

SECURING YOUR MISSION CRITICAL MOMENTS



CONTENTS

04/ **PYROALLIANCE
SOLUTION
PROVIDER**



06/ **INNOVATION,
SERVING YOUR
MISSIONS**



08/ **DEFENCE**

10/ **SPACE**

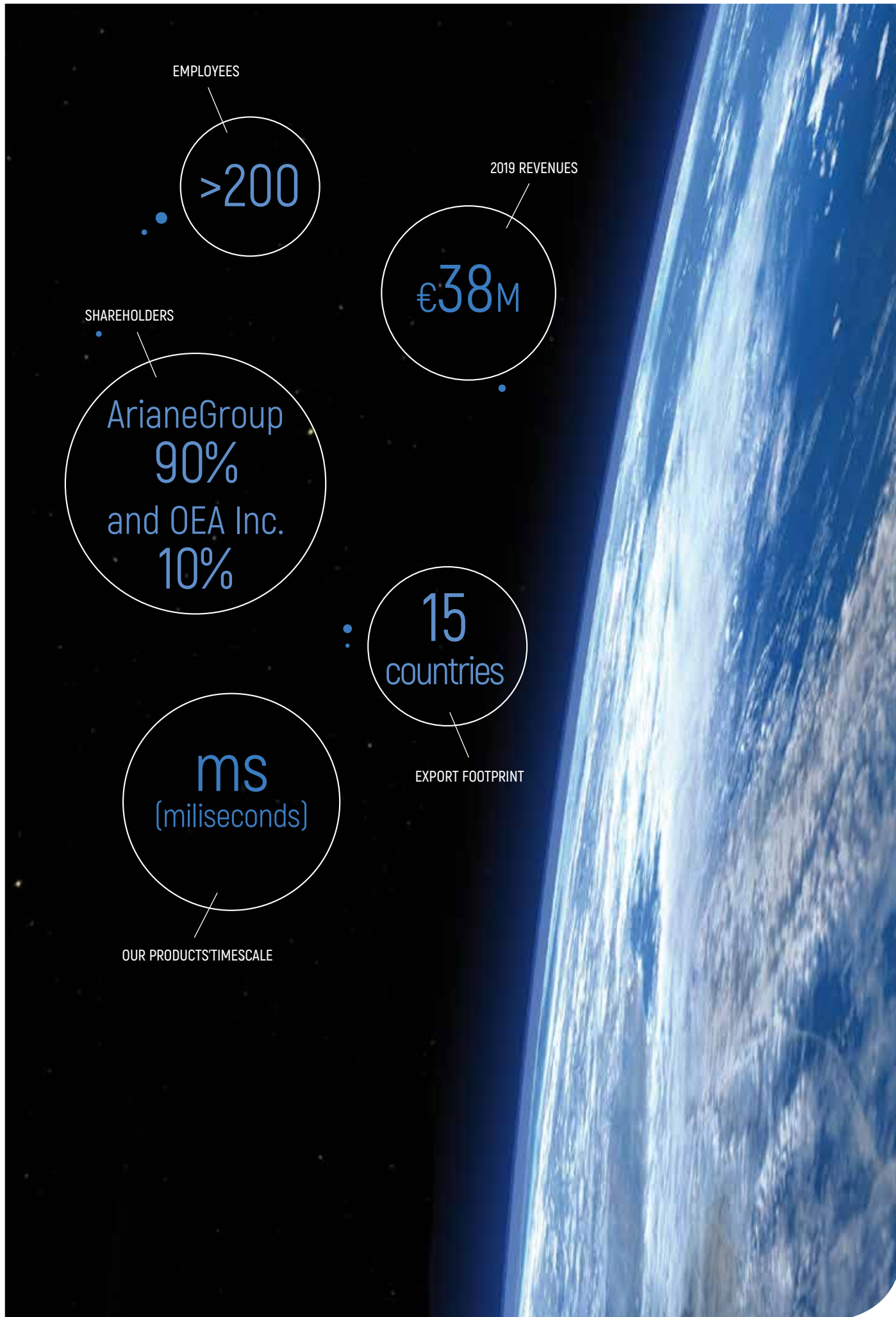


12/ **AERONAUTICS**

14/ **INDUSTRY**

16/ **MECHANICAL
SOLUTIONS**





PYROALLIANCE, SOLUTION PROVIDER

Pyroalliance is the European leader and a world-class player in pyrotechnics, delivering innovative and cost-effective solutions tailored to our customers' critical requirements.

With more than a half-century of experience as a manufacturer of state-of-the-art pyrotechnic and mechanical equipment, Pyroalliance addresses the requirements of cutting-edge industries, including aerospace, defense and energy. We leverage our proven expertise and innovative mindset to develop products that combine the performance and reliability needed to perform critical functions for our customers' systems.

KNOW-HOW, FROM DESIGN TO MANUFACTURE

Our complementary skills in engineering mean that we do act as design authority for the functions in question and so each application is guaranteed to work under some of the most demanding environmental conditions with a response time in milliseconds.

In addition, we have great industrial flexibility to adapt to our customers' production rate and volume requirements.

Given the specific nature and complexity of our products, we also rely on our operators' unique know-how.

OUR CUSTOMERS' TRUST IS OUR PRIORITY






Customer satisfaction is our top priority. In response to their requirements, we offer solutions for complete functional chains incorporating the best technologies available.

We support our customers in their developments and throughout the lifetime of their systems, guaranteeing them the availability of our solutions and expertise. We are committed to our continuous improvement approach and work, for the benefit of our customers, to optimise all our activity cycles.

A CERTIFIED QUALITY MANAGEMENT SYSTEM

The quality of our solutions directly impacts the reliability of our customers' systems. Our certification approach thus secures our commitment to comply with specifications and requirements. We are certified to ISO 9001 and EN/AS/JISG 9100 for the "Design, Development, Production and Sale of functional chains consisting of mechanical and energetic equipment". We also comply very strictly with the requirements of standard NF ISO 14001 and with the ArianeGroup's Health, Safety, Environment and Energy performance system.

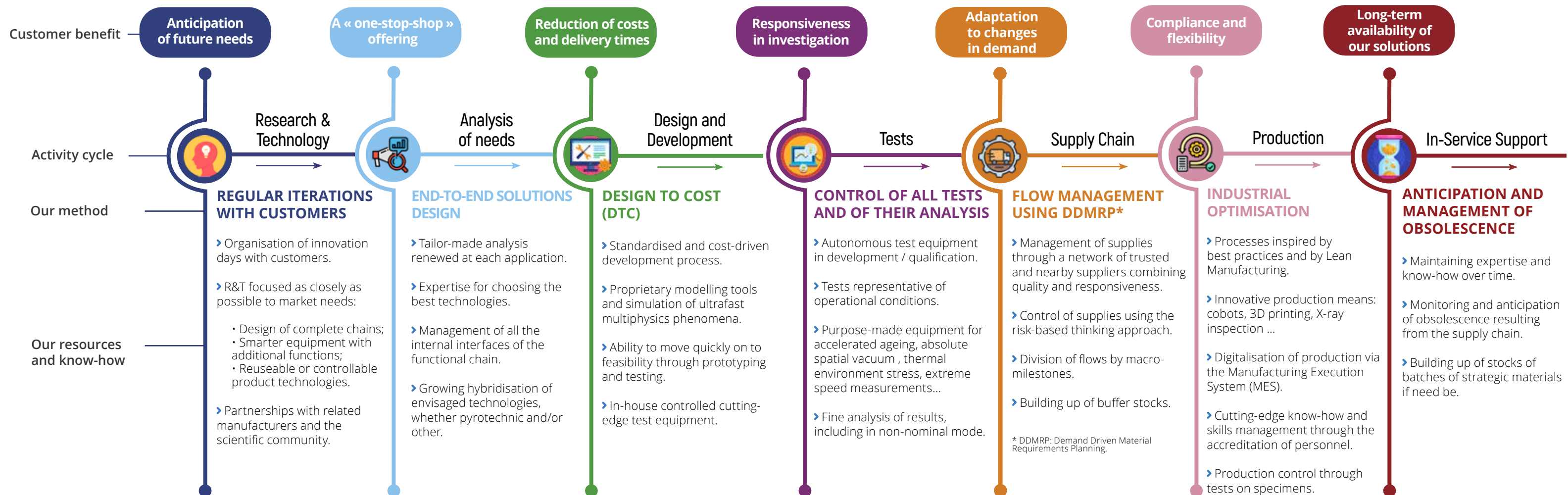
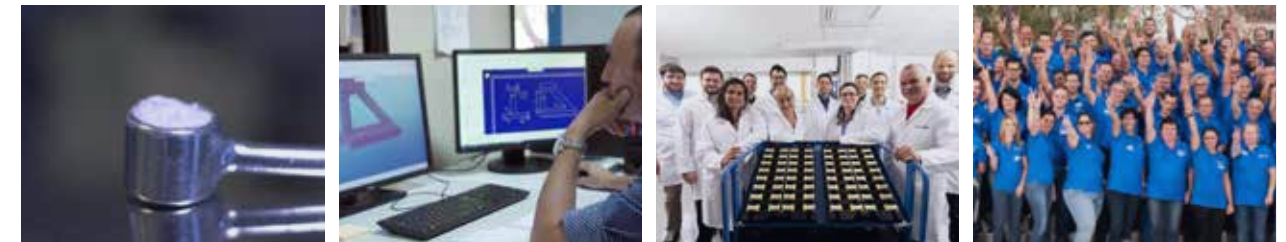
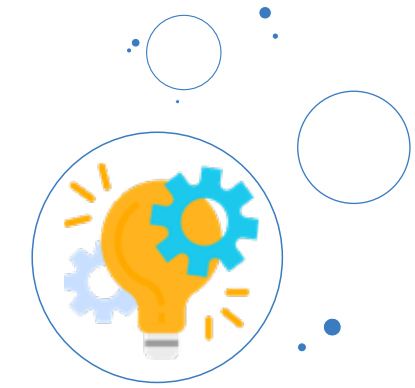
Through our majority shareholder ArianeGroup, Pyroalliance can count on the strengths of a world leader, while also enjoying the autonomy and agility needed to independently serve a wide range of customers from around the world.

Our equipment primarily handles the following functions					
Transmission	•		•	•	•
Ignition	•		•		
Actuation	•	•	•	•	•
Opening / Closing of circuits		•	•		•
Ejection / Propulsion / Inflation	•		•		•
Cutting / Fracturing	•		•	•	•
Separation	•	•	•		•
Safety and arming	•		•		
Flight termination	•		•		

INNOVATION, SERVING YOUR MISSIONS

We constantly innovate to provide answers to our customers' challenges, speed up our processes and make our products more competitive.

Innovation is present throughout our activity cycles. It comes into play as early as the upstream phases with the search for new technologies but it comes through more generally in the definition of solutions, the development methods or the new industrial approaches implemented for the benefit of our customers.



DEFENSE

Pyroalliance is a pivotal supplier of high-value-added pyrotechnic and mechanical solutions for defense, including ballistic and tactical missiles, torpedoes, ships and aircraft.

Our products are designed to carry out a number of functions that ensure the success of a weapon system, including ignition, transmission, thrust, separation, jettisoning, deployment, cutting, range safety and much more.

They are used on all kinds of missile systems, including air defense, combat aircraft, antitank, antiship, cruise missiles, etc.

By delivering equipment that meets the highest standards of mission-critical reliability, Pyroalliance plays a key role in your mission success.



Application on a cruise missile.



Deployment actuator.



Explosive bolt.



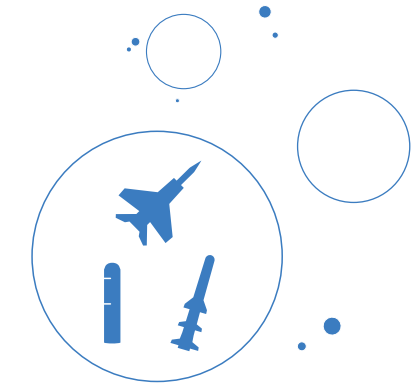
Fuel valve for a tactical missile.



Transmission line.



Air-to-Air and Air-to-Ground missiles.



We also supply a large selection of crew safety equipment to leading aircraft manufacturers, all to the same demanding standards of reliability.

Our wide range of defense products includes the following:

- › Turbine engine igniters,
- › Through-Bulkhead Initiators,
- › Transmission lines,
- › Ignition delays,
- › Gas generators,
- › Pyrotechnic rams,
- › Shears,
- › Cutting cords,
- › Retractors (locking or unlocking),
- › Hold and release bolts and nuts,
- › Normally closed/open valves,
- › Flight termination systems,
- › Stage separation systems.



Through-Bulkhead Initiator.

SPACE

Pyroalliance designs, develops, produces and sells pyrotechnic equipment for mechanical or propulsive functions, used on launch vehicles, satellites and interplanetary probes. Our products play a key role in the success of these missions.

Because of the high added-value of this equipment, coupled with our skills and expertise, Pyroalliance has become a benchmark supplier to space agencies and leading space system prime contractors alike.

We deliver products that have been qualified to the most stringent space industry standards. Furthermore, they are not restricted by ITAR (International Traffic in Arms Regulations).

We have long played a key role in the success of Europe's launcher programs, especially Ariane and Vega, including products that carry out essential functions:

- ▶ Solid rocket motor ignition,
- ▶ Stage separation,
- ▶ Flight termination,
- ▶ Hold and release of satellites from payload adapters and dispensers.



Ariane 5's solid boosters are ignited by Pyroalliance devices.



Opening of fairing and release of a satellite on Ariane 6.



A number of Pyroalliance products are used on Vega and Vega C.



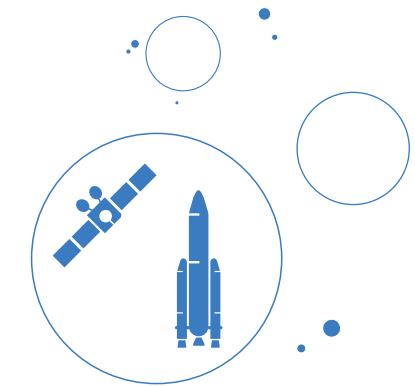
Transmission lines.



Linear shaped charge device for flight termination with integrated cutting cord.



Part of a stage separation system.



Hold Down and Release Mechanism (HRM). Separation nut.

Pyroalliance delivers ultra-reliable hold and release solutions, as reflected in the 100% success rate of the more than 8,000 separation nuts delivered to date.

These solutions are designed for use on either satellite dispensers or the satellites themselves. We make the equipment needed for the in-orbit deployment of solar panels, antenna reflectors and masts, already fitted to a wide variety of satellite platforms.

Our Hold and Release Mechanisms (HRM) are extremely reliable, capable of meeting even the most demanding requirements on satellites and other spacecraft. They are compatible with both NASA Standard Initiators (NSI) and their European counterparts (ESI).

OUR HRM OFFERING FOR MEGACONSTELLATIONS

Building on our experience applied to those exceptional programs, we offer ever more sophisticated and competitive products meeting their challenges: a minimum induced shock level, increasing tensile strengths, adapted production flows for an optimal project economy.

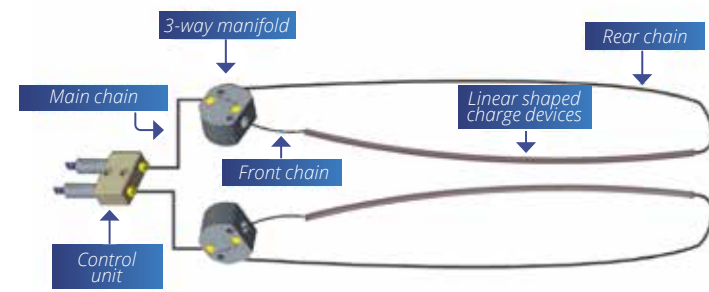
AERONAUTICS

We develop pyromechanical applications in the aeronautics field for civil and military aircraft and helicopters.

There is vast scope in this sector, mainly as regards aircraft safety and safeguarding, thanks to the specific characteristics of pyrotechnic equipment, i.e. compactness, power and reliability:

- › Ejector seat initiation systems,
- › Inter-seat sequencing systems for two-seater aircraft,
- › Canopy severance and cutting systems,
- › Dropping of loads or beacons,
- › Cutting of helicopter hoist cables and slings.

As solution provider, we design complete functional chains for canopy fracturing systems.



We develop pyromechanical applications in the aeronautics field for civil and military aircraft and helicopters.



Gas generator for expulsion of motor extinguishing liquid.



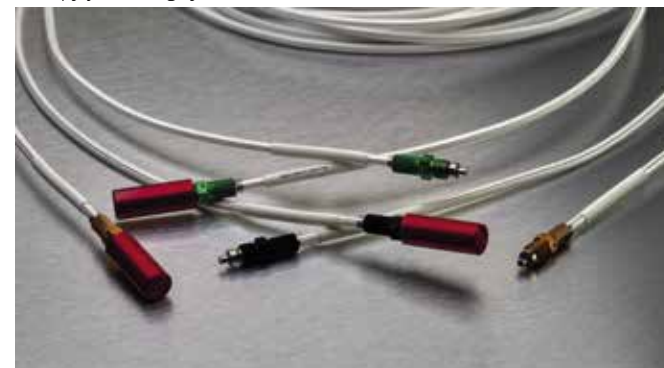
Pyrotechnic ram solution for emergency opening of door.



Canopy fracturing system: control unit (1/4).



Canopy fracturing system: 3-way manifold (2/4).



Canopy fracturing system: transmission cord (3/4).



Canopy fracturing system: fracturing cord (4/4).



We offer emergency pyrotechnic systems for civil aeroplanes.

We have a range of products for the aeronautics segment, including:

- › (External and internal) control systems: strikers,
- › Detonating or explosive transmission lines,
- › Multi-way manifolds,
- › Ignition delays,
- › Detonating cords (transmission or cutting),
- › Pyrotechnic clamps and disconnectors.

INDUSTRY

By combining our skills in mechanical and pyrotechnic engineering, we provide industry with innovative, robust and competitive solutions.

Our technologies underpin cutting-edge solutions in a number of industries for a wide range of applications:

- › Safety processes on potentially hazardous installations (nuclear, oil & gas, chemicals, petrochemicals, offshore rigs, etc.),
- › Fire safety,
- › Inflammable product storage safety,
- › Environmental protection against natural risks,
- › Interventions in inaccessible or hostile environments (nuclear, submarines, etc.).



We make nuclear power plants safe.



Cisaille pyrotechnique.



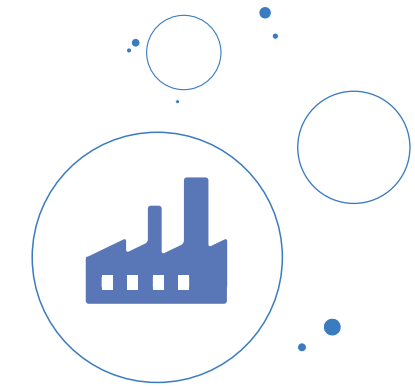
Vanne ultra rapide.



Pyrotechnic shear (wire cutter).



Pyroalliance makes equipment for petrochemical plants.



We have developed a wide range of products to meet the needs of these different sectors, including:

- › Pyrotechnic valves and emergency actuators for the high-speed closing or opening of pressurized lines,
- › Devices that are waterproof down to a depth of 6,000 meters (bolts, shackles, nuts, pyrotechnic cutters, disconnectors),
- › “Fast empty” systems for dams to ensure emergency flood management,
- › Pyrotechnic anti-theft and marking systems for cash-in-transit companies and currency destruction,
- › Automatic inflation systems (cartridges and perforators) for life vests and life rafts, and helicopter flotation systems.

Our industry customers include world leaders in the energy sector.

MECHANICAL SOLUTIONS

We support our Defence and Space customers in the design, development, qualification and manufacture of complex mechanical assemblies subjected to extreme environments.

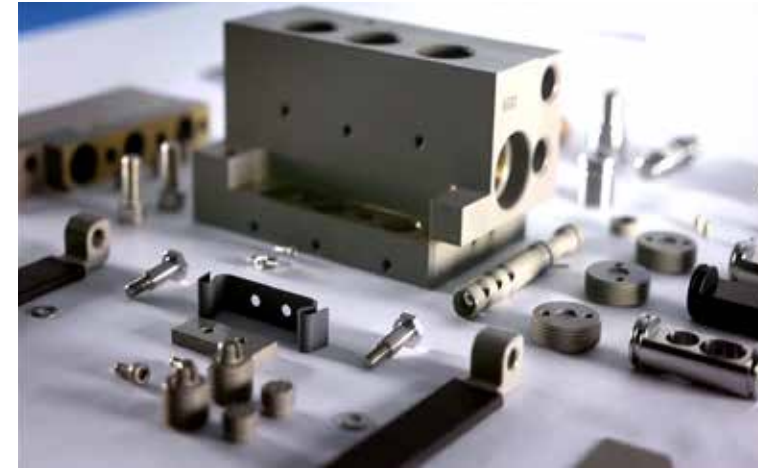
The know-how acquired over more than half a century in pyromechanisms (sets of mechanical parts actuated by a pyrotechnic energy source) and in the design of tools and benches enables us to propose a specific mechanical offering meeting our customers' many needs.

This offering comprises:

- › Design and assembly of complex mechanical assemblies,
- › Manufacture of large-sized mechanical structures subjected to high deformation loads,
- › Design of specific test benches to suit demanding environments,
- › Management of the integration of mechanical parts and electrical connectors.



Structure mécanique critique de grande dimension.



Hermetic assembly of complex moving parts.



Test in extreme environment.



Connectors and cabling of a hydrogen burner.

Our footprint in Defence and Space applications means that we have proven experience of international standards (ECSS, STA- NAG or EN9100) and enables us to guarantee the management of the life cycle of our products.

We master all of the following simulation and design means:

- › Multiphysics digital simulation in ultrafast dynamics in demanding environments (LS dyna),
- › Design of mechanical systems (CREO) subjected to high pressures or stresses,
- › Design of test benches and of the associated tools.

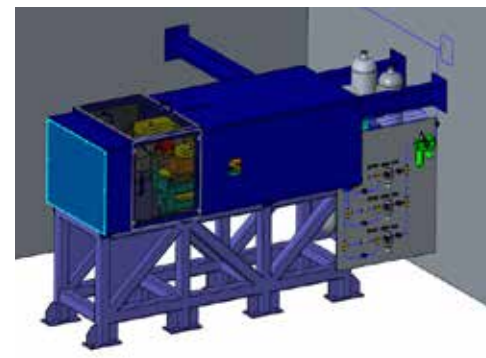
As well as the purpose-made testing and qualification means representative of demanding environments like:

- › Functional, dimensional and performance tests (tensile test machines, X-ray and electrical checks),
- › Vibration tests,
- › Tests in climatic chamber with variation of temperature, pressure and/or relative humidity,
- › Helium leak tests,
- › Lifetime and ageing tests (salt spray).

Design and production of an instrumented test bench



Multiphysics digital simulation in ultrafast dynamics (LS dyna).



Design of mechanical systems (CREO)



Production of the test bench and control of the associated tests.

NOTES



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Lined area for notes on page 19.

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PYROALLIANCE COMMUNICATION DEPARTMENT

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