



*protom*  
for **AEROSPACE**



ITALY

FRANCE

ENGLAND

BRASIL

**ABOUT US:**

Protom is a global player in designing and developing innovative solutions for small, medium & big companies on both national and international basis. We are leaders in global consulting and system integration, specialized in development of KIBS (Knowledge Intensive Business Services), and intangibles are our main assets.

**COMPETENCES:**

Protom has created an integrated offer of highly innovating services thanks to its methodological competences, acquired during the years, in program and project management. We are leaders in Airframe Structure & Systems Design, Integration, Qualification & Certification.

**APPROACH:**

Protom constantly aims at offering services of the highest quality. Research and Innovation are pillars of our methodology. Our capability to reach the highest standards makes us the perfect partner for those who want to achieve their business goals. We are able to integrate different divisions and skills in order to offer advanced services, never losing a tailor-made approach nonetheless.

# Operational Domains

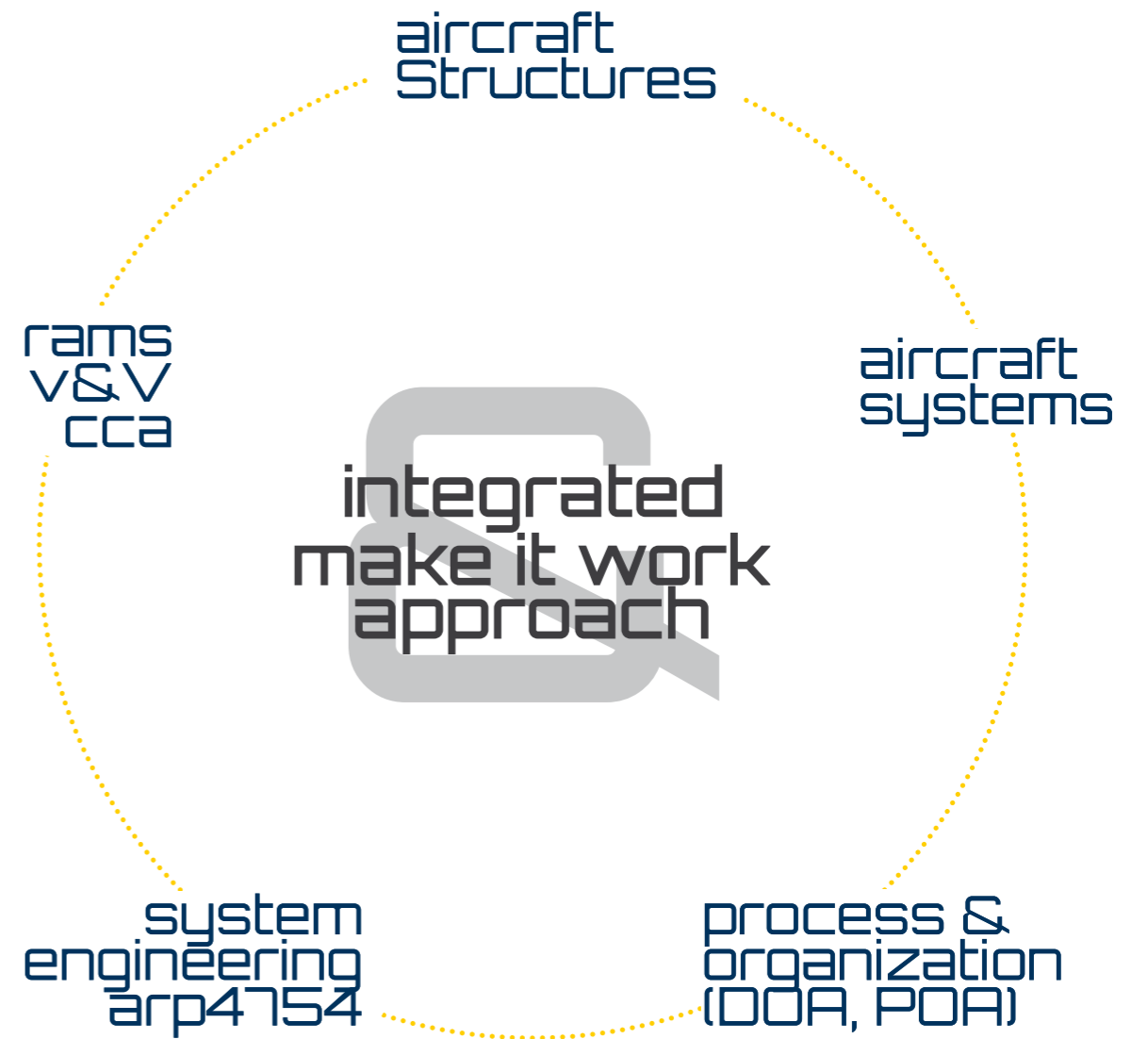
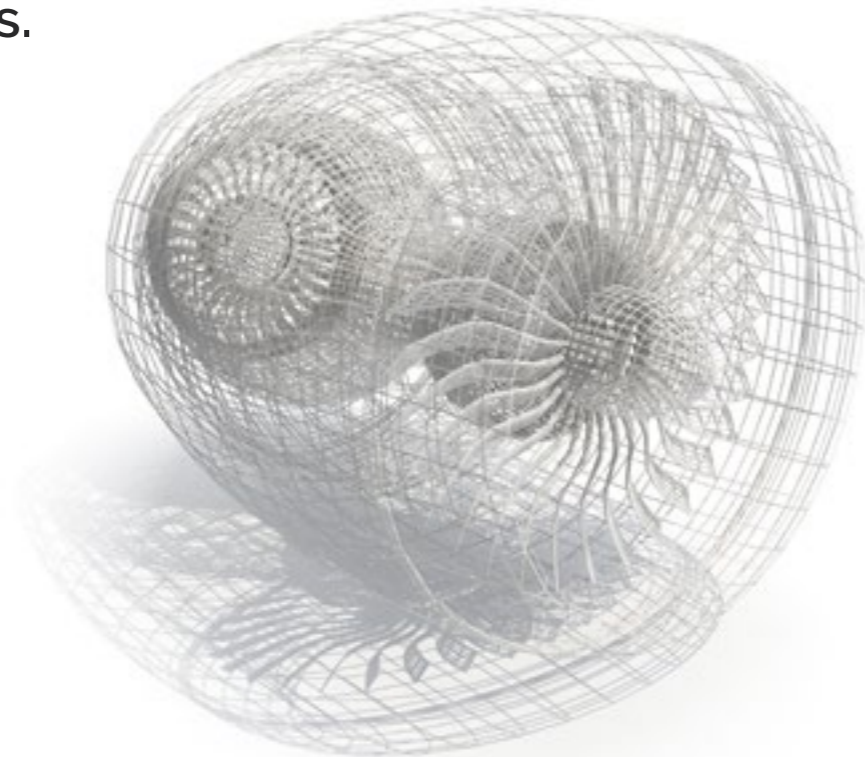
Taking advantage from the expertise of each of the Aerospace Business Unit team members, based on long time experience in aircraft OEM's and aviation knowledge, we are able to apply an integrated & make it work approach covering the entire Aircraft Life Cycle passing through the domains in the infographic on the next page.

We are able to manage an aerospace project from the Requirements definition (TLAR) through the Concept definition, Preliminary and Detailed Design up to the Certification support with the authorities. Together with our manufacturing Partner we are able to take responsibility for complete product development work packages.



# Disciplines

Protom Aerospace Team is able to provide expertise in the following Aircraft Disciplines, relying on its group of well experienced Senior Design Engineers, Managers and Project Coordinators.





# Aircraft Structures

Aerospace Industry is in continuous evolution; both Aircraft OEMs and Tier 1 Suppliers necessitate to keep up with this evolution by implementing new design concepts but, above all, supporting this design changes with the involvement of vertical design companies with highly skilled resources.

As a leading global Design Engineering Center for Aerospace & Defense in Airframe Structures, Protom is a key partner for the top Aircrafts OEMs and Tier 1 suppliers that need to outsource entire and complex Airframe structural design work packages, both

metallic and composite.

We are able to manage a complete Structural Design Work Package (Aircraft Section, Fairings, Movables etc) from the High Level Technical Requirements to the 2D drawings production in accordance with customer standards for Design & Manufacturing.

In conjunction with our production Partner we are able to support the industrialization and testing process up to the implementation on the aircraft taking the responsibility for the entire structural work package up to the hardware delivery.

For all the above Protom has

been selected in Clean Sky 2 as Partner with the Project ITEM B to support Airbus in the Design and prototype production of the Integrated Landing Gear Bay for the future Single Aisle Aircrafts.

Protom successfully manages complex vertical structural design work packages, autonomously accomplishing design and analytical activities.

## PRELIMINARY DESIGN & JDP

- Primary & Secondary structure Concept & Layout design
- Preliminary sizing
- Preliminary CAD 3D modeling & DMU management
- Weights estimation
- Materials choice
- Composite layout configuration definition

## DDP

- Linear & Non Linear FEM Analysis (Nastran, Patran)
- Global FEM Analysis
- Fatigue analyses (Apex)
- Detailed 3D CAD models (Catia V5 R20 and higher)
- BOM, PDM Management, Configuration Management (Envoia PLM)
- Parts, Assy, & Installation Drawing CAD 2D execution

## INDUSTRIALISATION

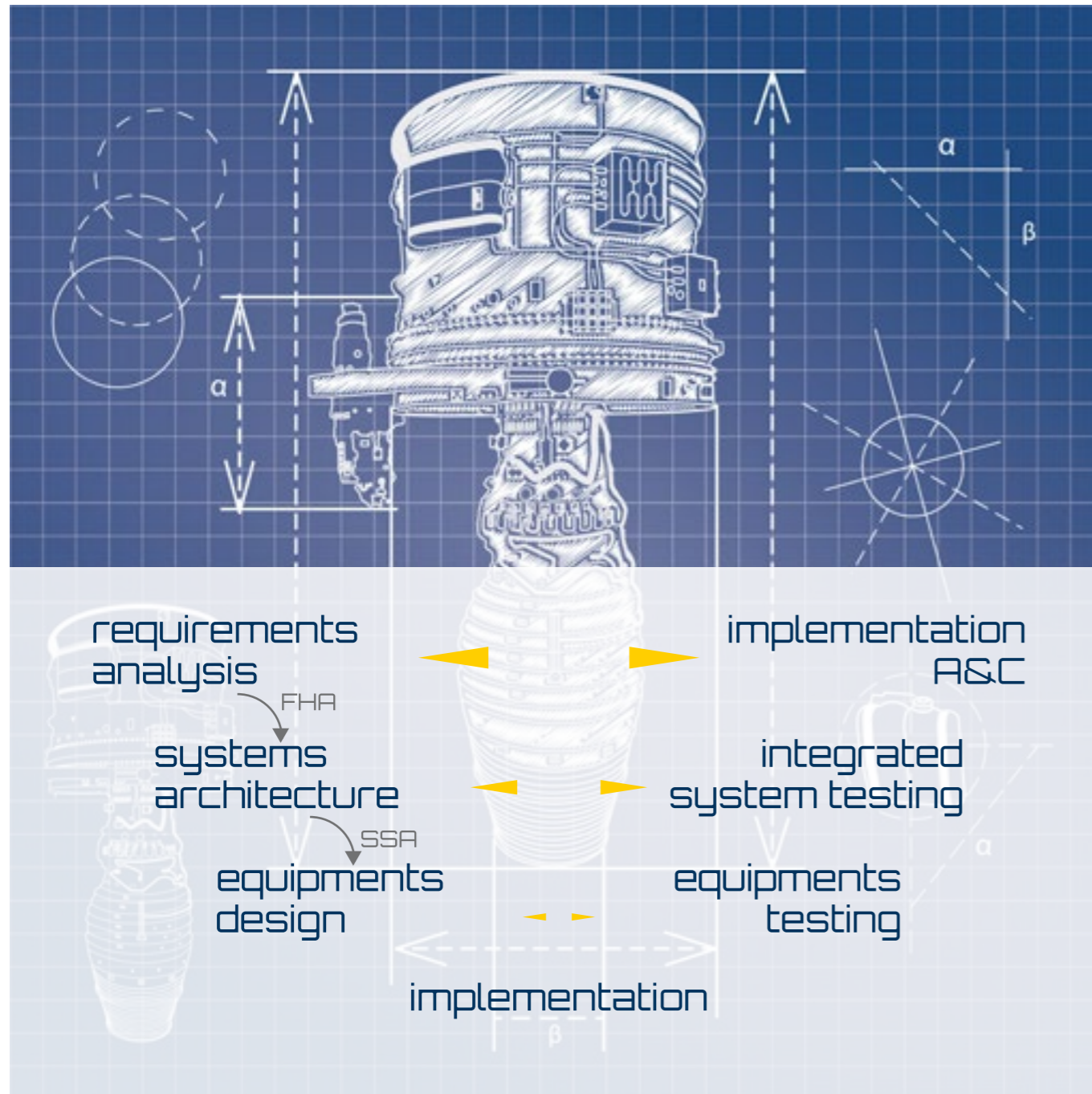
- Support to industrialization
- Design for Lean production
- Design for RAMS and Maintenance optimization
- Installation and tooling concepts

# Aircraft Systems

Thanks to our Senior System Engineers and their experience with EASA & FAA regulation and DO160, DO178 and DO254 standards, we are able to provide Engineering Coordination & Technical Leadership to manage the complete design lifecycle for Systems: Requirements definition, Architecture selection, Analysis, Preliminary Design, Detailed Design, System Integration, Validation & Verification Process, Systems Certification Support.

ARP 4754 "Guidelines for Development of Civil Aircraft Systems" methodology approach is used by our Systems Engineers to perform highly specialized Staff activities during system development :

- HLTR production & system specification
- SoW production
- Systems Architecture Definition & trade-off
- Systems performance analysts (LMS Amesim, Flowmaster)
- Systems Installation design coordination (Catia)
- System Suppliers liaison & Managing
- Technical Proposal Evaluation
- Requirements Validation & Verification (DOORS)
- Systems & Equipments Qualification (DO160)
- Systems & Equipments Certification, interface with authorities
- FHA support (ARP 4761)
- SSA support
- Management of technical and operational systems documentation (FCOM, MMEL etc.)





Based on the above Protom Aerospace BU is able to provide expertise in the following Aircraft Systems relying on its group of experienced Senior System Engineers

- Flight Controls (Mechanical and Fly-by-Wire)
- Landing Gears (Steering, Wheels and Brakes)
- Hydraulics
- Pneumatics, ECS & Ice Protection
- Oxygen & Fire Protection
- Systems Integration & Installations



Protom is also highly specialized in Systems Integration & Installation with respect to Hydraulics, Pneumatics, ECS, Fuel, Oxygen, Mechanical FCS & Landing Gears through the use of DMU (Digital Mock-up). We can provide support from the initial system space

allocation activity up to the detailed systems installation producing 3D & 2D drawings in accordance with the customer standards. Finally we have the capabilities to take the complete responsibility for systems integration & installation taking into account segregation, safety,

accessibility & maintainability requirements. Deep use of DMU (Digital Mock-up) for complete aircraft or equipped section space allocation, Clash Analysis, Accessibility Analysis & DMU review.

# RAMS

Protom RAMS team consists in professional in line with the ARP4754 guidelines for experts in the fields of Reliability Prediction and Development of Civil Aircraft Systems Protom Analysis, Maintainability Analysis (including RCM is able to support the Design process from and MSG3), Safety Assessment (ARP4761), Safety preliminary to the detailed design with Management. development of Validation & Verification activities.

- FHA
- System Safety
- Safety program plan
- System and Subsystem Safety Analysis (ARP 4761)
- System and Subsystem Hazard Analysis & Hazard Log
- FMECA (MIL-P-1629)
- Fault Tree Analysis (FTA)
- RAM requirements apportionment
- Testing procedures Design and Specification, for Subsys requirements V&V



# Common Cause Analysis (CCA)

The CCA consists of three separate types of analyses which are designed to uncover hazards not created by a specific subsystem component failure. The Particular Risk Analysis (PRA) looks for external events which can create a hazard such as a birdstrike or engine turbine burst. The Zonal Safety

Analysis (ZSA) looks at each compartment on the aircraft and looks for hazards that can affect every component in that compartment, such as loss of cooling air or a fluid line bursting. The Common Mode Analysis (CMA) looks at the redundant critical components to find failure modes which can cause

all to fail at about the same time. Thanks to its Senior Design Engineers accustomed with EASA/FAA regulation and in systems/structure design Protom is able to conduct Particular Risk following the AMC 20-128A Design Considerations for Minimizing Hazards Caused by Uncontained Turbine Engine and Auxiliary Power Unit Rotor Failure, Zonal Safety Analysis (ZSA) and Common Mode Analysis (CMA).



# Clean Sky



We are capable of facing complex challenges within the area of design for aerospace, thanks to the know-how of our engineers and their "integrated & Make it Work Approach".

Our abilities allowed us to become a partner in the Clean Sky 2 program that is taking place within the European venture of Horizon 2020.

Protom is Clean Sky 2 **CORE PARTNER** in the following project:

- **COSTAR** – Compact innovative Smart Actuators for next generation Rotorcraft (Airbus Helicopters Topic Manager),

Protom is Clean Sky 2 **PARTNER & COORDINATOR** in the following projects:

- **ITEM B** – Integrated Main Landing Gear Bay (Airbus Topic Manager) - In partnership with LAER and University of Naples Federico II
- **SPAIN** – Smart Insulation Panels for SAT Aircraft Interiors (Evektor Topic Manager) - in partnership with TIA
- **DEVILS** - Development of Vhbr engines Innovative Lubrication System (Rolls Royce Topic Manager)- In partnership with Abete, Tat Technologies (Israel), Euro.soft, Istituto Motori-Consiglio Nazionale delle Ricerche and University of Naples Federico II – Industrial Engineering Dept.
- **SEaSiDE** - Smart Electro-expulsive System for Sat aircraft DE-icing (Piaggio Aerospace Topic Manager) - in partnership with GKN Aerospace (UK)
- **EURECA** - Enhanced Human Robot cooperation in Cabin Assembly tasks (Fraunhofer Institute Topic Manager)- In partnership with Istituto di Tecnologie Industriali e Automazione-Consiglio Nazionale delle Ricerche, and IT Robotics

# Our Services

## Engineering Consultancy Service

Consists in providing highly specialized Engineering expertise consultancy on some specific developing competences or to assist in planning design actions or implementation support in the following domains :

- Structure Design & Analysis
- Cabin Interiors & Systems
- System Engineering
- Aircraft development and Integration (ECS, IPS, Structure, Mechanical Systems)

## Plug & Play Service

Consists in providing specialized manpower on site for short or long period of time, supported in back office by the Core Team of our Aerospace Business Unit:

- Structure Designers (Metal & Composite)
- Structure Analysts
- FCS Design Engineer
- LG design Engineers
- ECS Design Engineers
- Systems Installation Engineers
- RAMS

## WP Leadership Service

Design Responsibility on a complete WP mainly in Structures domains:

- Project management
- Requirement engineering
- Design and specification
- Design assurance
- 2nd tier supplier management (design & stress, technical documentation, test)



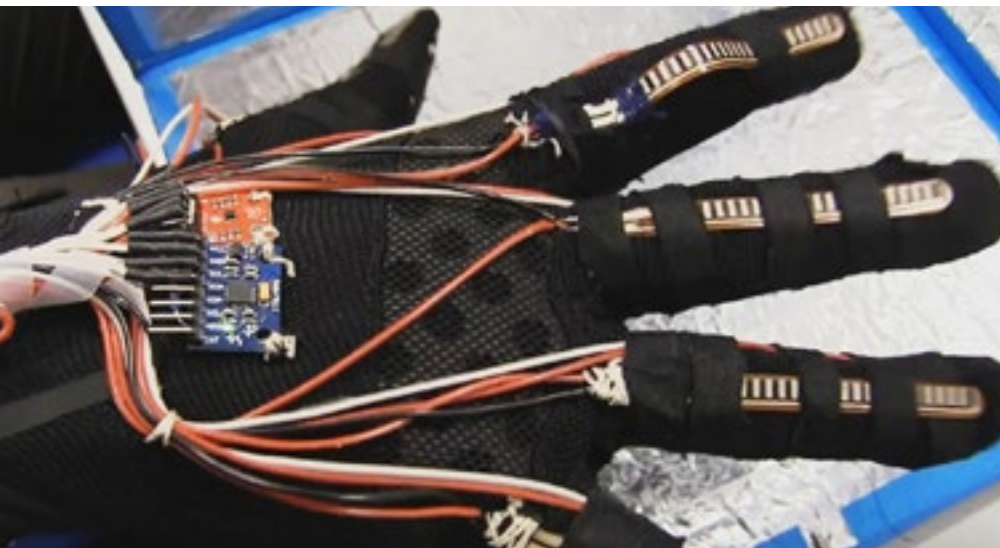
# ICT for Aerospace

Protom developed WALL-T, an open and extremely flexible framework, capable of completely handling an interactive virtual reality that can "submerge" the user, thanks to the integration of biometric sensors and innovative interfaces.

WALL-T can handle physical reactions, thus rendering with extreme realism the interactions coming for real world stimuli, in the virtual reality.

We created virtual cockpits with a number of different configurations that can be used for both simulations and exercises, which allows to analyze in a safe environment the reactions and cognitive responses of the pilot in front of dangerous situations.

Furthermore we have developed a prototype of glove equipped with motion and haptic actuator sensors to operate manipulations with a feedback on digital materials.



# Training for Aerospace

We provide training solutions that allow the development of the most important skills and professional growth, aiming at increasing our customer's corporate results.

We are constantly innovating our training solutions and methods through the capitalization of the know-how we developed in over 20 years of activity.

Our strenght is being part of a corporate reality known for addressing both private and public customers and providing them highly added value training services.





# Sustainability

Companies today have an active role in the fabric of society and they have to commit to ensuring a better quality of life, especially for future generations.



Protom considers sustainability a strategic asset in the development of business. We firmly believe that lasting commercial success can only be achieved by pursuing an environmentally and socially conscious growth. Therefore we commit to implementing responsible practices and to develop innovative solutions that improve people's lives and respect the environment,

employing standards and certifications and adhering to international initiatives. Our final goal is to safeguard and increase the success of the company, to continue to grow focusing on respecting and improving social values and the quality of the environment.



## Global Compact

The United Nation Global Compact is a strategic initiative for those companies aiming to align their business with universal principles on human rights, labour, environment and anti-corruption. More than ten thousands organizations take part in the initiative, including over seven thousand companies from 145 different countries. Protom joined the UNGC and, therefore the commitment has been made to observe Ten Principles set by United Nations. Joining the UNGC, Protom takes on the effort of reporting every year to the UN the progress made in order to implement the Global Compact principles, incorporating them into strategies, policies and procedures valued as strategic for the business success.

## SDGs

On 1 January 2016, the 17 Sustainable Development Goals (SDGs), adopted by world leaders at an historic UN Summit, officially came into force. As the 2030 Agenda for Sustainable Development stated, all countries will mobilize efforts to end all forms of poverty, fight inequalities and tackle climate change, while ensuring that no one is left behind. Even if SDGs are not legally binding, Protom considers the pursuing of these goals an issue of social responsibility and, at the same time, an essential tool to outline new markets and opportunities and grow its own business.





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