

LAND MRO

Giving You the Leading Edge



ABOUT US

ST Engineering is a global technology, defence and engineering group with extensive experience and a strong track record in Maintenance, Repair and Overhaul services. We bring innovation and technology together to solve real-world problems and give customers a competitive edge.

ENGINEERING

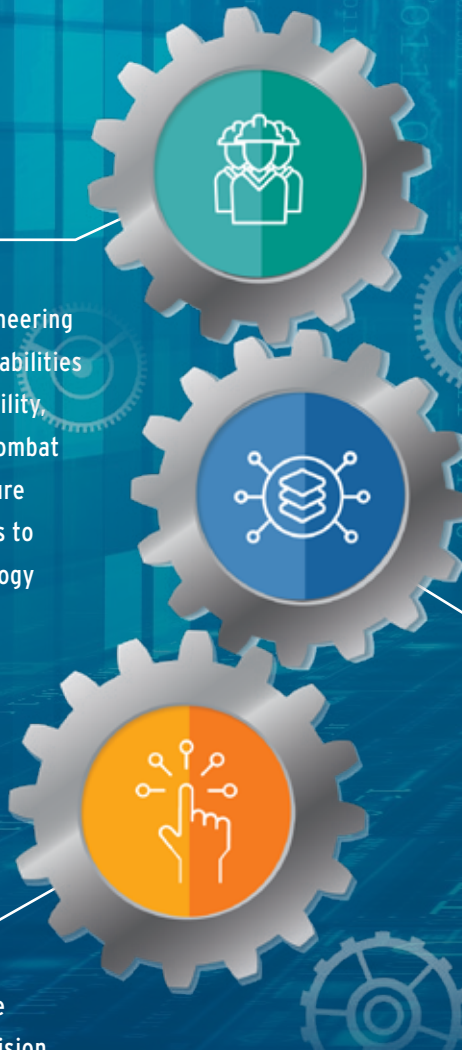
With decades of expertise in developing military technology and innovative engineering solutions, our products have proven capabilities and combat readiness in battlefield mobility, personnel protection and firepower in combat deployment. We forge a supportive culture of innovation that enables our engineers to dream and push the frontiers of technology and engineering.

DIGITALISATION

We harness the power of data mining, analytics and machine learning to derive valuable and actionable insights for decision making. Our scalable data science, analytics and AI solutions are designed to provide intuitive experiences and insightful outcomes.

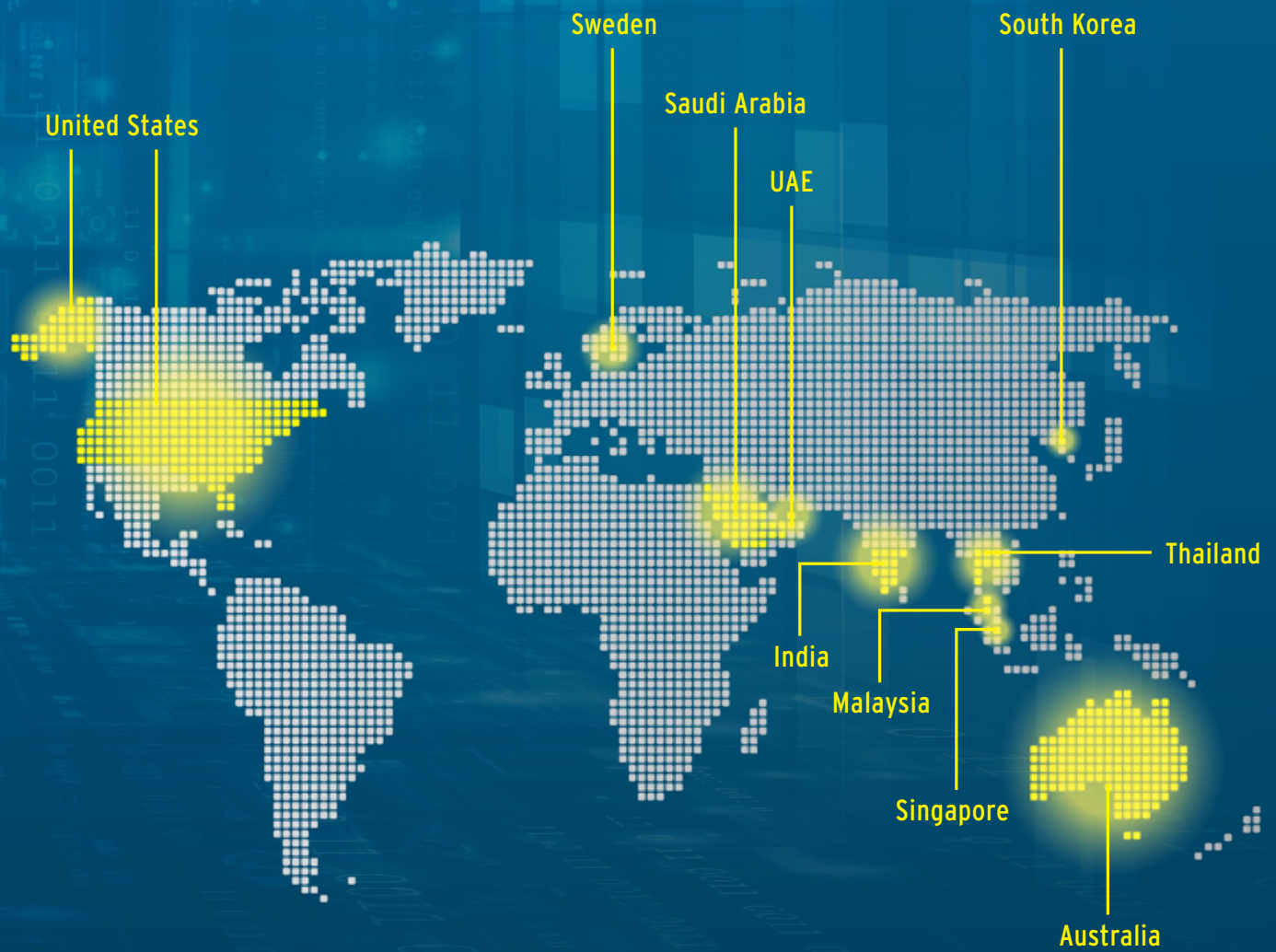
OPERATIONS

We offer after-sales support services and solutions that optimise the life cycle of assets, including servicing, maintenance and upgrades to ensure equipment serviceability and smooth fleet operations. Our precision engineering capabilities include overhaul, diagnostics, testing, and re-manufacturing.



Our MRO Footprint

Maintenance | Repair | Overhaul



Proficiency in
>300
equipment types

Customers in
>10
countries

Experience of
>30
years

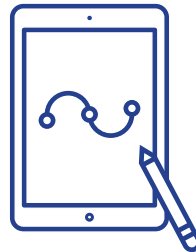
WHY MRO IS CRITICAL

Maintenance, Repair and Overhaul (MRO) is designed to optimise the life cycle of operating assets from deployment, reset/upgrade to retirement. Good MRO keeps equipment in a high serviceable state, ensures fleet optimisation and sustainable use of resources.

Maintenance involves the inspection and replacement of materials and components before they break down thereby preventing unexpected failures. Preventive maintenance is done at regular intervals ranging from quarterly to 6-yearly.

Repair is typically carried out when there is accidental damage or unexpected failure. Deep expertise and understanding of the equipment is essential at this stage to diagnose and perform the necessary remedial work using appropriate methods.

Overhaul is the highest level of maintenance work involving extensive replacement of worn out materials and components. Typically run as a programme similar to a manufacturing line, overhaul requires detailed planning for materials, defining scope-of-work, disassembly/assembly process and optimised turnaround of equipment.

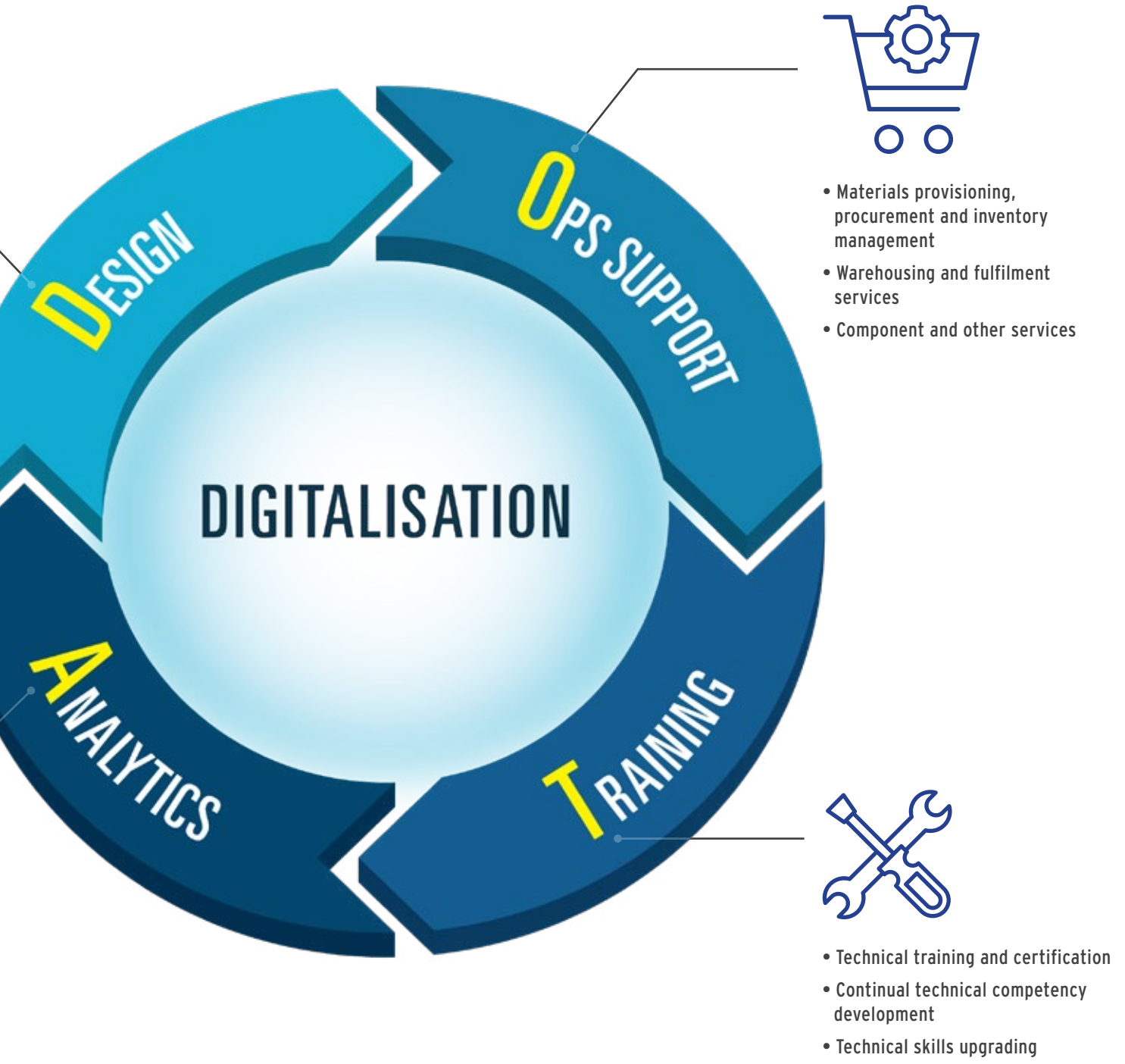


- Workshop workflow and process
- Infrastructure and facility layout
- Customised digital solutions



- Data description, mining and storage
- Data monitoring, diagnostics and abnormality detection
- Machine learning and predictive maintenance
- Prescriptive analytics for optimal decision making

MRO Digitalisation adopts a reinforcing DOTA cycle, from design of workshop process and layout, to establishment of operations support including materials and manpower, followed by training and finally data analytics.



The Digitalisation of MRO

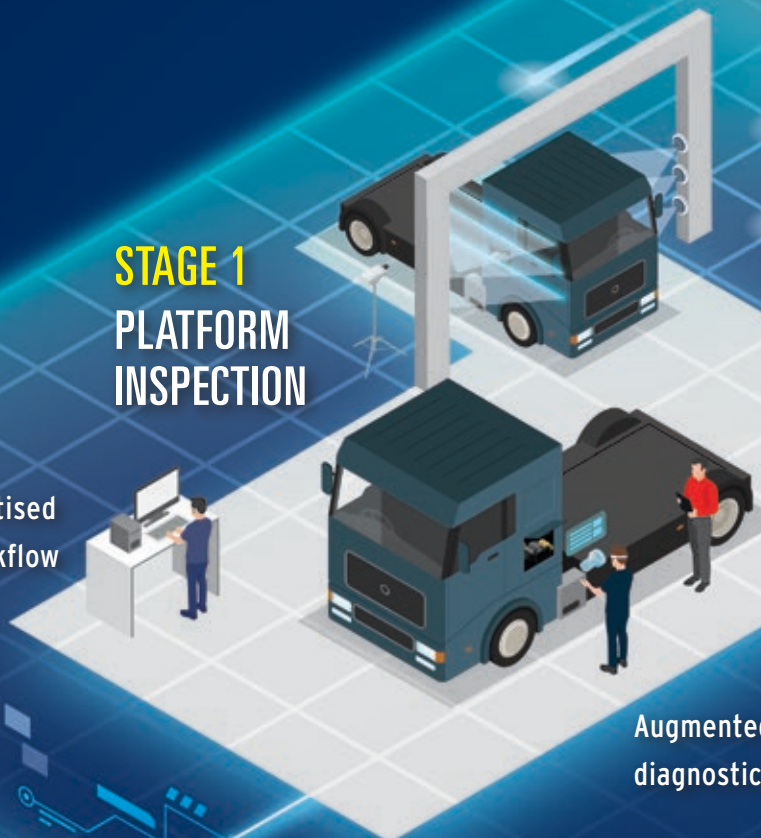
Traditionally a manual and labour intensive process, MRO operations have been transformed into highly efficient and resource optimised activities driven by technology and data analytics. Here are some examples:

- Augmented diagnostics
- Digitised workflow
- Integrated supply chain
- Unmanned store
- Robotic automation
- Integrated tools management
- Digital inspection
- Real-time status harmonisation

STAGE 2 INTEGRATED SUPPLY CHAIN



STAGE 1 PLATFORM INSPECTION





INTEGRATED MRO OPERATIONS

- Fleet engineering data analytics
- MRO situation monitoring and anomaly detection
- Real-time status harmonisation

STAGE 3A PLATFORM REPAIR

STAGE 3B COMPONENT REPAIR



Robotic automation

Augmented component diagnostics

Integrated tools management



Digital inspection

STAGE 4 PLATFORM ASSEMBLY AND INSPECTION



DESIGN

Infrastructure Setup

Anchored on LEAN methodology, the workflow of an MRO workshop is designed to reduce waste. A well-designed workshop reduces unnecessary steps, is process efficient and optimises resources.



Smart infrastructure design and facility layout increases productivity and optimises space. Whether it is basic replacement of materials/components or extensive assembly/disassembly and overhaul of equipment, or even installation of large machines, an ingenious infrastructure setup will enhance workflow efficiency.

OPERATIONS SUPPORT

Spares Management



The MRO supply chain typically encompasses materials provisioning, procurement, inventory management and warehouse fulfilment. To ensure service-level fulfilment, our proprietary software **PRIMS (Provisioning & Inventory Management System)** uses digitalisation to analyse consumption trends and inventory planning.

Through the utilisation of data-driven intelligence and automation, our integrated supply chain enables customers to make astute decisions and purchases.

OPERATIONS SUPPORT

Component MRO

Component level systems include parts such as engines, hydraulic cylinders and electronic cards on vehicular platforms. Working closely with Original Equipment Manufacturers (OEMs) and end users, we are able to repair customers' components at the factory level and thereby extend their operation and support life cycle.

Mechanical



Hydraulics





With a wide range of precision engineering solutions, we support customers in defence, marine, shipbuilding, power, rail and industrial sectors. Our competencies include engine and transmission maintenance, repair, overhaul, diagnostics and testing, as well as engine re-manufacturing.



Testing Capabilities

- Main engine dynamometer (max 3,000hp)
- Portable dynamometer (max 800hp)
- Allison transmission dyno test cell (max 450hp)
- Generator load test bench (max 1,100kW)
- Fuel injector service facility



We provide end-to-end MRO services which include customised engineering solutions and test services.

With ISO 7 & 8 certified standard clean rooms with optimal controlled environments specially designed for hydraulic components, you can be assured of quality work produced in an environment that has close to no contamination.

Our high-tech automated test equipment for suspension, auxiliary, brake, pump and fan systems are able to simulate various environmental conditions and perform real-time data analysis and recording.

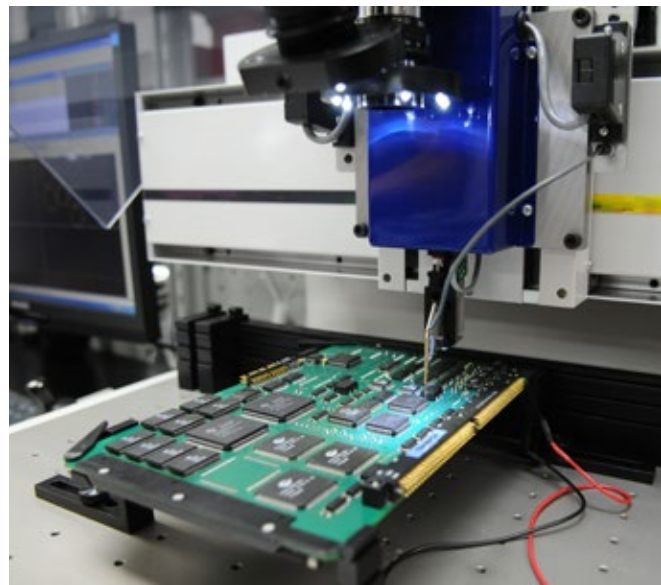
OPERATIONS SUPPORT

Component MRO

Why choose us

- Shorten lead time by 30%
- Increase cost efficiencies by 35%
- High-tech ANSI 20:20 certified workshop

Electronics





Having supported the defence, automotive and rail industry for many years, we have deep expertise in the repair and reconditioning of electronic cards. We have an ANSI ESD 20:20 certified electronics workshop with state-of-the-art testing equipment and staff who are IPC certified. Our diagnostic and testing services include developing and customising testers to speed up diagnosis and achieve better accuracy.

Key Capabilities



Design & Development



Prototyping & Production



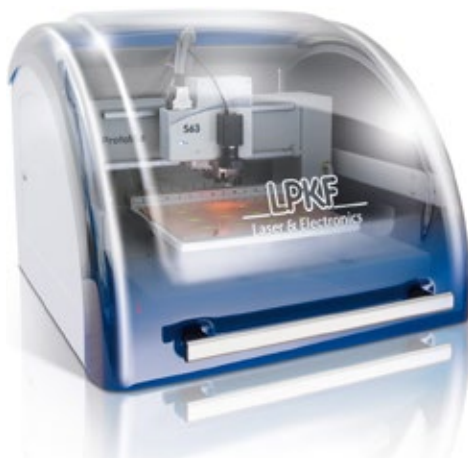
Testing & Validation



Maintenance & Repair



Equipment and Testers



Rapid Printed Circuit Board (PCB) Prototyping and Design Validation Machine

- Highly precise production of prototype PCBs of up to 8 layers within a day
- Validation of prototype design and development for PCB redesign/refurbishment



8-point Flying Probe System

- Latest frontier (in terms of speed, coverage and flexibility) in flying probe test technology
- High test speeds which reduce diagnostic turnaround time
- Wide and flexible test coverage for PCB prototyping, manufacturing or repair

OPERATIONS SUPPORT

Other Services



Equipment
Preservation



Field Support
Representatives
(FSR)



Obsolescence
Management

Equipment preservation is the specialised storage and upkeep of equipment that is not required for active use. Preservation can be customisable and takes into consideration the three M factors (Medium, Machine and Management).

Medium: refers to protection against the environment such as oxidation, radiation, etc.

Machine: leveraging external systems to prolong the life of equipment such as batteries

Management: the upkeep and regular inspection of equipment under preservation



Field Support Representatives (FSR) are specialised staff (trained engineer/technician) attached to the MRO workforce. Depending on the specific needs, FSR can take on a hybrid of different roles, such as technical coach to guide a developing workforce, subject matter expert to impart technical knowledge, or even augment the operating workforce. FSR also function as a forward-deployed conduit to facilitate communication with the OEM technical consultations. They can add value by advising and resolving matters relating to fleet engineering and materials supportability.

Obsolescence occurs when a product or component passes the point of repair or replacement, potentially rendering an entire system dysfunctional. Obsolescence management takes into account the life span of the equipment to ensure continued serviceability as it ages, mitigating the need for a complete and costly redesign.



Engine Re-manufacturing

Using precision engineering and machining processes, we are able to restore engines to 'almost new' condition. To ensure reliability and performance standards, all re-manufactured engines are dyno tested to OEM specifications and performance ratings.

Electronic Card Refurbishment

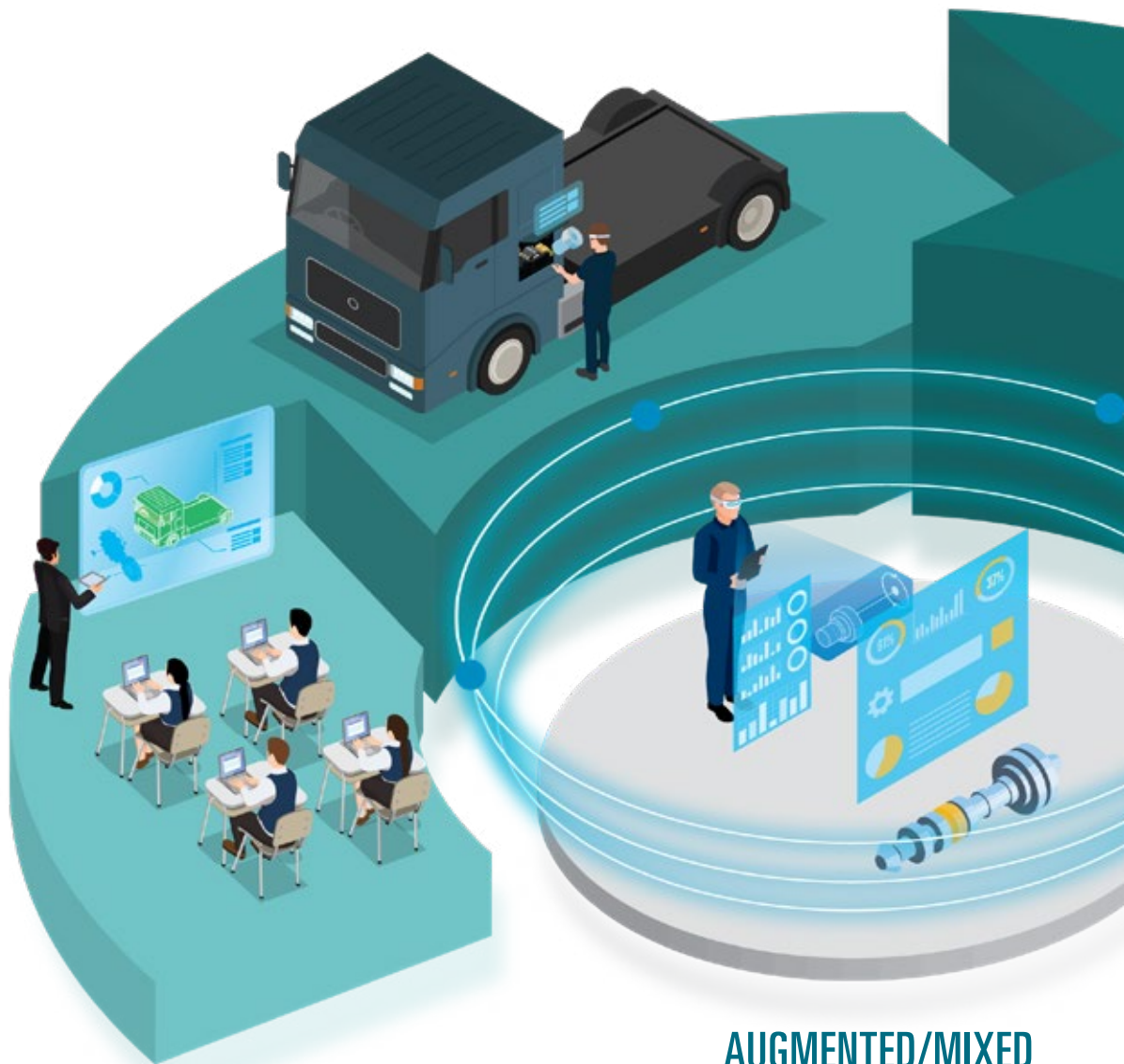
As a leader in Maintenance, Repair and Overhaul, we have a strong track record in electronic card refurbishment. Our integrated modular test systems and equipment enables accuracy at every step of design, development, prototyping and production of obsolete components to extend the serviceability of systems.

TRAINING

Technical training is the elementary process to develop an MRO workforce. Basic technical training typically comprises theory lessons, hands-on practice and tests. A technician's training is a continual process beyond the completion of technical training as the individual will continue to hone and develop competencies through on-the-job experience. There will also be opportunities to further deepen and upgrade one's technical skills through supplementary training.

CONTINUOUS COMPETENCY DEVELOPMENT

TECHNICAL TRAINING & CERTIFICATION



AUGMENTED/MIXED REALITY TRAINING

TECHNICAL SKILLS UPGRADING



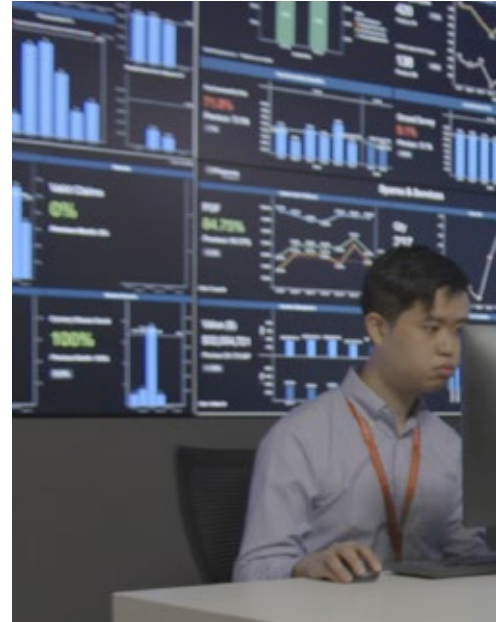
Augmented/Mixed Reality

The adoption of Augmented Reality/Mixed Reality (AR/MR) can enhance the effectiveness of training and optimise resources. AR/MR can also augment equipment diagnostics and effectively guide repair procedures.



ANALYTICS

Data Analytics starts with the inception stage of data mining, storage and processing prior to any Analytics Modelling/Algorithm Building. Basic analytics provides descriptive and diagnostic functions – what happened and why, which is useful for situation monitoring, trending and anomaly detection. Advanced analytics entails machine learning and enables prediction and informed decision making.



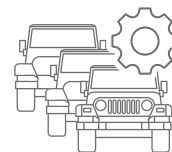
Health and Usage Monitoring System



MRO Operations Analytics



MRO Management Analytics



Fleet Engineering Analytics



The deployment of Data Analytics in MRO minimises equipment downtime, shortens repair turnaround time and optimises resources. All this translates into improved productivity and insights which enable better decision making.

Health and Usage Monitoring System harnesses the power of Edge Analytics observed from an equipment's sensors to predict and prevent any failure before it occurs.

MRO Operations Analytics provides real-time visualisation of on-going jobs and ageing situation from data collated from MRO Enterprise Resource Planning (ERP) or other software.

MRO Management Analytics reviews completed jobs to analyse workshop performance trends, investigate causal factors and correlate supporting resources.

Fleet Engineering Analytics provides equipment performance in accordance to Reliability, Availability, Maintainability and Supportability (RAMS) methodology.



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