en fatigue

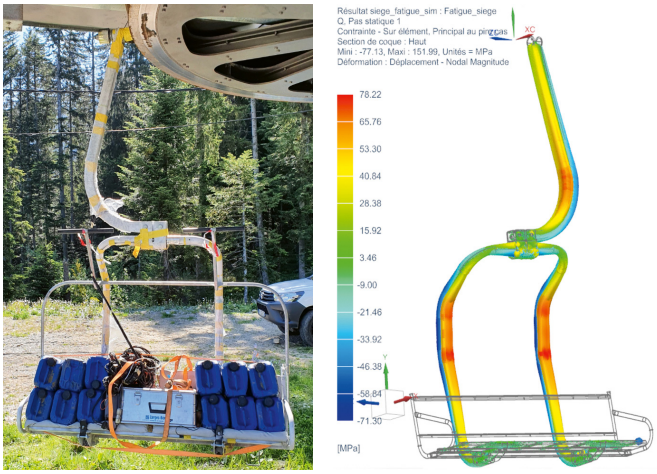
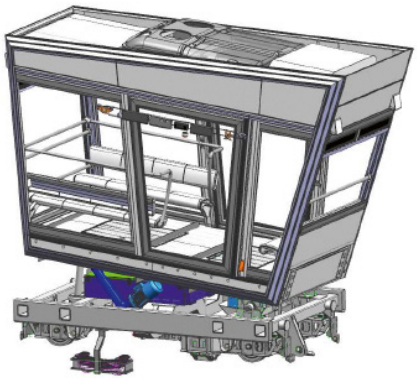
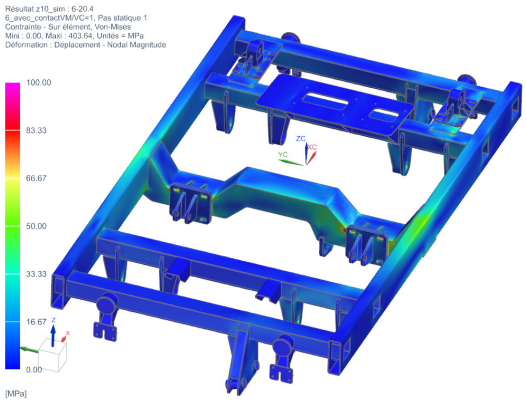


Photo and counter calculation: STRMTG-ON. Photo taken in Bernex on the Petit Combet TSF4 on 18/05/2022 during extensometry testing by CETIM for GMM, in the presence of STRMTG-ON.

LEITNER FUNICULAR RAILWAY PROJECT IN MILAS





Following recent funicular railway projects in 2018 (in San Pellegrino, Italy) and 2021 (in Tibidabo, Spain), Leitner wanted to continue its collaboration with STRMTG-ON to obtain certification of several assemblies for the funicular railway project in Milas, a seaside resort in southeastern Turkey.

This funicular railway project serves different levels of terrain. It uses a system with a single unmanned 33-person car, operating back and forth on a 660 m line with 8 stations. To ensure user comfort, the design ensures that the floor of the car remains horizontal throughout the journey despite the variations in slope.

STRMTG-ON's service covers subsystems No.2 (drive and brakes), No.3 (line) and No.4 (vehicle). For subsystem No.4, STRMTG is in charge of certifying the undercarriage (chassis/wheels including the track brake, cable end attachment) and the complete subsystem.

The mechanical design of the various safety components (mainly the chassis and its various components) were verified by analysis of the calculation notes or independent re-calculations (see. image) by means of finite element software, using static and fatigue calculations.
In addition to these verifications, the functionality of the components and subsystems, as well as the maintenance conditions, were examined. To date, subsystems 2 and 3 have already been approved.

The 2022 KEY FIGURES for the Notified Body

- **106** new certifications or design reviews of safety components and/or subsystems.
- **81** changes to previously evaluated components or subsystems.
- **13** manufacturer audits.

Since 2003, under Directive 2000/9/EC
- **3821** actions (modules H7, B, F and G) and **141** manufacturer audits.

From 2018, under Regulation (EU) 2016/424
- **998** actions (modules H1 3.6, B, F and G) and **57** manufacturer audits.

STRMTG

The Technical service in charge of safety for ropeways and guided transports

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