

THE **BOOK** OF **Innovations**



In order to meet the technological and societal challenges of each era, the world of engineering has always relied on its capacity for innovation, especially in terms of design, study and production of works, equipment and products.

Whichever field Segula Technologies is engaged in - Automotive, Aerospace, Energy, Naval, Railway or Oil & Gas - our group's DNA drives us to find the solutions required to bring these projects to life, and to support their implementation as competitively as possible. Naturally, then, innovation has a special place in our development strategy and growth momentum.

In a world of ultra-competitive markets, our customers need rapid innovation. In order to support them, we provide a consistent source of innovative solutions by relying on:

- > **the effectiveness of our organisation:** our Research and Innovation (R&I) is essential for understanding our customers' needs. It is at the core of our agencies and brings us closer to our customers and staff. This proximity also allows us to maintain close relationships with SMEs, Start-ups, laboratories and industry clusters, leading to cross-fertilisation and creativity.
- > **The talent of our engineers,** and the passion which drives them: more than 200 projects are developed every year by our R&I teams. These projects bring together talented individuals to collaborate on major challenges in the design of new products, systems, services and methods.
- > **open innovation:** large-scale alliances and collaborative projects have been formed with well-known customers and partners, enabling us to innovate quickly by capitalising on new synergies.



We are acutely aware that our engineers can play an important role in shaping the world of tomorrow. As such, our group is particularly focused on **6 AREAS**:

Industry 4.0			Tools and advanced methods
Connected, autonomous mobility			Weight reduction / new materials
The environment			Data Engineering

Our Book of Innovations is here to provide an overview of some of the current innovations being developed by our R&I teams.

We hope that this information will allow you to see a new side of our group: our capacity to continually innovate in order to anticipate and support the changing world of Industry.

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STABILOAD

Stabiload



AN ONBOARD LOADING AND STABILITY CALCULATOR



The ship loading process must adhere to stability criteria while maintaining the proper distribution of stress on the ship's structure.



STABILOAD is a modular onboard loading and stability calculator used by ship's crews. It can simultaneously simulate structural strength and check stability criteria.



It performs stability calculations by calculating the free surfaces when intact or damaged (hydrostatic equilibrium, verification of regulatory criteria - IACS type 2 and 3), and by calculating structural strength. STABILOAD also simulates damage (flooding combinations).



Improved safety, swift implementation of the loading plan (remote level indicators), customisable software.



Project owner:
Segula Technologies



Customers/users:
BRITTANY FERRIES,
CFT, PIRIOU, MCM,
NAVY, etc.



Areas of Expertise:
Naval architecture,
Stability, Software
engineering

ODOT



5% FUEL SAVINGS WITH LOADING MANAGEMENT SOFTWARE



Environmental and health concerns, along with the rising cost of fossil fuels, make the reduction of ships' energy consumption a priority.



The ODOT (Operational Displacement Optimisation Tool) project aims to provide crews with a decision support tool to better manage cargo (freight, consumables) and thus reduce energy consumption. It has been selected as part of the JOULE H2020 European collaborative project.



The ODOT module optimises weight distribution in the ship, reducing the ship's underway resistance and leading to energy savings of more than 5%.



Low financial investment, immediate return on investment, no modification required to existing ships, easy to pick up.



Project owner:
Segula Technologies



Partners:
STX France,
BRITTANY FERRIES
EU H2020



Schedule:
Prototype tested
Commercialisation
2018



Areas of Expertise:
Naval architecture,
Hydrodynamics,
Software
engineering

REMORA



Project owner:
Segula Technologies



Partners:
CETIM, IMTA,
IREENA, GEPEA,
ICAM, ADEME



Schedule:
Prototype 2018
Demonstrator 2020+



Areas of Expertise:
Thermal, Power
electronics, Hydraulics,
Naval Architecture

HIGH EFFICIENCY SEA-BASED ELECTRICITY STORAGE



Energy storage needs are becoming increasingly important due to the growing share of intermittent renewable energies in the energy mix.



The REMORA project aims to meet the flexibility needs of power networks by storing electrical energy offshore in the form of compressed air, with an overall efficiency target of 70%, and a capacity of several hundred MWh.



REMORA hinges on a process developed and patented by SEGULA Technologies that uses the principle of isothermal air compression. A design demonstration prototype is under development.



Great potential for acceptance (inconvenience restricted because of the unobtrusiveness of the facilities), proximity to off-shore wind generation, non-polluting process, lower storage cost than batteries, adaptable modular system.



SOxLOW



Project owner:
Segula Technologies



Partners:
UCCS,
IPREM



Areas of Expertise:
Chemistry, Industrial
Processes, Shipping

ONBOARD DESULPHURATION OF MARINE FUEL



The international MARPOL (MARine POLLution) convention sets requirements for significant reductions in the discharge of contaminants, and therefore requires the development of alternative retrofit technologies.



SOxLOW is aiming to develop a desulphuration system for marine fuels (heavy refining products) for continuous onboard treatment.



SEGULA Technologies has developed methodologies for sulphur compound analysis that are suitable for marine fuels and necessary to process them. The Group has conducted hydrocarbon decontamination experiments.



Possibility of adapting the system to existing ships, functional for all types of heavy fuel oil, reduction of environmental and health impacts in compliance with the various regulations.



The environment



Connected, autonomous mobility

GREEN DELIRIVER Waterway logistics



Project owner:
Segula Technologies



Partners:
GPSEO, NOVALOG,
HAROPA, GRDF, VNF



Areas of Expertise:
Naval architecture, Energy
efficiency, Logistics, Design

A LOGISTICS SOLUTION TWO TIMES LESS POLLUTING THAN ROAD TRANSPORT



The massive boom in e-commerce has greatly increased the need for alternative logistics solutions for parcel delivery, since road transport is the world's second biggest source of carbon dioxide emissions.



GREEN DELIRIVER is a solution for preparing, transporting and storing goods that uses inland waterways and electric conveyors to carry merchandise to their destinations in urban centres, thus reducing the number of trucks in urban areas.



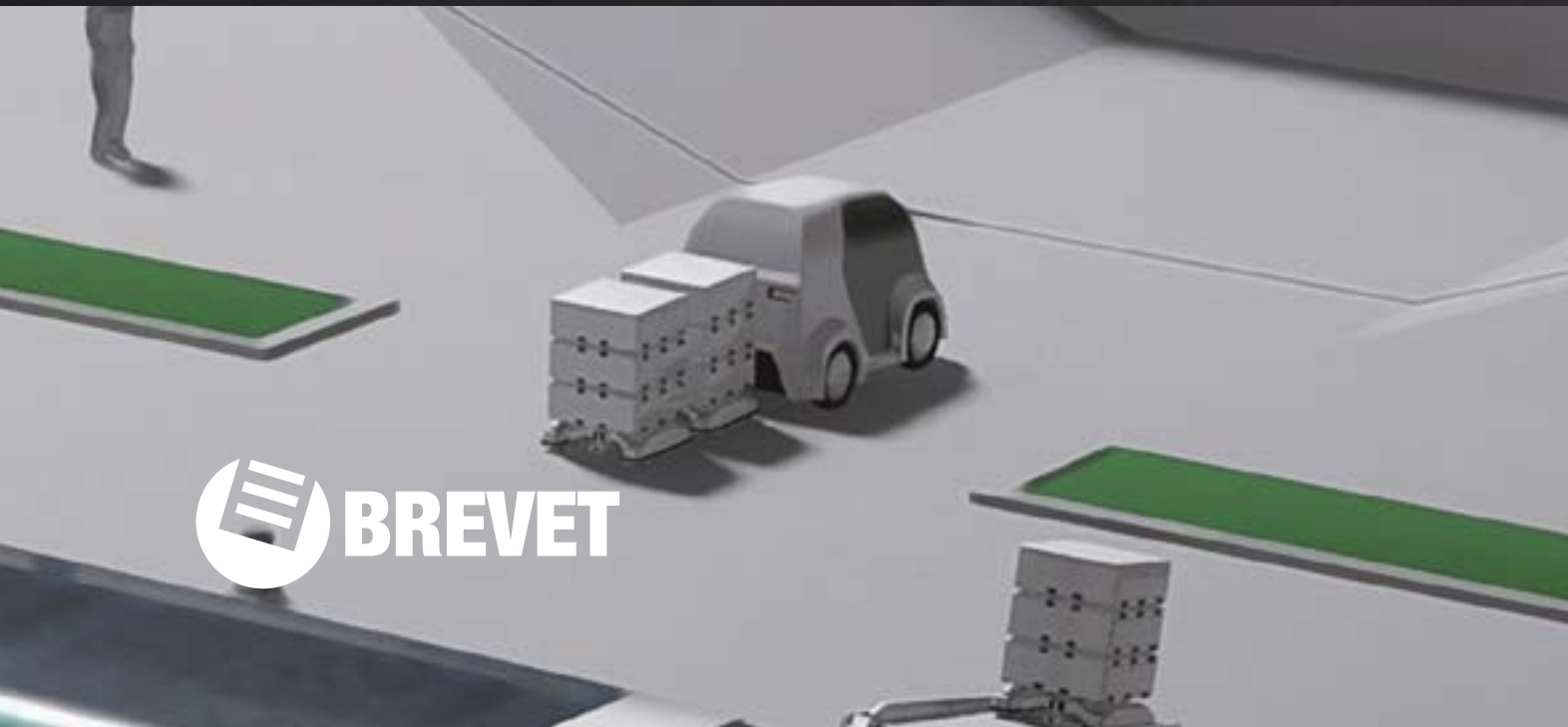
GREEN DELIRIVER is equipped with a hybrid gas-electric engine, photovoltaic panels, batteries and lightweight materials, thereby reducing energy consumption.



Reduction in harmful emissions, reduced noise pollution, urban decongestion, design in harmony with urban landscapes, and integrated logistics eliminating the need for a specific unloading infrastructure.



GREEN DELIRIVER Autonomous Conveyor



AUTONOMOUS LAST KM CONVEYORS: SMART GOODS MANAGEMENT



The massive boom in e-commerce has greatly increased the need for alternative logistics solutions for parcel delivery, since road transport is the world's second biggest source of carbon dioxide emissions.



GREEN DELIRIVER last km electric conveyors are designed to load and deliver goods to urban centres, thereby reducing pollution and traffic.



GREEN DELIRIVER last km electric conveyors are autonomous loading systems directly embedded on board a ship/train/lorry. Once they arrive at a delivery site, they directly proceed to their delivery locations. The battery is recharged while the packages are unloaded and loaded.



Reduction in harmful emissions, reduced noise pollution, urban decongestion, integrated logistics eliminating the need for a specific unloading infrastructure.



Project owner:
Segula Technologies



Partners:
GPSEO,
NOVALOG,
HAROPA



Schedule:
Prototype 2018



Areas of Expertise:
Systems architecture,
Energy efficiency, Mechanics,
Logistics, Design

RC-HYDRO

REGULATING A HYDROELECTRIC POWER PLANT



Hydroelectric plants produce electricity on a continuous basis, but can also adapt very quickly to energy consumption needs. To achieve these rapid adaptations, the turbines need to be properly regulated, as they are designed to function at a nominal level with very little variation.



The RC-HYDRO project aims to develop a tool to digitally simulate the operation of turbines and hydroelectric power plants in order to regulate them based on energy requirements.



SEGULA Technologies has been engaged in modelling the actual operation of hydroelectric plants in order to determine the regulation parameters (flow, speed, power, etc.) for different types of turbines. The proposed models are correlated with experimental data.



Provision of a modelling tool for hydroelectric plants with Francis, Pelton and Kaplan turbines; Creation of simulation libraries.



Project owner:
Segula Technologies



Areas of Expertise:
Simulation, Fluid mechanics,
Regulation, Energy, Turbines



FAB 3D



REDESIGN AND ADDITIVE MANUFACTURING OF COMPLEX SYSTEMS



The redesign of existing systems, together with additive manufacturing, offers great potential for reducing the weight, costs and number of parts, as well as for simplifying processes.



SEGULA Technologies has redesigned a pressurised helium tank for launch vehicles by incorporating the feasibility of additive manufacturing. The objective is to reduce weight and minimise bulkiness.



SEGULA Technologies has developed specific skills as well as a methodology for redesigning complex systems using functional and topological optimisation.



Savings in completion time (2 days vs. 6 months), bulkiness, weight (25%), safety and costs.



Project owner:
Segula Technologies



Partners:
CNES, AREVA



Areas of Expertise:
Optimised re-design, Topological and
functional optimisations, Calculation

ARCCAM



USING ADDITIVE MANUFACTURING TO ACHIEVE 40% WEIGHT REDUCTION IN RAILWAY STRUCTURES



To reduce the energy consumption of trains and rail wear, railway vehicles need to be made lighter.



The ARCCAM (Advanced RailCar Conception for Additive Manufacturing) project aims to reduce the weight of heavy components (undercarriage and bogie) by at least 40%.



The weight of the structures has been optimised using topological optimisation and re-design processes, while ensuring that all features remain in compliance with allowable criteria. Topological optimisation coupled with additive manufacturing makes it possible to reach a technical optimum, reduce the number of parts and speed up the manufacturing process.



Equipment and assembly stages eliminated. Tooling and assembly stages eliminated. Bogie frame 40% lighter.



Project owner:
Segula Technologies



Areas of Expertise:
Optimised re-design, Topological
and functional optimisations, Calculation



SARISTU



MODELLING THE PROPAGATION OF COMPOSITE PANEL DAMAGE



To make way for the aircraft of the future and respond to economic and environmental concerns, SEGULA Technologies is participating in a vast research programme launched by the European Commission.



The SARISTU (FPRD) collaborative project has brought together 64 major aerospace companies with the aim of designing the aircraft of the future by reducing structural weight, improving performance and reducing costs.



SEGULA Technologies has developed a method for demonstrating the effect of composite panel damage during compression and buckling. The group conducted a study on the consortium demonstrator (a complex composite panel) and introduced an innovation into the bonding models based on the damage demonstrated.



Development of a tool to model composite structure damage, weight savings on weight, design time and testing time. Reduction in development costs.



Project owner:
AIRBUS



Partners:
LATECOERE, CNRS, ONERA,
ALENIA, BOMBARDIER
EU FPRD



Areas of Expertise:
Aerospace, Composites,
Bonding, Propagation, Damage



TOLDO

IMPACT DAMAGE TOLERANCE OF A COMPOSITE LAMINATE



Composite laminates are sometimes exposed to external mechanical impacts, which can significantly change their structure and reduce their strength.



The TOLDO project aims to simulate the behaviour of carbon/glass hybrid composite structures after an impact such as a tool drop or bird strike.



SEGULA Technologies has developed a digital model to simulate the damage caused by an impact. This model has been validated by experiments. As a result, digital solutions were developed in order to improve damage tolerance.



Provision of a predictive digital model, increased lifespan of materials, increased security.



Project owner:
Segula Technologies



Partners:
ISAE, ICA, CNRS,
AIRBUS, ARIANE Group



Areas of Expertise:
Aerospace, Laminates,
Digital modelling, Impacts



FISA



PROPAGATION OF CRACKS IN AIRCRAFT STRUCTURES



Increasing the lifespan of aircraft structures requires a predictive treatment of crack propagation in metal parts under intense pressures.



This project, in partnership with AIRBUS, aims to increase structural lifespan and optimise maintenance schedules.



SEGULA Technologies has developed a digital model that can reproduce the physical phenomena occurring during the propagation of cracks on structural parts, as well as validate the technological processes employed to delay their appearance.



Provision of a predictive model, increased aircraft lifespan, improved safety.



Project owner:
Segula Technologies



Partners:
AIRBUS



Areas of Expertise:
Aerospace, Digital modelling,
XFEM



GENOSIA

A NEW COCKPIT SEAT, 20% LIGHTER AND WITH NEW FEATURES



Weight reduction and safety are key issues for the aerospace industry.



The GENOSIA (FUI17) collaborative project aims to develop a cockpit seat that provides greater safety in case of impacts, but is also lighter, more ergonomic and more comfortable, all thanks to new features such as the inclination of the seat and armrests.



SEGULA Technologies has carried over the expertise it developed in the automotive sector in order to incorporate new functionalities in the pilot's seat, while taking into account the constraints of the aerospace sector.



New seat architecture reduces its mass while adding comfort and ergonomical features and maintaining pilot safety in the event of a crash. Improved crew alertness.



Project owner:
STELIA



Partners:
AEROSPACE VALLEY, ARTUS
& TFE, CRITT, AXIAL, CNRS,
CELSE PORTALLIANE



Areas of Expertise:
Aerospace, Design,
Calculation, Crash



SICCRIO

COCKPIT SEAT IN CRASH & BIOMECHANICS



Today, aeroplane cockpit seats are still dimensioned using an extensive array of prototype tests. Digital simulation can be used as a substitute to reduce study time and cost.



The aim of the SICCRIO project is to develop a crash test simulation model that takes into account biomechanical analysis criteria, and ultimately to size and optimise a cockpit seat in terms of mass and ergonomics.



The model developed reproduces the behaviour of the seat and its occupant under transient dynamic loading.



Provision of a digital model which meets aerospace regulations, savings in development time, weight savings, improved safety.



Project owner:
Segula Technologies



Partners:
STELIA, ZODIAC



Areas of Expertise:
Aerospace, Crash, Transient
mechanics, Biomechanics

MIFOSA

MODELLING LIGHTNING IMPACTS ON AN AEROSPACE STRUCTURE



Heavy defences are currently added to planes to protect composite structures against in-flight lightning strikes. If their weight is to be reduced and their size optimised, the phenomenon of lightning strikes must be better understood and managed.



The MIFOSA project aims to develop a methodology for modelling lightning strikes.



SEGULA Technologies has been engaged in describing the mechanical stresses resulting from a lightning strike, using an experimentally validated digital modelling tool.



Development of a lightning strike modelling tool, Reduced structural weight, Reduced development time, Safety.



Project owner:
Segula Technologies



Customers:
AIRBUS, BOEING,
EMBRAER, etc.



Areas of Expertise:
Aerospace, Impact, Lightning,
Digital modelling



MESMA



MODELLING AN UNDERSEA EXPLOSION



When determining the dimensions of naval defence equipment, it is difficult to conduct explosion tests on real structures such as ships and submarines. It is therefore necessary to model the damage caused by an undersea explosion.



The goal of the MESMA project is to develop a predictive model to quantify the effects of an undersea explosion on a structure and devise adequate protection.



By identifying the phenomena that take place during an undersea explosion, we were able to model the propagation of a pressure wave in the water and the resulting fluid/structure interactions . The results of the simulations were validated by correlating them with experimental data.



Experimentally validated predictive model, improved safety.



Project owner:
Segula Technologies



Partners:
DCNS, AIRBUS,
French Defence
Ministry



Areas of Expertise:
Digital modelling, Fluid / structure
interaction, Explosions



ANAXAGORE

ANAXAGORE →

REDUCED DESIGN TIME FOR COMPLEX SYSTEMS



Command-control systems are increasingly complex and employ trades that all have their own specific tools, which can potentially lead to errors that are often only identified at the end of development.



Anaxagore aims to provide automated gateways between design models in order to quickly reach reliable solutions.



SEGULA Technologies has developed software that uses the physical system model to generate a complex system, ranging from commands sent to the actuators to supervision MMI. The software allows for automatic updating of the command-control system when changes are made to the physical system. During the design phase, ANAXAGORE allows for the different solution proposals to be quickly identified.



Exchanges between experts made more reliable thanks to a standardised language between the various tools, reduction in design times, facilitated supervision of complex systems.



Project owner:
Segula Technologies



Partners:
Lab-STICC, CRPCC, LIAS,
CRISTAL, IRISA, ENSM,
Polytech St-Nazaire



Areas of
Expertise:
IT, Automation,
Ergonomics





SARA

RE-DESIGNING AND CUSTOMISING AIRCRAFT INTERIORS



One of the challenges of the business jet industry is the customisation of aircraft that regularly change owners, resulting in periodic interior make-overs.



The SARA project aims to develop an application that will automatically reproduce a digital model from an existing aircraft scan.



Using a digital model reconstructed from a 3D scan of the cabin, SARA generates a virtual reality simulation, giving the future owner the chance to immerse themselves in the new layout (using 3D glasses). This solution also has many features: users may relocate objects, modify the texture, the colour of the furnishings and the colour of the planes interior, and even add furniture and/or amenities.



Very fast implementation, easy to use, savings in design time, decision support tool, sale support.



Project owner:
Segula Technologies



Customers/users:
RUAG



Schedule:
New features in
development,
Pattern recognition



Areas of Expertise:
Aircraft layout, 3D
SCAN, Augmented
Reality, Artificial
Intelligence



NAVI+



Project owner:
Segula Technologies



Areas of Expertise:
Design, Hardware electronics and
software, IT, Position determination

NAVIGATION AND GEO-TRACKING WITHOUT A GPS NETWORK



Infrastructures such as buildings, transport and factories are becoming increasingly complex and are not always covered by a GPS network.



This project aims to develop a geo-tracking solution, based on existing infrastructures, that does not use a mainstream network.



SEGULA Technologies has developed a solution based on VLC (Visible Light Communication) technology that addresses a variety of issues, such as guiding autonomous forklifts in a factory, guiding people in a hospital or helping the visually impaired get around.



Accurate tracking, an economically efficient solution, fast implementation that does not require any new infrastructures.



AROD



GUIDING A MOBILE ROBOT USING IMAGE PROCESSING



Security and surveillance challenges in complex environments are increasingly important and could be addressed with solutions that make more extensive use of drones.



This project aims to develop a reconnaissance and mobile target tracking system based on real-time embedded image processing.



SEGULA Technologies has developed a programme that factors in a number of constraints, such as real-time operation, lighting conditions, shooting stability, colour, etc.



Increased security level, mobilisation of easy-to-use resources, operates in poorly accessible environments.



Project owner:
Segula Technologies



Areas of Expertise:
Video processing,
Control



PREMCO

USING STEREO-CORRELATION TO PREDICT UNSAFE MOVEMENT AROUND RAILWAY LINES



If vehicles are to become increasingly autonomous, it is essential to strengthen built-in safety systems, particularly those designed to predict potential dangers.



PREMCO proposes to equip vehicles with a system for monitoring and anticipating the movement of surrounding objects such as pedestrians, cars and bicycles.



SEGULA Technologies has developed an algorithm that uses stereo-correlation processing (in which 2 cameras visually process the scene simultaneously) to predict the trajectories of moving objects.



Real-time solution, improved safety.



Project owner:
Segula Technologies



Areas of Expertise:
Video processing,
Detection of moving objects



KITTING

AUTOMATED KITTING IN AN ASSEMBLY WORKSHOP



The number and variety of components is increasingly important in factories. Putting the assembly kits together manually is a complicated and time-consuming task. The challenge is to save time and eliminate mistakes.



The objective of this project is to design a kit-making robot that works directly from factory stocks.



This work has resulted in the design of the most compact autonomous system to date. It can grip components up to 8 kg in weight and at a height of up to 4m. It uses the “jamming gripper” to grab a wide range of components. With this system, several robots can work together if required.



Considerable time savings, fewer human errors and less heavy work for operators.



Project owner:
Segula Technologies







Areas of Expertise:
Supply chain, Automation,
Lean manufacturing



DATA LOGIC

REAL-TIME FLOW MANAGEMENT

-  There is currently no system that gives a consolidated view of all the flows required for a factory to run smoothly. The development of LEAN methods in factories requires the development of a powerful system to supervise and prioritise the huge amounts of data circulating in real time.
-  This project aims to develop software to give a real-time view of flows in production plants (storage areas, assembly workshops), thereby optimising operations.
-  This global system catalogues all the incoming stock and flow data and offers an interactive MMI, which allows the user modify flow traffic from their terminal, at their leisure.
-  Real-time data sharing, optimisation of information to operators, monitoring of the smooth running of activities, detection and warning when operations are abnormal, better view of the supply chain.



Project owner:
Segula Technologies



Schedule:
Static view
diagrams: 2019



Areas of Expertise:
MMI, Supply chain
Automation,
Lean manufacturing

ATLAS



A COLLABORATIVE, AUTONOMOUS INDUSTRIAL DRONE



The factory of the future will have to be more flexible and modular if it is to adapt to variations in pace and products.



The objective of this project is to develop an autonomous industrial drone to take the place of conventional conveyor belts on assembly lines.



ATLAS is a compact, smart, collaborative drone equipped with lifting mechanisms. 4 drones can lift a vehicle to a height of 1.80m. They can manoeuvre seamlessly along the assembly line.



A very flexible solution that can be transferred to other activity sectors, economic savings due to a reduction in heavy infrastructures.



Project owner:
Segula Technologies



Areas of Expertise:
Automation, Industrial IT,
Embedded systems, Robotics



IMADRONE



SEMI-AUTOMATIC PILOTING OF A DRONE IN EXTREME CONDITIONS



Drones are used to capture images of the surfaces of engineering structures (*which are then processed to analyse their condition*) in inaccessible and difficult terrains.



The objective of this project is to develop a reliable means of inspecting engineering structures, using an algorithm which factors in the parameters that can influence a drone's flight path (wind gusts, etc.) in order to produce a 3D reconstruction in post-processing.



SEGULA has installed a semi-automatic piloting system which lets the drone scan the surface to be inspected without the risk of missing shots as it reacts to weather conditions. Segula has incorporated image processing to calculate ego-motion and control trajectory.



Obstacle detection in all directions without previous familiarity with the inspection area.



Project owner:
Segula Technologies

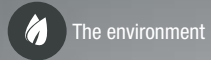


Partners:
Technidrone



Areas of Expertise:
Embedded systems,
Image processing





The environment

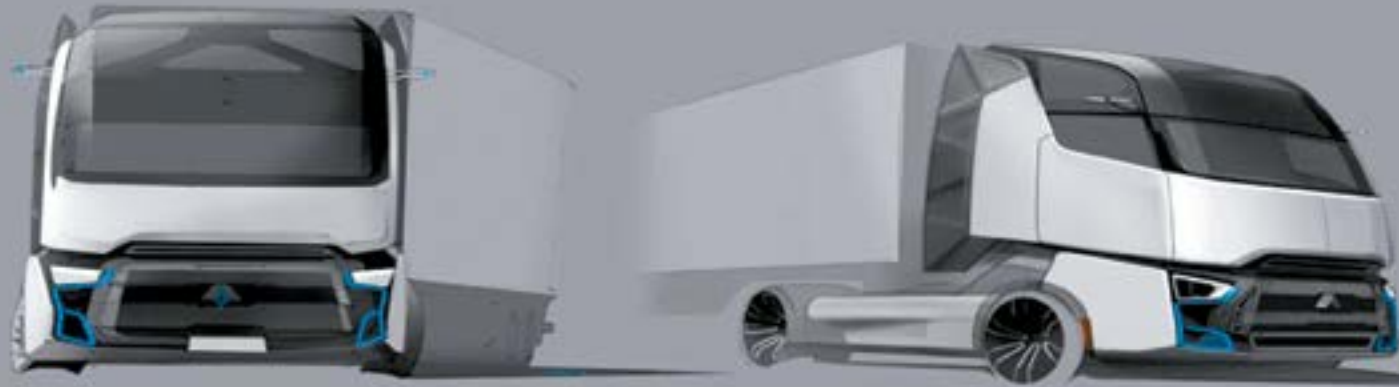


Weight reduction / new materials

COMPOSITE CAB



PATENT



USING COMPOSITES TO PRODUCE A 30% LIGHTER TRUCK CAB



Road transport is facing major societal and technological challenges. It must solve the paradox of achieving an optimal load capacity while minimising vehicle weight.



COMPOSITE CAB aims to reduce fuel consumption while increasing a lorry's load capacity. The project focuses on reducing cab weight and incorporating various features using composites.



SEGULA Technologies has leveraged its expertise in computation and life cycle analysis (LCA) in order to re-design the rear section of the cab using composite sandwich materials. This solution has not only led to a significant reduction in weight but also the integration of new thermal and acoustic features and a non-mechanical sleeper system.



This project has resulted in a cab that is 30% lighter. The patented sleeper design is covered under an operating license negotiated with Renault Trucks and can be offered as a solution in other sectors.



Project owner:
Renault Trucks



Partners:
Solvay, PO, Mecaplast,
Altair, Saertex, Addiplast,
Insa, Isat



Areas of Expertise:
Composite Design,
Eco-Design, Crash
Calculation, LCA



3R-COMP

REPAIRABLE, REUSABLE AND RECYCLABLE THERMOSETTING COMPOSITE MATERIALS



In the automotive and aerospace sectors, the usual strategy is to replace metallic materials with composite (thermosetting) materials. Despite their high mechanical performance, however, these materials cannot be reprocessed after hardening.



This collaborative project aims to develop a new generation of high-performance thermosetting composite materials (3R-COMP) that can be reprocessed, repaired and recycled, along with the associated manufacturing processes (RTM, Thermoforming).



SEGULA Technologies has been working on the simulation of products and their manufacturing processes using finite element method calculations. The main innovation of the 3R-COMP project is the replacement of components currently manufactured using conventional (aerospace) and metal (automotive) composites by 3R-COMP components.



These “3R components” bring several benefits: they can be repaired using heat and pressure, reused thanks to compression technologies, and recycled.

Project co-funded by CDTI and FEDER



Project owner:
Aerospace and
Automotive Industries



Partners:
SOFITEC COMPOSITES,
SL, GONVARRI



Areas of Expertise:
Simulation of materials
manufacturing processes

TISSUSIM

SIMULATING FABRIC BEHAVIOUR IN SHAPING PROCESSES



The modelling of industrial fabric moulding requires reliable tools to assist with decision-making, especially for shaping processes. Especially for shaping processes.



The objective of this collaborative project is to develop an algorithm for fabric simulation (carbon fibre, etc.) and integrate it in the standard CAD system (CATIA) in order to help industries optimise the design of products and processes.



SEGULA Technologies is developing new software to simulate fabric behaviour in industrial shaping processes.



Products and processes can be more efficiently designed using more sustainable and less expensive materials.

Project co-funded by MINECO through the RETOS-COLABORACION programme



Project owner:
Segula Technologies



Partners:
GRUPO ANTOLIN, AEROSCTEC
Subcontractors: ITCL, URJC



Areas of Expertise:
Numerical Calculation,
Materials



SAFEMIUM

MULTIFUNCTIONAL SAFETY PRODUCTS FOR HIGH-END VEHICLES



Current safety requirements for component manufacturers in the automotive sector impose new constraints with regard to materials. This is particularly the case for high-end vehicles that incorporate more composite materials.



The objective of this project is to develop new products for the automotive industry using a combination of processes such as additive technology + thermoforming and injection + thermoforming. Design tools need to be adapted to these new processes.



SEGULA Technologies has been working on the simulation of composite parts and its manufacturing processes (RTM and thermoforming) in order to develop tools for designing and evaluating these processes.



Creation of design and calculation software suitable for composite materials and the combination of processes.



Project owner:
Segula Technologies



Partners:
CIKAUTXO, MAIER
GESTAMP, CIE ORBELAN,
TUMAKER, AFM



Areas of Expertise:
Materials,
Manufacturing processes,
Structure calculation



SIDIN

VIRTUAL REALITY IMMERSION IN A CAD MODEL



Industrial facilities are becoming increasingly complex. Projects must be developed as quickly and inexpensively as possible. Virtual reality makes it possible to validate technical choices by immersing the project teams in an environment which faithfully reproduces the plant under design.



The objective of the SIDIN project is to develop a solution that converts a CAD model into a virtual reality simulation.



SEGULA Technologies is focusing their efforts on a comprehensive solution that incorporates both hardware and software development. It is adaptable to any type of industrial environment.



Cost-effective solution. Improved design reliability.



Project owner:
Segula Technologies



Partners:
STT, XUPERA,
ALECOP, ISEA



Areas of Expertise:
Virtual Reality



CONSOTRUCK

UNDER-TRAILER COMPONENTS



In order to reduce emissions, we have to use all the tools available to reduce the energy consumption of heavy goods vehicles. At a speed of around 85 km/h, more than 40% of a vehicle's power is used to counteract the air effect.



Develop a simulation model (CFD) to test different solutions in order to reduce a lorry's drag force and therefore its consumption.



SEGULA has shown that typically 75% of the drag force is due to the trailer, and 50% of that is caused by the underbody and rear of the trailer. SEGULA has designed aerodynamic components for the trailer underbody.



Fuel consumption reduced by an estimated 2.6%.



Project owner:
Segula Technologies



Areas of Expertise:
Design, Numerical calculation in
fluid mechanics



IMACAR

USING IMAGE PROCESSING TO IMPROVE PERCEIVED QUALITY



The perceived quality of a product is currently a major issue for consumers, who are increasingly more demanding when it comes to their vehicles.



The objective of this project is to improve the vehicle's perceived quality by developing a more reliable means of assembling the body parts while reducing the time taken to position them.



Segula has come up with a solution for estimating and adjusting play between parts, based on image processing with a camera installed at the assembly station.



A non-invasive solution, suitable for all types of components, reliable under industrial use (assembly plant), fast calculation and more precise positioning.



Project owner:
Segula Technologies



Partners:
IVECO Bus



Areas of Expertise:
Image processing

OPTI+

DETECTING APPEARANCE DEFECTS ON STAMPED PARTS



Specialists mainly use subjective sensory methods to detect appearance defects. These methods are time-consuming and lead to a number of errors.



The objective of this project is to find an optical, non-destructive inspection tool that can almost instantly analyse and quantify all the appearance defects on a stamped part. A non-specialist operator in the field would be able to carry out these tests, which would be definitive.



This work has led to the design of a system based on axial chromatism coupled with an algorithm for processing and classifying the detected defects.

This objective analytical method and the intelligent algorithm that has been developed can reduce inspection times and associated errors.



Establishment of objective criteria to approve the quality of the parts.



Project owner:
Segula Technologies



Partners:
Renault



Areas of Expertise:
Stamping,
Image processing

MTCSIM

A SIMULATION TOOL FOR ENERGY CHAIN SIZING



Engine development, energy management and component sizing all require a multitude of preliminary calculations and behaviour simulation.



The MTCSim (Mathematical Temporal Calculation Simulation) project aims to develop an economic tool for simulating traction chains on electric and hybrid road vehicles, independently of market tools. In addition, MTCSim offers the possibility of configuring mathematical models for each component that needs to be simulated.



SEGULA Technologies has developed an integrated and modular digital simulation platform based on physical models of systems, subsystems and components.



Thanks to the platform's code and the mathematical expertise that went into making it, the tool is totally reliable and can be upgraded at a lower cost compared to tools available on the market.



Project owner:
Segula Technologies



Areas of Expertise:
Energy modelling,
electrotechnics

PAC

SIZING AND IMPROVING THE RELIABILITY OF A FUEL CELL



The future of transport requires the development of alternative solutions to fossil fuels, such as electric or hybrid solutions. Since all-electric vehicles do not currently meet user expectations, particularly regarding fuel endurance, hybrid appears for now to be the most appropriate solution.



This project aims to develop a new fuel cell architecture that can ensure independent control of the various cells and thereby improve the system's reliability.



To this end, SEGULA Technologies is developing tools for the rapid pre-dimensioning of hybrid vehicles, and more particularly PAC-battery technologies. Our efforts are focused on the integration of multi-PAC systems in vehicles.



Improved fuel endurance. Reduced maintenance costs. Improved battery reliability.



Project owner:
Segula Technologies



Partners:
Femto-St,
FCLab, UTBM



Areas of Expertise:
Electrochemical, Power electronics,
Thermal, Fluidics, Mechanics

LI-FI CAR

CAR-TO-CAR COMMUNICATION USING LI-FI



The development of driver assistance systems is a major challenge for car manufacturers, who must meet increasing safety objectives (accident reduction).



The objective of this project is to design a system for real-time transmission of vehicle to vehicle data in order to avoid possible collisions.



SEGULA has designed a system that uses Li-Fi technology to transmit data between vehicles via the front and rear lights that are already on the vehicle. This system can be used to maintain suitable distances between two vehicles, and in the future, it can be used to create convoys of partially autonomous vehicles by transferring data between the lead vehicle and those following behind.



Cost-effective technology, safety.



Project owner:
Segula Technologies



Areas of Expertise:
Embedded systems,
Dependability

3D PRINT KNUCKLE



Project owner:
Segula Technologies



Areas of Expertise:
Design, Product-process,
Topological optimisation

USE OF ADDITIVE MANUFACTURING TO PRODUCE A CAR'S HUB CARRIER



The development of additive manufacturing technologies is an important advance in the industry and paves the way for new designs. Additive manufacturing offers great potential for simplifying parts, reducing their weight and improving their reliability.



The objective of the Print Knuckle project is to use additive manufacturing to produce a wheel rotation axle (knuckle) for a car. This solution optimises development and prototype manufacturing times.



Our design offices have been doing R&D work on 3D PRINT KNUCKLE in order to take into account the constraints of additive manufacturing right from the design phase. In order to achieve the desired goal of weight reduction, our teams have used digital tools specifically designed for structural optimisation.



Weight savings, simplified manufacturing processes, optimised development and validation times.

HERMES



SOFTWARE THAT AUTOMATICALLY GENERATES RECYCLING OPERATIONS SCHEDULES



The recycling of a product composed of several different parts requires the planning of successive stages, which are generally validated using prototypes.



The objective of the HERMES project is to develop new software that can automatically generate the successive stages required for product recycling. Furthermore, this software can be adapted to use Virtual Reality / Augmented Reality solutions in order to quickly and easily train operators.



SEGULA's teams have developed an algorithm that works in the CATIA environment and automatically generates dismantling steps based on the digital model created during the design phase.



Reduced costs, streamlined dismantling lines, greatly reduced number of prototypes to validate the operating lines.



Project owner:
Segula Technologies



Partners:
CEIT-IK4



Areas of Expertise:
Virtual Reality,
Augmented Reality, MMI

ARDIOM



AN AUGMENTED REALITY INSTRUCTION MANUAL



Augmented reality solutions and smart systems are becoming more commonplace due to technological advances. These solutions have been extended to traditional instruction manuals, replacing them with enhanced dynamic formats.



ARDIOM aims to develop and validate a System for designing a Digital Instruction and Operation Manual, intended to be used on mobile devices. This system is based on Augmented Reality technologies.



ARDIOM overlays real information (supplied by a mobile device) over data from a 2D or 3D model previously enhanced with additional information. With this project, SEGULA has shown its skill as a developer / adapter / integrator of CAD/PDM solutions.



Increased manual ergonomics, easy publishing, content creation and management, reduced intervention times and fewer errors.



Project owner:
Segula Technologies



Partners:
STT, XUPERA,
ALECOP, ISEA



Areas of Expertise:
Augmented Reality,
Documentation



THERMICAB

PRE-DIMENSIONING SOFTWARE FOR THE AIR CONDITIONING SYSTEM OF A PASSENGER COMPARTMENT



Electric and hybrid vehicles are being developed because of environmental issues that will emerge over the coming years. "Clean" vehicles still offer limited fuel endurance, and so the challenge is to reduce the energy consumption of auxiliary systems (such as air conditioning) to a "bare minimum".



The objective of the Thermicab project is to develop software that can optimise the dimensioning of an air conditioning system.



By estimating energy consumption—factoring in the architecture of the passenger compartment, the climatic conditions, as well as the phases of use—SEGULA has developed software that can be used to dimension air conditioning systems to a bare minimum, thus optimising the vehicle's energy requirements.



Weight savings, space savings, reduced consumption.



Project owner:
Segula Technologies



Areas of Expertise:
Thermal and thermodynamic
calculation



SAFE SCOOT

IMPROVING THE SAFETY OF 2-WHEELED VEHICLES USING A DIGITAL MODEL OF CRASH SCENARIOS



According to the French National Interministerial Monitoring Centre for Road Safety, two-wheeled vehicles represent only 1.9% of total motor vehicle traffic, but account for 43% of serious injuries.



The SAFE SCOOT project aims to develop solutions to improve the safety of motorcyclists by protecting their vital organs.



SEGULA has developed a digital model that incorporates crash scenarios while adhering to EuroNCAP criteria. Analysing these scenarios allows us to design solutions to dissipate energy during side impacts (by deforming the structure). It also provides solutions that allow the driver to speed up to escape the impacting vehicle.



A digital crash model suitable for 2-wheeled vehicles.



Project owner:
Segula Technologies



Areas of Expertise:
Structure calculation,
Crash simulation, Certification



EVOHD

DESIGNING AND DEVELOPING OF A NEW GENERATION OF HGV ENGINES



Growing environmental restrictions bring new challenges in terms of improving the performance and reducing the weight of internal combustion engines used by heavy goods vehicles.



This project aims to develop new engine components to reduce their weight and improve their performance by reducing the friction produced by the movement of internal parts.



SEGULA Technologies has been engaged in defining specifications, drafting the design, and performing calculations for the new engine components. SEGULA has also set about simulating the system and manufacturing / validating the prototype. The main innovations of the EVOHD project include:

- The use of new materials and the processing of contact surfaces
- The design of new engine components (variable control oil-jet cooling, a twin / triple turbo supercharged system, etc.) and their integration into the engine.



Improved performance, reduced weight.



Project owner:
Segula Technologies



Areas of Expertise:
Materials, Engine cooling

ECOBAC

OPTIMISING ELECTRIC AND HYBRID PROPULSION CHAINS



In the face of increasing pollution from emissions, as well as increasingly stringent environmental regulations (MARPOL 73/78, IMO), new electric and hybrid propulsion architectures are being developed to reduce both harmful emissions and energy consumption.



The project aims to develop a tool for choosing the right propulsion architecture for a ship, and particularly for ships with wide variations in velocity such as ferries and tugs.



The models developed are based on energy models of the various components, which can quickly predict energy consumption according to the propulsion architecture and sizing of the different components.



Provision of a tool for optimising propulsion chains, reduced energy consumption, reduced harmful emissions, reduced noise pollution, improved flexibility of use and longevity.



Project owner:
Segula Technologies



Partners:
STT, XUPERA,
ALECOP, ISEA



Areas of Expertise:
Naval architecture, Energy efficiency,
Optimisation



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