idD PORTUGAL DEFENCE

Defence Industrial Capabilities in Portugal

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The Portuguese defence economy has a very diverse set of companies and technological research and training centres, **covering 40 sectors of activity and promoting synergies between dual military and civilian use.**

It is based on **highly educated and skilled human capital**, with a high level of productivity and a superior content of **knowledge and technological R&D that support innovation** and master key competences in developing products and providing services in all military domains: complex systems, communications, engineering, aircrafts, ships, manned and unmanned vehicles, training & simulation, weaponry, technical textiles and many other areas.

I - Command, Control, Communications, Computers and Intelligence (C4i)

There are several Portuguese engineering and software companies, geared towards R&D, production, development and integration of systems, and specialized in the delivery of products and services, as well as solutions to support the operation and maintenance of complex systems taking advantage of their large experience, as well as in cooperating and partnering with state entities, global OEM´s, and other companies.

They combine engineering skills such as problem solving, data modelling, logical thinking, creativity and project management, route to market of mature solutions, with soft skills of flexibility, trustworthiness, agility and customer friendly options.

This approach helps to deliver high-integrity systems using agile frameworks and user-centric designs, ensuring a more flexible development process that enables safety-critical system certification. These agile principles are taken a step further when using quantitative performance indicators and are adjustable to users' dynamic needs.

Some examples of capabilities:

- Content authoring and design
- Complex systems and technologies
- Complete and integrated communications systems, including command and control
- Joint development of communication systems / Partnerships with local industry
- Beyond Line Of Sight (BLOS) Systems
- Software and Hardware engineering services
- Weapons and sensors' command and control

systems for military aircrafts, ships and vehicles

- Information integration systems in aerial, naval and other platforms
- Military logistic information systems
- Networking and multi-domain security
- Collective security systems
- Modelling and visual displays
- Quality Assurance policies and system
- Quality Control Tests and Standards

II - Maintenance, Repair and Overhaul

Aeronautic, naval and land MRO, including Corrective & Planned Maintenance, Life cycle support management, Mid-life update, Life extension program, Modernisation & Modifications (partnerships), Systems' integration, Logistical Support, Education & Training and Project Management.

MRO Aeronautic

Maintenance, repair and overhaul of different types of aircrafts (C-130H, P-3 ORION, F-16, C295, AW101, EMB 145 AEW&C, EMB 314 SUPER TUCANO, LEGACY 600/650, LINEAGE 1000, ERJ, E-JETS and E2 Families) and engines (AE 1107C, AE 2100A / P, AE 2100D2, AE 2100D3, AE 3007A SERIES, T-56 / 501D SERIES).

- Navigation Systems
- Gyros & Accelerometers
- Landing Gears
- Propellers

- Brakes
- Electrical and Avionics
- Gimbal Assemblies
- Electronics
- Instruments
- Accessories
- Hydraulics, Pneumatics and Fuel Systems
- Painting Services
- Consulting Services and asset management

MRO Naval

Maintenance, repair and overhaul of different types of surface vessels – from combat to specialized and auxiliary - and submarines, weapon systems and military and security equipment's throughout the life cycle, including mid-life upgrades.

- **Overview Services**
  - Engine
  - Dry-docking & ship support
  - Naval Component
  - Modification
  - Pressure hull, hatches, superstructure, winches
  - Hull penetrations, armatures, pipes
  - Tanks, bilges
  - Safety and lifesaving installations
  - Diesel engines, exhaust gas system
  - Fuel system, seawater system, cooling system

- Masts (e.g. periscope, snorkel, antenna)
- Propulsion system
- Fuel cell system
- Propulsion battery
- Steering system, hydroplanes
- Air compressors, compressed air system
- CMS, Radar, Sonar, ESM, TCM
- Complete communication systems (including its command and control, and tactical data links integration)

- **Intermediate Overhaul**
  - Scope of work
  - Ship 'hull
  - Shaft and propellers
  - Rudder
  - Mechanical and pipe fitting
  - Hull valves
  - Cathodic protection
  - Depth sounder and Loch
  - Painting
  - Marking of hull and drafts
  - Anchors and Chains
  - Structural Repair

- **Weapons & Sensors**
  - Guns (100MM MOD.64, MOD.68, CADDAM Creusot-Loire 76MM MK.33 Oerlikon, OTO MELARA 76/62 compact, 40MM BOFFORS L60, L60 twin barrel, L70, 20MM guns)
  - Missiles & Launching systems (Seasparrow GMLS MK.29, VLS MK.41 missile launching system, Seasparrow RIM-7M/7P Missiles, Seasparrow RIM-7M/7P/VL, HARPOON HWS, 84D, AHWC missile maintenance CIWS, PHALANX BLOCK 1 & 1B, Certified by the Naval Surface Warfare Center)
  - Goalkeeper Torpedoes & Launching systems (MK. 32 Torpedo Launching tubes, Torpedo MK46 Light torpedoes. The Intermediate Maintenance Facility is Certified by the NUWC, Hottorp, Torpedo Black Shark heavy torpedoes)
  - Mines (Mine MK55 Mod. 2 Submarine mines)
  - Decoys & Countermeasures (NIXIE AN/SLQ-25 decoy)
  - Effectors MTE & Jammers

- **Laboratories**
  - Vibration and Acoustic
  - Mechanical Testing
  - Non-Destructive Testing
  - Protective Coating Inspection
  - Dimensional and Mechanical Metrology
  - Electric and Electronic Metrology

MRO Land

Maintenance, repair and overhaul of light and heavy armoured and non-armoured vehicles, including fleet maintenance, and retrofits and upgrades in special vehicles.

- **General reconditioning, retrofits, upgrades, transformations and armoring in specialized and technological vehicles**
- **Technical assistance**
  - Preventive maintenance of specialized and technological heavy vehicles with replacement of filters, lubricating oils and valves
  - Mechanical repairs to engines, gearboxes (manual and automatic), transfer boxes, transmissions, axles, braking system, suspensions and steering
  - Repair of front and rear differentials
  - Repair of the fuel supply and injection system
  - Overhaul/Repair of the engine's water cooling system
  - Revision/Repair of electrical installation and interior and exterior lighting
  - Services in hydraulic and in pneumatic systems
  - Special welds in stainless steel, aluminium and mild steel
  - Sheet metal, bodywork and metalwork services
  - Renovation of upholstery, side covers and cabin ceilings
  - General paintings with polyurethane acrylic paints

- Characterization of vehicles / Application of advertising schemes
- Technical assistance in refrigeration systems - air conditioning
- Replacement of windshield glass
- General washing of heavy vehicles (interior and exterior) and chassis. Engine wash.
- Paraffination and lubrication with greases and oils

III – Training and Simulation

Engineering services geared towards the development and integration of systems, software and hardware, specialized in the delivery of products and services addressing learning, training and simulation, and solutions to support the operation and maintenance of complex systems. These systems allow the Armed Forces to regularly train in a secure and eco-friendly environment, saving resources and reducing the equipment's wear.

Our mission is to improve customer performance by promoting ideas, provide innovative solutions that fit their needs and expectations and secure best value for money in the following areas:

- **Design and Development of new Synthetic Training and Simulation systems (Air, Land, Naval)**
  - Cabin Mock-ups - Mechanical Design and manufacture of complete or replicas of crew cabin/compartment mock-up or specific Trainee's Position, including electrical/ electronic system design and development to interface with physical instrument panels, controls, levers and sensors, and integration

with motion systems.

- Emulated Commands/Instruments, hardware-based, with LCD/Touch-based panels, graphical human-machine interface (HMI) design and development, prototyping and development environment design and integration with HW/SW components
- Visual system with high fidelity modelling of the terrain, 3D models, design and integration of visual display system
- Modelling, Simulation, software development - Analysis, modelling and design, programming, integration (SW-SW, HW-SW), and unitary and integration tests, SW Installation and configuration, Integration with third parties' software, legacy SW modules and with motion system, instructor Operator Stations Design, programming, integration with other subsystems (HW-based and SW-based), Design & Development according with simulation standards (DIS/HLA), protocols (VoIP, ARINC 429, MIL 1553, C2Sim), object-oriented programming, other standards (OpenGL, SGML)
- Modelling and simulation of platforms (aircrafts, vehicles, ships, drones) state with respect to its dynamic and modelling and simulation of respective systems (electrical, hydraulic, pneumatic, avionics, sensors, etc) behaviour
- Design and development of Instructor and debriefing stations to plan, control, monitor and perform the exercise debriefing
- Communication systems (messaging, handling systems, voice and other data transfer specific services)

- **Modernization and commissioning of obsolete and inoperative training and simulation systems as well as HW-based and SW-based obsolete test, measurement and control systems, such engine test benches, conditioning monitoring and control of complex equipment or processes**

- **Digital Learning Contents Development**
  - Conduct training Need Analysis (TNA) leading to a pedagogical and technical Strategy Approach
  - Definition of the learning and performance objectives, training steps and courseware sequence and structure, based on the TNA
  - Storyboard creation
  - Creation of multimedia assets (text, audio, 2D/3D graphical elements, videos
  - Creation of LO (learning Objects) that integrate different multimedia assets and of the courseware
  - Design and development of CBT player with additional functionalities
  - Design and development of digital learning experiences using Virtual and Augmented Reality, Gamming and digital twin technology
  - SCORRM compliant
  - Cross platform content (web, tablet, laptop)
  - Integration with LMS/LCMS

- **Other services**
  - Airport and air traffic management simulation
  - Technical documentation production,

comprising content authoring and graphical design, according with S-1000D standard

- Operations and maintenance services and support as required
- Design and development of test, measurement and control solutions, for engine test benches, for conditioning monitoring and control of complex equipment or processes

Our Value Proposition is to improve business performance of our customers, by delivering products and services to excel acquisition of skills and knowledge, that will allow the companies to face the digital transformation challenges that are leading to a new thinking and new ways of doing things.

IV – Learning and education

Theoretical education (in-house or abroad), on-the-job learning and customised and dedicated training in areas such as cyber, maintenance, repair and overhaul for naval, air and land systems and equipment.

- **Cyber defence (Cyber Academy and Innovation Hub)**
  - Cyber security and cyber defence
  - Cyberspace and cyber conflicts legal framework
  - Cyber intelligence and cyberspace situational awareness
  - Information security management
  - Software and applications' security
  - Risk and incidents management

- Critical systems and infrastructures' protection
- Digital leadership
- Information warfare
- Cyber security and cyber defence capability development
- Operational planning of cyberspace operations
- Penetration testing and ethical hacking
- Forensic analysis
- Scenario development and cyberspace crisis management exercises

- **Naval and shipyard (Alfeite Academy)**
  - Search and rescue
  - Project and lean Management
  - Additive Manufacturing: Process Overview
  - Technical Drawing
  - Computer Vision
  - Non-Destructive Testing
  - Tungsten Inert Gas Welding
  - HVAC Systems Design and Operation Requirements
  - Visual Management and 5S
  - Process Mapping (VSM)
  - Naval Nomenclature
  - Metrology
  - Implementing Circular Economy in Shipyards
  - Energy efficiency
  - Design Thinking and Agile

- Basic Control Concepts - autonomous ships and unmanned underwater platforms

- **Aeronautic Academy**
  - Aeronautical Technician
    - Mechanic Qualification
    - TMA's Certification (B's)
    - Inspectors Qualification
    - Courses Aircraft/ Engine Type/ Component
  - Non-Aeronautical Technician
    - Management Skills
    - System tools
    - Languages
    - Maintenance Resource management
    - Processes and Systems
  - Behavioural
    - Leadership Competencies
    - First Line Management
    - Communication Skills
- **Maritime security (Atlantic Centre)**
  - Strategy design and implementation
  - Capacity-building on Vessel Board Search and Seizure
  - Cooperative solutions to support operational responses to humanitarian catastrophes
  - capacity-building to develop synergies between ocean security and the blue economy

V – Manufacturing and Trading Systems & Components (Electrical, Electronic and Mechanical)

Electrical, electronic and mechanical engineering maintain and support all military equipment and systems, for all branches of armed forces, keeping it in top condition and working in every equipment life-cycle phase, from design, production, evaluation and acquisition through in-service support to eventual disposal. It is based on highly skilled and highly trained staff with specialized engineering knowledge of the Vehicle, Weapon, Electronic-Optronic and Materials occupations, with the ability to manufacture equipment to maintain battle winning aircraft, ships, tanks and weapons ready to use when and where they are needed.

- **Electrical and electronics**
  - Electrical & Electronics Equipment
  - Avionics equipment and aircraft electronics
  - Intercommunication and public address systems, airborne
  - Radar equipment, airborne
  - Radio navigation equipment, airborne
  - Sound recording and reproducing equipment
  - Video recording and reproducing equipment
  - Intercommunication, radiofrequency equipment integration, command and control

- **Aircraft structures, equipment and engines**
  - Aircraft air conditioning, heating, and pressurizing equipment

- Aircraft control cable products
- Aircraft ground servicing equipment
- Aircraft hydraulic, vacuum, and de-icing system components
- Aircraft landing equipment and landing gear components
- Aircraft launching equipment
- Aircraft propellers and components
- Aircraft wheel and brake systems
- Airframe structural components
- Aircraft, fixed wing and rotary wing
- Empennage and Fuselage
- Gliders and lighter-than-air vehicles
- Helicopter rotor blades, drive mechanisms and components
- Miscellaneous aircraft accessories and components
- Parachutes, aerial pick up, delivery and recovery systems

- **Other manufacturing**
  - Common Machinery & Components
  - Spare parts
  - Manufacturing of tools and tooling

VI – Ships and maritime equipment

Naval construction and maritime equipment based on specialized and experienced teams capable of managing the greatest technical challenges in every phase of a ship construction to meet the expectations for the quality of the implemented solutions and to answer to the needs and requirements of clients.

Each project is designed and developed through different computer tools (e.g. Nupas, Cadmatic, Autohydro, Modelmaker, 3D-Beam or MARS) and the knowledge of industry trends in terms of hull shapes, materials, techniques and production technologies, where the reduction of gas emissions and the use of alternative energies such as natural gas and batteries is a constant concern, thus ensuring rigorous and technologically advanced ship construction.

- **Ship Design, test and performance**
- **Digital ship and ship digital architecture**
- **Naval Construction, OPVs, specialized Vessels**
  - Vessel's hydrodynamic
  - Structural health monitoring systems
  - Hydro-acoustic systems
  - Damage detection/diagnosis and prognosis,
  - Propulsion Engineering

- **Ship equipment**
  - Ship and boat propulsion components
  - Weaponry
  - Deck machinery
  - Marine hardware and hull items

- Modular and multirole offshore patrol vessel
- Miscellaneous ships and maritime equipment

- **Radars, navigation data and surveillance systems**
  - Battlespace Communications
  - Radio navigation equipment
  - Intercommunication and public address systems
  - Sound recording and reproducing equipment
  - Video recording and reproducing equipment
  - Underwater systems (communications, sonars, echo-sounders, pingers an so on)

- **Other equipment**
  - Maritime Infrastructure
  - Safety Equipment
  - Hydraulic Arms
  - Hydrographic maps, charts and geodetic products
  - Coastal Defence

VII - Land and soldier systems

Full soldier systems, including equipment for command and control, mobility, communications, and individual protection, developed in a laboratory environment and then tested in the field, by the Portuguese special forces. The uniforms and individual protection high-tech equipment allow the soldier to benefit from the best conditions of safety in extreme fighting environments.

- **Military mobility**
  - Topographic Maps, Charts & Geodetic Products
  - Digital exchange of information systems
  - Vehicle Electronics/Navigational Systems Engineering
  - Vehicle Mechanical and Electrical Systems Engineering

- **Combat Clothing & Soldier Support Systems**
  - Textiles, Clothing & Equipage
  - Subsistence
  - Technical fabric for uniforms and boots

- **Communication systems, Surveillance and Reconnaissance**
  - Vehicular Intercommunication Systems
  - Complete C4i dismounted soldier systems
  - Combat Net Radio
  - Personal Radios
  - Field Communications

- Field media gateway
- Field/tactical Telephony
- Military Messaging systems
- Systems integration
- Radio navigation equipment
- Intercommunication and public address systems
- Sound recording and reproducing equipment
- Video recording and reproducing equipment
- Radar equipment

VIII - Space systems and services

The open spaceport on the island of Santa Maria, Azores, provides space launch facilities for satellites and quality testing facilities for rocket engines and launcher stages, while also providing maintenance, verifications and upgrading services for launchers and other space equipment. These are the basis for low earth orbit services for earth observation activities covering the entire area of the Atlantic Ocean, including the gathering of data for defence purposes via remote sensing technologies, usually involving satellites carrying imaging devices, satellite communications, which provide connectivity in places not covered by terrestrial networks, and satellite navigation through Global Positioning System (GPS) stations.

- **Space systems and equipment**
  - Ground support Equipment
  - Satellite and Launchers Onboard Systems,
  - Mission Control Infrastructures
  - Space Data Applications and Development

- Automation and Robotics components and Technologies
- Thermal Protection Systems (MLI)
- Control Electronics Technologies
- Structural Design and verification methods and tools

- **Satellite Navigation**
  - Space Vehicle Remote Control Systems
  - Navigation Warfare (NAVWAR)
  - NSS-based equipment
  - GNSS-free sensors
  - Remote Sensing and Ground Segment

IX – Cyber defence

Modern warfare also occurs on the digital space and cyber defence is nowadays a key domain to control and protect the exposure to the digital world. Cyber defence services are designed to implements technologies to protect and defend against the constantly evolving cyber threats. These services are developed interconnecting universities, research centres, industry and other state and private entities, and aim to identify risks, to detect threats, to implement protecting devices and technology, and to prevent and respond to incidents and recover from attacks.

- **Information Warfare and Hybrid threats**
  - Active Defence (Red teaming, Deception, Threat hunting
  - Cloud Security

- Encryption
- Endpoint, Application Security and Whitelisting
- Identity and access management / Fraud
- Incident Response
- Information, mobile and messaging security
- Internet of Things Security & 3rd Party Management
- Managed Security Services Provider
- Network (Firewall & VPN)
- Penetration Testing
- Risk and Compliance
- Security and Behavioural Analytics
- SOAR: Security orchestration, automation and response
- SIEM: Security information and event management
- Threat Intelligence / Detection
- Intelligence and Data Warfare

- **Digital Nomads and Virtual Leadership**

- **Artificial Intelligence & Machine Learning**

- **Cyber and Space**

- **Cyber defence security assessments**
  - Process Improvement & Gap Analysis

- Test Automation & Optimisation
- Security Services
- Source Code Quality
- Performance and Scalability Testing
- Independent Software Testing
- Test Management Services
- Continuous Builds, Delivery and Test Environments
- Application Lifecycle Management

X - Unmanned Systems and Vehicles

Short and long-range aerial, terrestrial and maritime unmanned vehicles (and systems) for intelligence, surveillance and reconnaissance missions. These are user friendly, cost effective and operatively intuitive drones and systems that can deliver the needed autonomy and actionable real-time data and intelligence, adjustable to specific customer and mission requirements so that the air, land and sea targeted areas become safer.

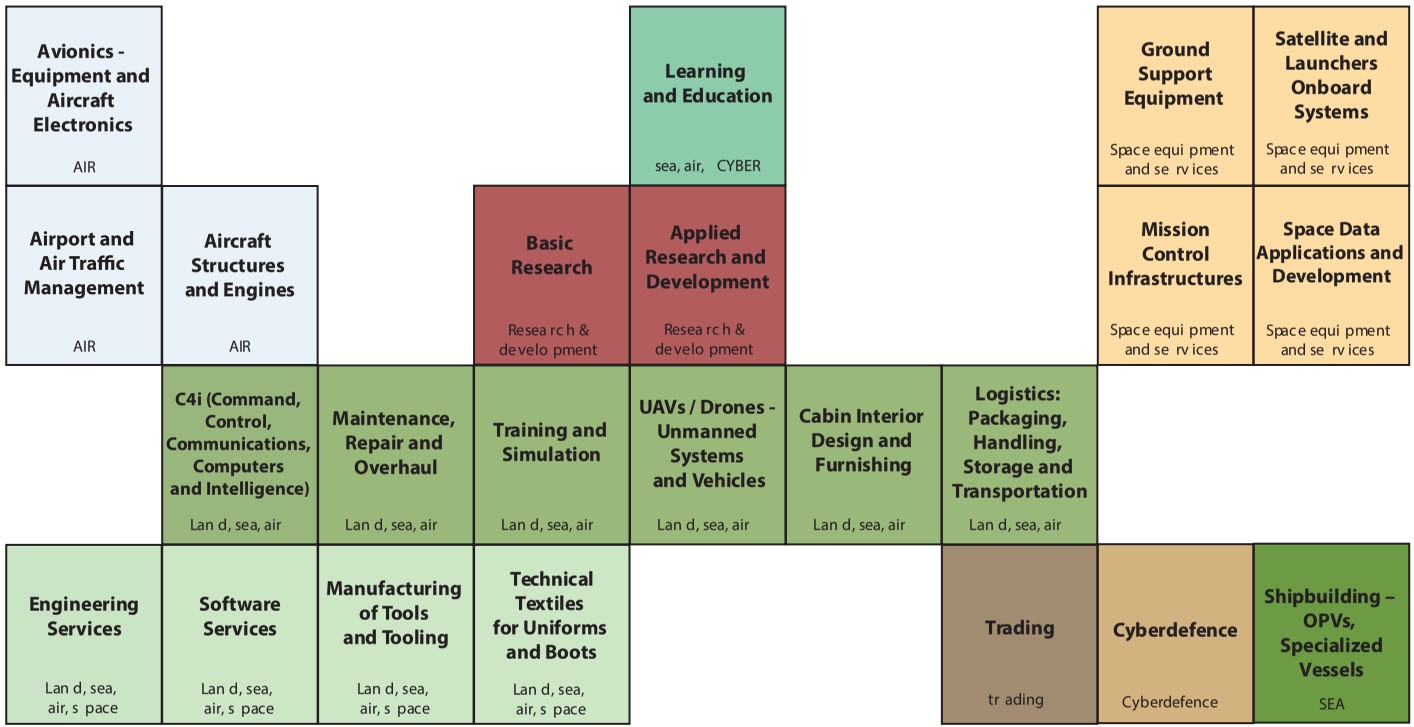
- Unmanned Surface Marine Vehicles (USVs)
- Undersea vehicles
- Aerial drones for surveillance and reconnaissance
- Unmanned land vehicles
- Unmanned aerial, maritime and ground vehicle systems and technology

XI - Research & development and other services

The Portuguese defence industry develops basic and applied research for different fields and provides a complete set of services for armies around the world:

- Basic research
- Applied research and development
- Industry Support Technical R&D & Environment
- Prototyping, production and development
- Aerodrome and Airfield Design
- Cabin Interior design and furnishing
- Dismantling of ammunition
- Medical Equipment & Services
- Environmental Management
- Security Systems
- Legal Services
- Civil protection
- Management Advisory Services
- Industry Support Professional Consultancy, Finance & Legal
- Risk Management
- Integrated Logistics: Through Life Support, Packaging, Handling, Storage, Transportation
- Trading

DEFENCE INDUSTRIAL CAPABILITIES IN PORTUGAL

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