

MIIRA

A CAF GROUP COMPANY



MAINTENANCE & SPARE PARTS SOLUTIONS

www.cafmiira.com

Beyond
wheelset
solutions

Your partner for wheelset solutions



INTEGRAL WHEELSET SOLUTIONS

At CAF MIIRA, we are dedicated to being your global leader in providing cutting-edge Integral Wheelset Solutions. Our commitment extends from the heart of the rail industry, offering innovative engineering, manufacturing, and maintenance solutions for complete wheelsets and portal axles, for all type of trains.

Our solutions are designed to streamline supply chain management and reduce the carbon footprint, contributing to a greener and more sustainable future.

By designing and manufacturing the main elements of the wheelset internally, we ensure full traceability throughout the assembly process.

A committed and highly qualified team, with strong leadership capabilities, focuses on customer satisfaction, continuously driving innovation and excellence in every project. Together, we strive to exceed expectations and achieve shared success.

Forward together.



WHY CHOOSE CAF?

- **Reduced lead times** and improved logistics efficiency
- **Reliability, efficiency, and cost-effectiveness**
- **Decreased total weight** of the complete solution
- **Minimized carbon footprint**

CAF GROUP

The CAF Group is a multinational group with over 100 years' experience offering integrated transport systems at the forefront of technology that provide high value-added sustainable mobility for our customers.

We are international leaders in the implementation of comprehensive rail and bus mobility solutions, with extensive experience addressing projects throughout the entire project life cycle in a multitude of geographies.

CAF continues towards the challenge of decarbonisation as the main axis of its strategy, with a commitment to sustainable growth focused on the environment, and leading the transition towards net zero emissions mobility.

Our strategic commitment to decarbonisation and the energy transition is reflected in the 2021 accession to SBTi (Science Based Targets Initiative) and Race to Zero, international alignment initiatives in the fight against climate change and Paris Agreement.



CERTIFICATIONS

Our quality systems are rigorously tested and currently comply with major international standards and regulations.

PRODUCT & MANAGEMENT SYSTEM

QUALITY • ARR • ISO 9000 • IRIS • ISO 1725 • RISAS • VPI	ESG <i>Sustainability & Environment</i> • CDP • EPD • ISO14001 • ISO26000 • RAILSPONSIBLE • ECOVADIS GOLD <i>Labour health & safety</i> • 45001 SCIENCE BASED TARGETS DRIVING AMBITIOUS CORPORATE CLIMATE ACTION RACE TO ZERO EPD® PLATINUM Top Tier 2023 ecovadis Sustainability Rating		
SAFETY • UNE			
TSI • TSI			

Lead the way with CAF MIIRA's Eco-Approved solutions



Green e-Energy

100% renewable certified e-Energy, produced by wind turbines.

Sustainable. Infinite.

ECO design

More efficient designs that are lighter, require less maintenance and offer longer lifetimes.

Complete wheelset and gearbox designs that eliminate compatibility related problems, maximizing the reduction of total weight.

Efficient. Lightweight.

ECOmmited

Part of SBTi (Science based targets initiative) and Race to Zero initiatives against climate change aligned with the Paris Agreement.

Focus on continuous improvement to reduce carbon footprint throughout the entire life cycle of our products.

Endless improvement.

ECOnsumption

Lightweight designs that require less material and generate less waste.

Production and supply of complete wheelsets generate less carbon footprint: we avoid unnecessary operations and transports.

Integral. Clean.

Circular ECOnomy

100% of the scrap generated by our products is used to produce the steel we use. No additional external resources needed.

Reusable packaging system.

Recyclable.

Green Steel

Green Steel wheels and axles. Our steel is below Standards in terms of generated GHG intensity and below industry average.

Responsible. Green.

MAINTENANCE & SPARE PARTS SOLUTIONS

PRODUCT KNOWLEDGE APPLIED TO THE ENTIRE WHEELSET LIFECYCLE

As a designer, manufacturer and maintainer of wheelsets, gearboxes and resilient wheels, CAF MIIRA combines product expertise with lifecycle support to maximize reliability, availability and performance.



Complete wheelsets



Wheels



Gearboxes



Axles



Resilient wheels



Maintenance & spare parts



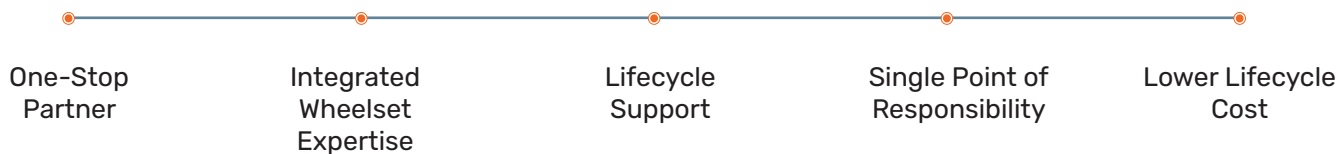
YOUR FLEET DESERVES ENGINEERING THAT INTEGRATES EVERYTHING

CAF MIIRA has evolved from a historical supplier of rolling components into a technology partner providing integral wheelset solutions. We design, manufacture and maintain wheels, axles, resilient wheels, gearboxes and complete wheelsets, ensuring full control over the system and its in service behaviour.

This level of integration allows us to anticipate failure modes, optimise total cost of ownership (TCO), reduce operational risks

and guarantee full mechanical and functional compatibility. By concentrating engineering, manufacturing and in service support under a single point of responsibility, we simplify logistics, lead times and risk management for operators.

Our commitment extends across the entire wheelset lifecycle: from design and validation phases, through in house manufacturing of critical components, to preventive and corrective maintenance, modernisations, spare parts management and end of life solutions.





OPERATIONAL CHALLENGES REAL SOLUTIONS

OPERATIONAL CHALLENGES

Reliability Issues

Premature wear (wheels, gears, couplings), recurring failures (water entries, bearings' failures, leaks) and reduced reliability.

Maintenance Complexity

Inspection constraints, diagnostics difficulties and maintenance execution challenges.

Obsolescence & Supply Risks

Component availability, long lead times and procurement challenges.

Fleet Availability Constraints

Downtime, service disruptions and operational impact.

ENGINEERED SOLUTIONS

Reliability Optimization

Root cause analysis, engineering improvements and performance stabilization.

Maintenance Optimization

Technical expertise, inspections, life extension assessments and optimized maintenance strategies.

Obsolescence Management

Spare Parts reengineering, modernization, re-definition of validity and manufacturing criteria.

Availability Assurance

One-Stop Shops, strategic spare parts and rapid response capabilities.

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- **100+** YEARS WHEELSET EXPERTISE
 - **7** WORKSHOPS WORLDWIDE
 - **> 20.000** WHEELSETS SERVICED ANNUALLY
 - **36** COUNTRIES SUPPORTED
 - **30** MAINTENANCE ENGINEERING SPECIALISTS PASSIONATE ON LIFECYCLE SUPPORT
 - **600** PROFESSIONALS SUPPORTING THE COMPLETE WHEELSET LIFECYCLE.

TURNING EXPERIENCE INTO BETTER MAINTENANCE

Through decades of design, manufacturing and maintenance experience, CAF MIIRA has accumulated a unique understanding of wheelset behaviour in service.

By combining Return of Experience (ROE), engineering expertise and operational data, we transform field knowledge into practical improvements that enhance reliability, optimize maintenance strategies and reduce lifecycle costs.



Return of Experience (ROE)

Real operational feedback integrated into maintenance and engineering decisions.

Dedicated Technical Office

Specialized teams supporting diagnosis, optimization and problem solving.

System-Level Understanding

Complete visibility of wheelsets, gearboxes and resilient wheels as an integrated system.

Data-Driven Improvements

Continuous refinement of maintenance plans based on operational evidence.

Continuous Performance Optimization

Engineering knowledge applied to improve reliability, availability and lifecycle cost.



PREVENTIVE MAINTENANCE

Light maintenance, overhaul and inspection services performed either at customer facilities or CAF MIIRA service centers, following qualified procedures based on industry standards and operational experience.



CORRECTIVE MAINTENANCE

Failure analysis, technical expertise and incident response supported by specialized engineering teams, technical assistance and dedicated maintenance facilities.

OUR SERVICE PORTFOLIO

CAF MIIRA supports operators throughout the entire wheelset lifecycle through four complementary service areas. Together, they improve reliability, optimize maintenance activities and ensure long-term fleet availability.



TECHNICAL ASSISTANCE

Engineering support that connects design knowledge with workshop operations, helping improve reliability, optimize maintenance activities and enhance fleet performance over time.



SPARE PARTS & LIFECYCLE SUPPORT

Strategic spare parts supply, obsolescence management, reverse engineering and modernization solutions designed to ensure long-term fleet availability and operational continuity.

PREVENTIVE MAINTENANCE & INSPECTION ROUTINES

Preventive maintenance is the foundation for maximizing **availability, reliability and lifecycle performance** throughout the wheelset lifecycle. Combining industry standards with CAF MIIRA's accumulated in-service experience, our programs are designed to **minimize the risk of failures, extend component lifetime, optimize maintenance intervals** and **reduce total lifecycle cost**.

We also **review** and **optimize original OEM maintenance programs**, adapting them to real operating conditions and accumulated service experience. Through a proactive and data-driven approach, operators benefit from **higher fleet availability, improved operational reliability** and **long-term cost stability**.



PERIODIC INSPECTIONS AND CONDITION ASSESSMENT

Regular inspections of wheels, axles, gearboxes and resilient wheels, adapted to operating conditions and maintenance plans, help identify potential issues before they affect service availability.



ADVANCED METROLOGY AND DIMENSIONAL VERIFICATION

Use of advanced measurement equipment, including 3D systems, to verify critical dimensions, geometries and tolerances throughout the wheelset lifecycle.



CERTIFIED NON-DESTRUCTIVE TESTING (NDT)

Ultrasonic testing, magnetic particle inspection, eddy currents and penetrant testing performed by certified personnel to ensure structural integrity and safety.



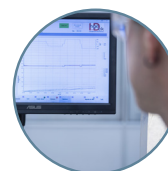
CRITICAL COMPONENT MONITORING

Assessment of bearings, sealing systems, fastening elements, oil condition and other key operational parameters to detect degradation at an early stage and prevent unexpected failures.



OVERHAUL & LIFE EXTENSION

Full overhaul cycles restore wheelsets and components to original operating conditions, extending service life and ensuring reliable long-term performance.



DIGITAL TRACEABILITY AND MAINTENANCE RECORDS

All interventions are digitally recorded, providing complete traceability, historical tracking and seamless integration with customer maintenance systems.



CORRECTIVE MAINTENANCE & RAPID RESPONSE

When operational disruptions occur, every minute counts. CAF MIIRA delivers rapid-response maintenance services through a unique combination of specialized One-Stop Shops, engineering expertise, Help Desk support and mobile technical teams. This integrated capability enables **faster recovery, reduced downtime, higher fleet availability** and **improved asset performance** throughout the wheelset lifecycle.



FAST DIAGNOSIS AND TECHNICAL ASSESSMENT

Initial inspections, measurements and engineering analysis allow rapid identification of the issue and definition of the most effective recovery strategy.



COMPLETE REPAIR AND RECONDITIONING CAPABILITIES

Disassembly, cleaning, damage assessment and repair activities are performed using advanced metrology, laboratory resources and approved procedures.



ROOT CAUSE ANALYSIS (RCA)

Beyond repairing the failure, we identify its origin and define corrective actions to prevent recurrence and improve long-term reliability.



CORRECTIVE ACTIONS & PERFORMANCE IMPROVEMENT

Depending on the findings, interventions may include component replacement, redesign recommendations or performance improvement actions adapted to operating conditions.



TESTING AND VALIDATION BEFORE RETURN TO SERVICE

All repaired components are verified through inspection, testing and functional validation to ensure safe and reliable operation.



CONTINUOUS IMPROVEMENT THROUGH ROE

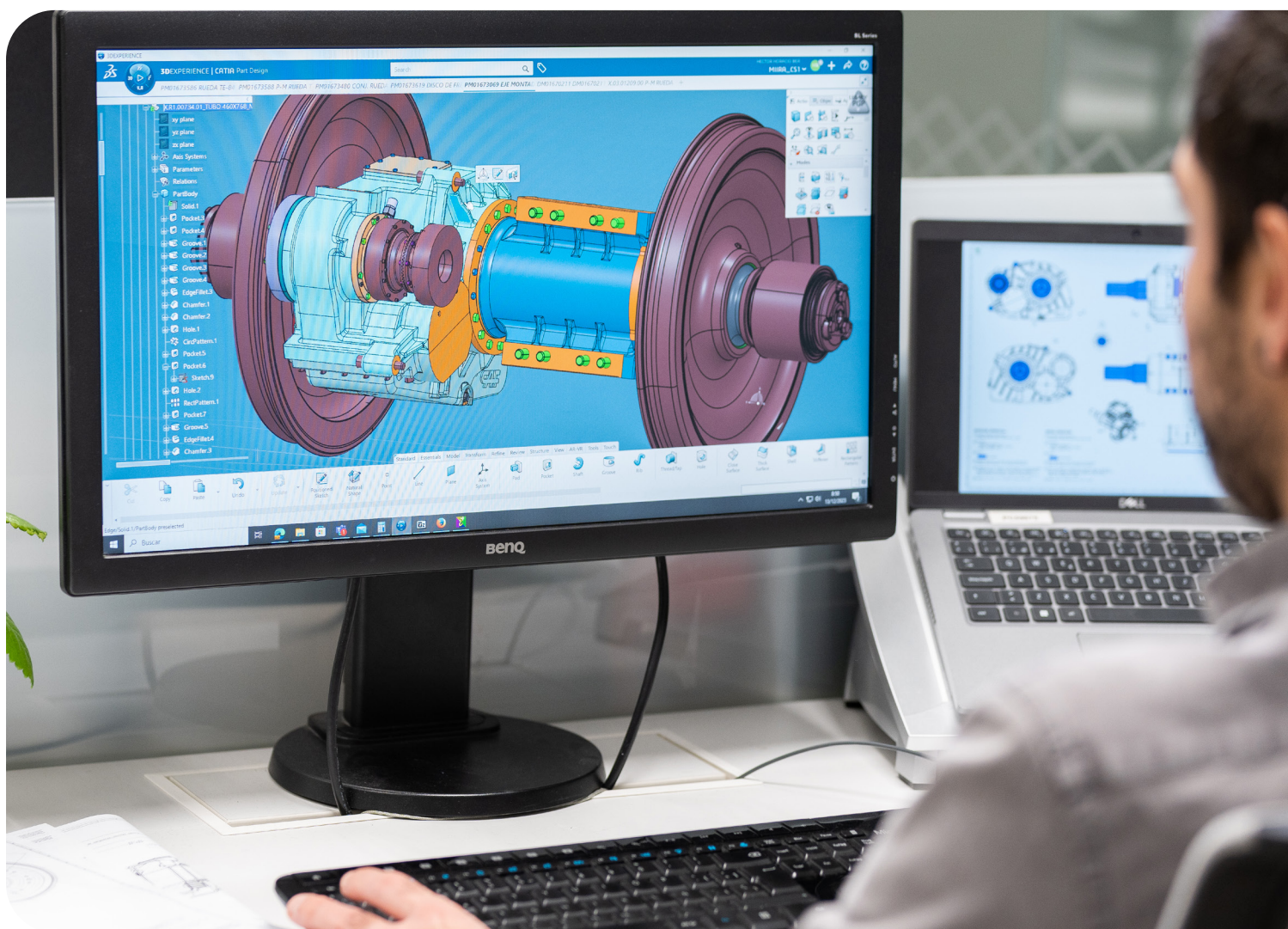
Information gathered during interventions is integrated into Return of Experience (ROE) processes, supporting the optimization of future maintenance and design strategies.



TECHNICAL ASSISTANCE & KNOWLEDGE TRANSFER

CAF MIIRA provides direct access to the expertise of its engineering teams and field specialists, helping operators improve maintenance quality, optimize processes and make better technical decisions. By transferring design, manufacturing and in-service knowledge to the maintenance environment, we help customers **improve repeatability, increase reliability, reduce lifecycle cost** and **continuously enhance fleet performance**.

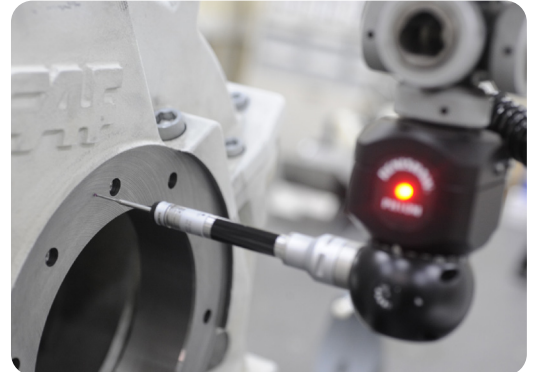
- Training & Knowledge Transfer
- Special Tools & Workshop Support
- On-Site Technical Assistance
- Technical & Process Audits
- Documentation & Technical Standards
- Lifecycle Optimization & LCC Reduction



- Workshop Design & Optimization
- Maintenance Equipment Selection
- FMEA & Reliability Engineering
- Structural Analysis (FEM) & Lifetime Assessment
- Predictive Maintenance & Vibration Analysis
- Condition-Based Maintenance (CBM)
- Remote Monitoring & Digital Tools
- KPIs & Continuous Improvement Programs

ENGINEERING & CONTINUOUS IMPROVEMENT

Maintenance engineering transforms operational data into actionable improvements. By combining analytical tools, reliability methodologies and in-service experience, CAF MIIRA helps operators **optimize maintenance strategies, improve asset performance, reduce intervention times and achieve measurable lifecycle cost reductions.**



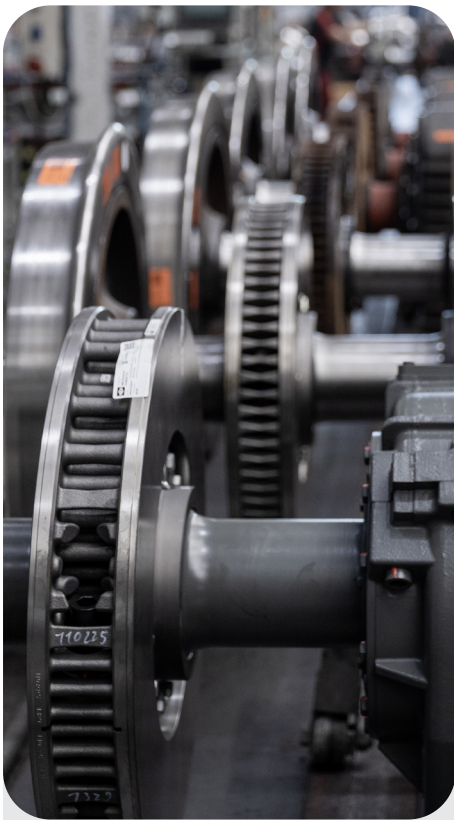
SPARE PARTS, TSSSA & OBSOLESCENCE MANAGEMENT

Spare parts supply is more than component availability. Through tailored service agreements, strategic stock management and engineering support, CAF MIIRA helps operators **ensure fleet availability, reduce supply risks, shorten lead times** and **optimize lifecycle costs**, guaranteeing long-term support throughout the wheelset lifecycle.

- TSSSA Contracts & Service Agreements
- Strategic Stock & Logistics Management
- Fast Response Spare Parts Supply
- Spare Parts & complete Gearbox Reengineering
- Obsolescence Management & Modernisations
- Supply Cost Optimization

COMPLETE WHEELSET SYSTEM EXPERTISE

CAF MIIRA combines decades of design, manufacturing and maintenance expertise across the wheelset system, enabling more effective maintenance strategies, improved reliability and enhanced lifecycle performance.



WHEELSETS

- Design & geometry optimization
- Material selection & heat treatments
- Assembly tolerances & testing
- Full lifecycle traceability



GEARBOXES

- Thermal and dynamic behaviour
- Lubrication & sealing systems
- Reconditioning & overhaul expertise
- Reliability-focused maintenance



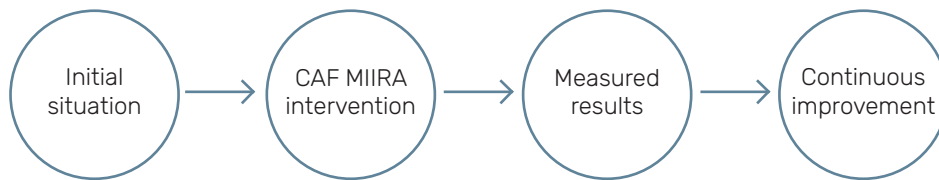
RESILIENT WHEELS

- Elastic system design
- Noise & vibration reduction
- Dynamic behaviour analysis
- Refurbishment & replacement strategies

CASES & KPIs

CAF MIIRA structures each project around measurable outcomes and objective performance indicators. Combining engineering expertise, maintenance know-how and in-service experience, our teams identify the root cause of operational challenges and implement effective solutions. The impact of each intervention is then assessed through clear and verifiable KPIs, providing customers with a transparent view of the value delivered.

HOW WE MEASURE SUCCESS



WHAT WE MEASURE

Failure Rates & Incident Levels

Monitoring the evolution of failures, recurring incidents and operational disruptions

Fleet Availability & Reliability

Evaluating operational performance, uptime and system reliability.

Maintenance Intervention Times

Tracking the efficiency of maintenance activities and operational impact.

Component Lifetime & Service Intervals

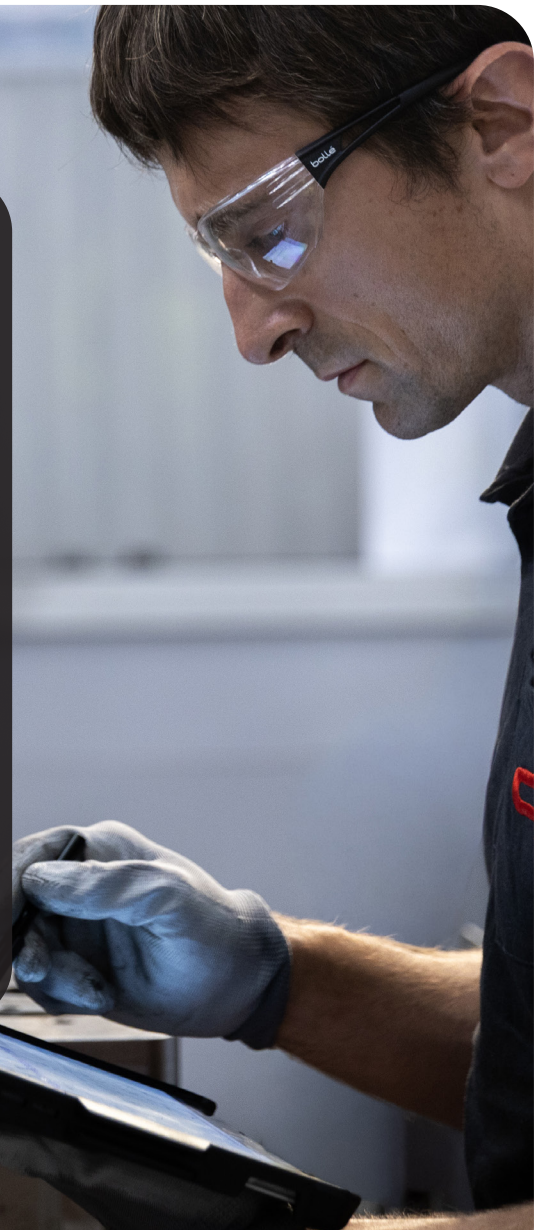
Measuring improvements in service life and maintenance periodicity

Total Cost of Ownership (TCO)

Assessing the impact of maintenance and engineering actions on lifecycle costs.

Project-Specific Performance Indicators

Additional KPIs adapted to the fleet, operating conditions and customer objectives.



CASE 1 METRO OPERATOR

PROBLEM:

Premature gearbox failures after first overhaul, exponential rise in costs and loss of availability.

SOLUTION:

Overhaul process audit and expertise. Identification of root cause, improved overhaul process and special tools definition, training, surveillance and technical support.

RESULT:

- Resolution of the problem
- Restored gearboxes health to as-new condition



CASE 2 REGIONAL FLEET

PROBLEM:

OEM and operator bogies and axle-box maintenance plan not matching with the real wheels wear.

SOLUTION:

Maintenance strategy review, engineered support for bearings and wheels life extension

RESULT:

- 25% wheelset and wheels' life extension
- 30% reduction in wheelsets maintenance costs



CASE 3 REGIONAL FLEET

PROBLEM:

High costs of preventive and corrective maintenance of Gearboxes, low service levels and technical dependency on original OEM.

SOLUTION:

Maintenance strategy review, reengineering of the gearbox, development of a completely new supply chain of components, light preventive maintenance technical training to Operator technicians on long-term service and OH agreement on MIIRA One-Stop Workshops.

RESULT:

- 65% reduction in gearbox maintenance costs
- Availability of Gearboxes from 80% to 94%





WE ARE WHERE YOUR FLEET OPERATES

Wherever your fleet operates, CAF MIIRA provides local access to engineering, maintenance and spare parts expertise.

Through our network of specialized workshops, engineering teams and One-Stop Shops, we help customers reduce response times, improve operational support and maximize fleet availability throughout the wheelset lifecycle.

- Global Presence
- Local Service Capabilities
- Specialized Workshops
- Engineering Support
- One-Stop Shop Approach
- Reduced Response Times



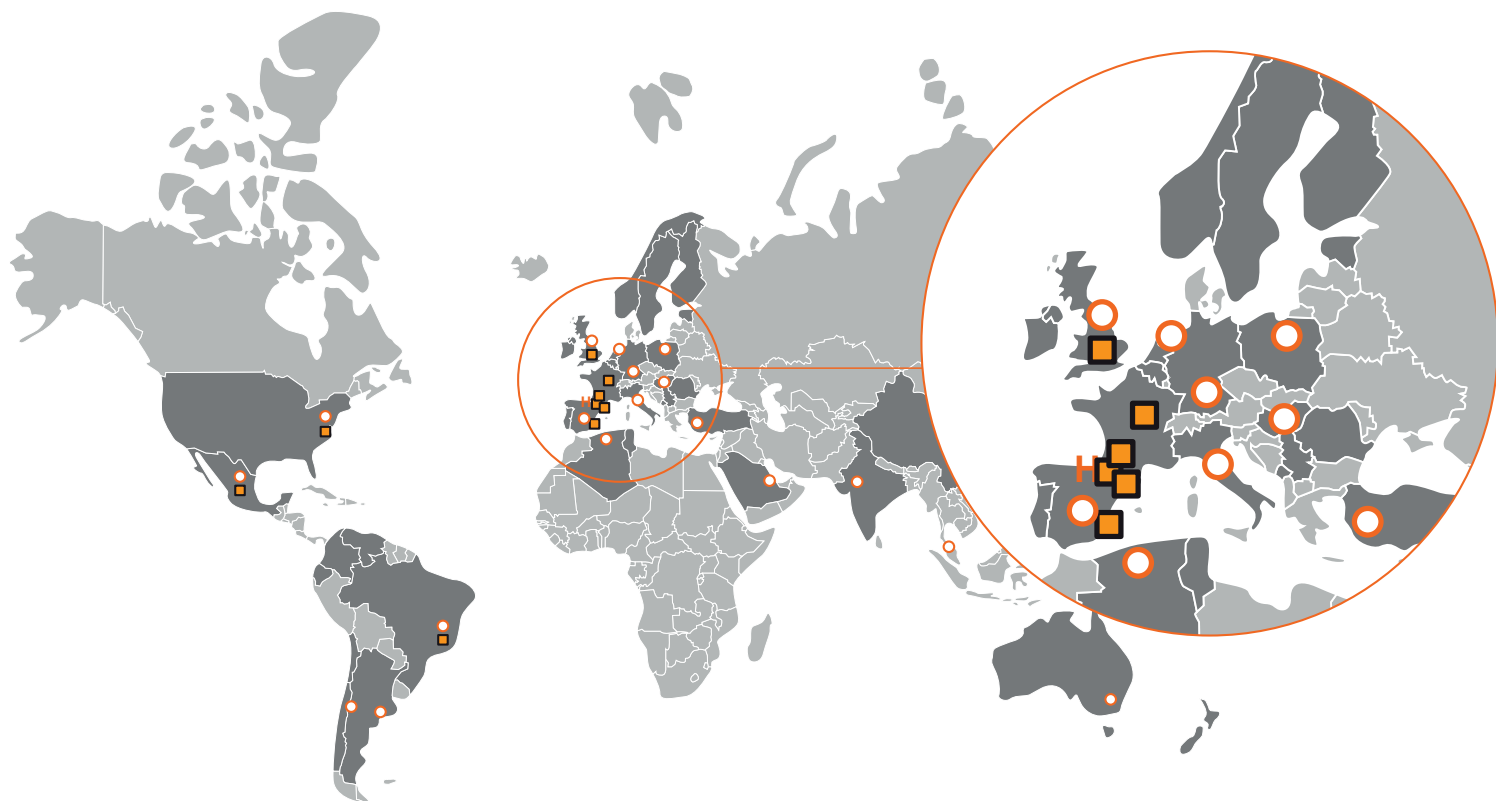
Our mission is simple: helping customers maximize reliability, availability and performance across the entire wheelset lifecycle.



Pedro Labayen

Maintenance Solutions Director

MIRA



- H** | Headquarters
- | Production Plants
- | Offices
- | Countries with ongoing projects

Headquarters:

- SPAIN

Production Sites:

- SPAIN • FRANCE
- USA • BRAZIL
- MEXICO • UK

Subsidiaries:

- MADRID • PARIS • LONDON
- MUNICH • WASHINGTON D.C.
- NEW DELHI • MEXICO D.F.
- ROME • SYDNEY • WARSAW
- SAO PAULO • BUENOS AIRES
- ISTANBUL • ROTTERDAM
- DOHA • KUALA LUMPUR
- SANTIAGO DE CHILE
- BUDAPEST

As part of **CAF GROUP**, we leverage decades of experience in train design, operation and maintenance, combining local service capabilities with access to a global network of experts, facilities and technical knowledge.

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