R&D IN AEROSPACE, SPACE & DEFENSE ENGINEERING

FERCHAU AEROSPACE & DEFENCE GROUP

Division of FERCHAU GmbH and RST Rostock System-Technik GmbH

Our industry expertise

Aircraft   Helicopters   Space   Defence

Employees

~ 1200

engineering specialists and IT consultants

European Sites

12

MAD,SEV,BCN,BIL,VAL,BOH,BS, HB,HH,MUC,DON,PAR,MARS,TLS

In-House

MANUFACTURING, INTEGRATION AND LABORATORY FACILITIES

We are

certified

to EN 9100, ISO 14001 and ISO/IEC 27001

Workforce MAD

+170 FTE

in Aerospace & Defense BU
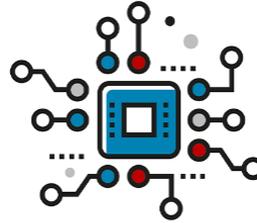
MAIN CUSTOMERS

R&D KEY AREAS
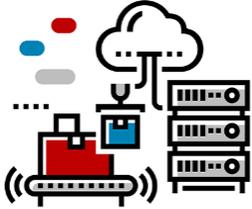
IoT

Comms and 5G/6G

Artificial Intelligence
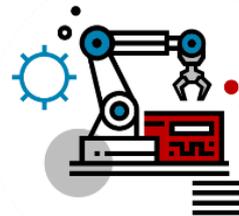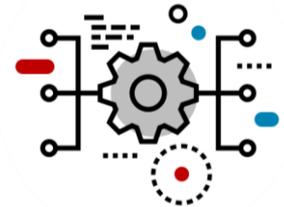
Modelling and Simulation

Cyber Security

Propulsion & Hydrogen

Power and High-voltage Management

Automation, Drones & Robotics

R&D Materials & Design

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R&D IN AEROSPACE & DEFENSE ENGINEERING

IT Security: Risk Analysis, Vulnerability Analysis, System Hardening
Penetration Testing: Identifying and mitigating security threats
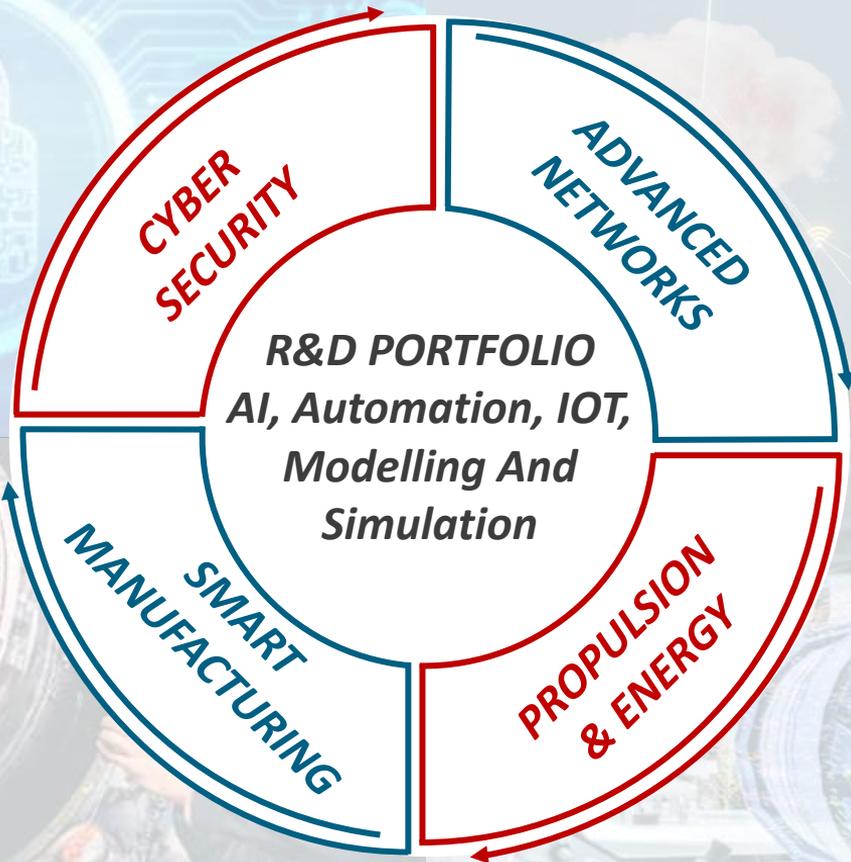
Next-Gen Connectivity: 5G & 6G Systems, Satcom
Autonomous Systems: Drone Systems, Developing Advanced Software & Hardware

R&D & Innovation: Design, Simulation, and Testing
Automation & Maintenance: Robotic Design, Predictive MRO

Power Systems: High-voltage & power management solutions
Sustainable Energy: Electric Propulsion, H_2 Fuel Cell & Storage Solutions

CYBER SECURITY

ADVANCED NETWORKS

SMART MANUFACTURING

PROPULSION & ENERGY

R&D PORTFOLIO
AI, Automation, IOT, Modelling And Simulation

HERWINGT

A pioneering Wing Design for a Hybrid Electric Regional Aircraft with a maximum capacity of 100 seats and a range of 500 km to 1000 km

PROJECT EXAMPLES

PROJECT DEMOS

- Project DEMOS: Pylon to Pylon Center Wing Box

- Design of a semi pylon to pylon multi-spar center wing box section, lower skins, spars and stingers, upper skin, and interface with the hybrid-electric propulsion mounting system.
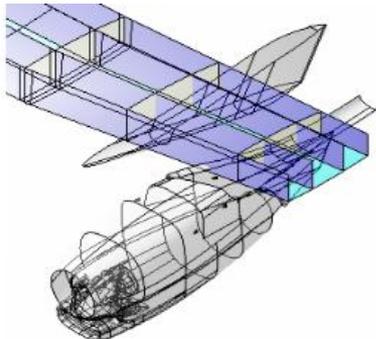
PROJECT UCA

- Thermoplastic Leading Edge

- Development of complex curved geometry of a reinforced Leading Edge

- In-situ consolidation technology

- Anti-erosion system

- Integration of Ice Protection system
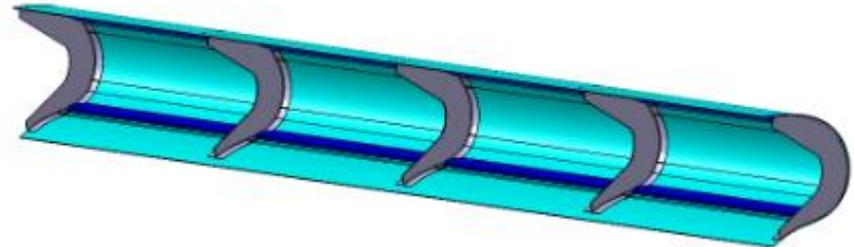
COMMUNICATIONS

- A350F
- A400M
- C295 FITS
- C295 MPA
- MRTT
- SIRTAP
- Advanced Airborne Communications

AIRCRAFT LINKS INTEGRATION MANAGEMENT SYSTEM

- Expertise on defining SW requirements according to V&V process

- Software Development and Implementation in ADA

- Creation, implementation, and feasibility evaluation of new software functionalities.
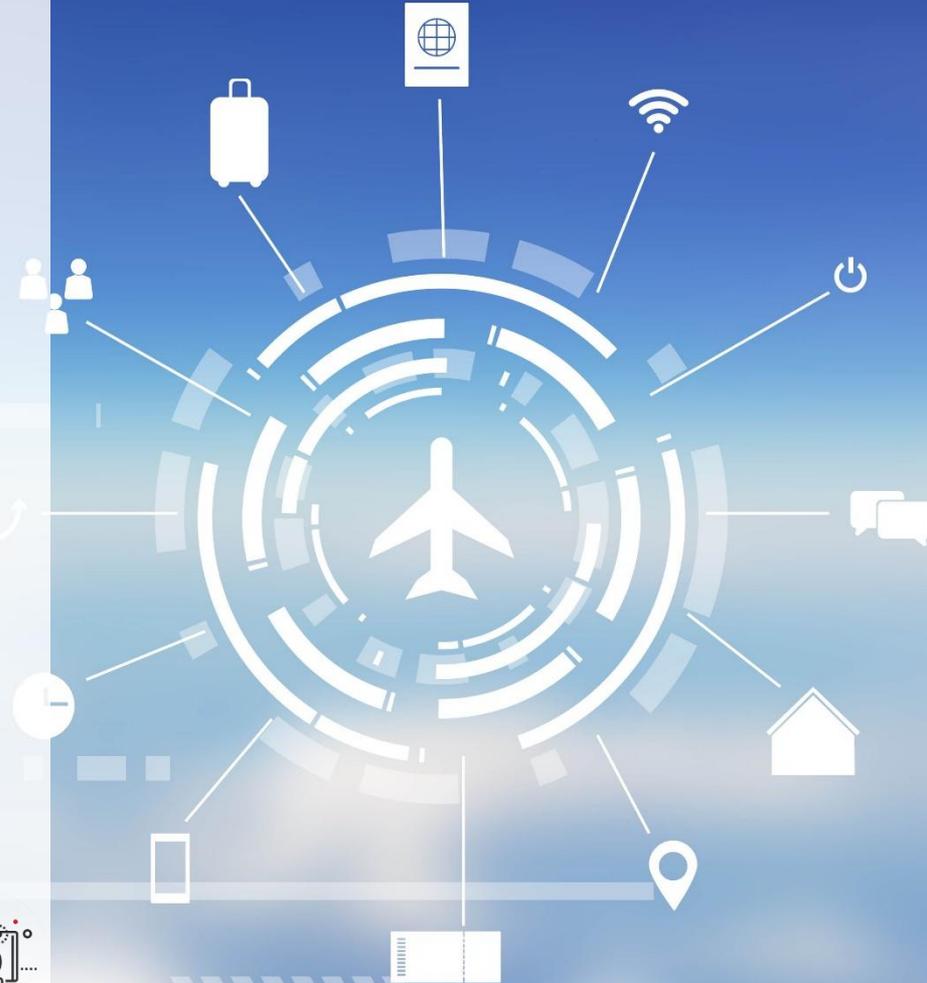
- Software Requirements Documents (SwRD) based on the functional requirements of each program

- Create test cases and procedures to validate the software and execute these tests in laboratory test benches

- Test Result Evaluation

- Test Bench Definition & ICD Generation

- Knowledge of SW airworthiness certification process (DO-178C) and SW life cycle process

- Expertise on defining the behavior of radio devices, for simulations used in the verification and validation processes

ADVANCED AIRBORNE COMMUNICATIONS

CONNECTIVITY SYSTEMS GROUP (LoS, Satcomm, LTE/4G/5G, Radar, SDR, …)

- Radio management HW Specification and Low-Level Requirements
- Market Survey and HW systems analysis
- Environmental and EMI/EMC analysis
- Suppliers Analysis and Follow Up tasks including Purchase Technical specifications, project milestones, etc
- Design and generation of Interface Control Documents
- Design and Generation of Installation Requirements and documentation (e.g. EDRs) including drawings and Configuration Management
- Complex HW Design including FPGAs programing using Hardware description languages and (e.g. VHDL, Vivado, Xilinx) following the DO-254 standards and Certification Routes
- Create and maintain lessons learnt feedback
- Design, simulation and implementation tools: Matlab, Simulink, Vivado

GENERAL COMMUNICATION R&D

- Embedded Software Development for Communications: Designing and implementing innovative software for embedded systems in various communication technologies

- Hardware Development for Mobile Systems: Developing circuit and architecture concepts, including analog and digital circuits, especially for 5G digital radio systems

- RF Chain Design & Definition: Dimensioning and defining TM-TC and RF communication chains, along with elaborating detailed RF specifications

- RF Architecture & Simulation: Defining architectures for RF solutions and performing simulations of antennas and their interactions

- Compliance with RF Standards: Ensuring adherence to current RF regulations and standards

- Comprehensive Testing & Validation: Conducting all levels of testing (development, unit, module, system), debugging software, and performing integration and validation in 5G networks

- Automated 4G/5G Test Execution: Executing automated test cases for 3GPP 4G/5G functionality, including log analysis and troubleshooting

- Measurement & Spectrum Analysis: Operating measuring devices, performing spectrum and network analysis, and evaluating measurement results for 5G

- Telecommunications Network Planning: Designing and planning radio and telecommunication facilities, including fiber optic and copper networks

PROJECT EXAMPLES

COMMOMISS - A400M, C295 FITS

- PDIP/PDEP ground console
- Graphical aids
- Datalink status widget
- EO/IR videostreaming configuration
- Link alerts threshold
- Tactical management
- EO/IR sensitivity
- Expertise in testing activities such as laboratory, ground or air tests (LTRs, GTRs, FTRs)
- Expertise in the entire V&V process
- Flight sequence management from ground console
  - Flight sequence and guiding data acquisition
  - Flight sequence management

MRTT, SIRTAP, C295 MPA & OTHER

- V&V
- Requirements traceability
- System Specification
- Testing
- Block Diagram
- Support in preparing documentation for FITS OFP
- Support in Polar Nav Campaign

A350F CABIN SYSTEMS DEVELOPMENT

- Development of Built in Test Equipment System

- Main Deck Cargo Doors (MDCD)

- Cargo Loading system

- Tail tipping warning system

- IoT Backbone, providing internet connectivity

ELECTRICAL SYSTEMS & INTERGATION

- A400M –FuselageFTI
- A400M-DIRCAM (German/UK)
- C295-FTI IceShapes
- C295 FTI: OMAN/TS03/SA04
- C295-OMAN/ TS03/ BR02/ SA04/EG05
- A330 MRTT FSTA/ RSAF/ENH/GOS/FAF/COREA
- BAE Nimrod Aircraft MRA4
- E-Fan X

PROJECT EXAMPLES

E-FAN X

- Ensure performance of works related to Flight Test instrumentation and equipment installation for the BAE RJ100 demonstrator.

- Design of wiring diagrams, design of electrical systems installations, provision and design of mechanical systems installations (including Hydraulic/Pneumatic systems), design for components and assemblies, preparation of Installation Documents (SI, DOI or similar), Systems interface integration, configuration Management, technical documentation and technical Analysis support in MAP/FAL tests..

A400M

- Design and development of new communication systems for tanker aircraft

- Design and development of new systems for the A400M platform used in firefighting

- Design and development of new functional improvements for the A400M transport aircraft
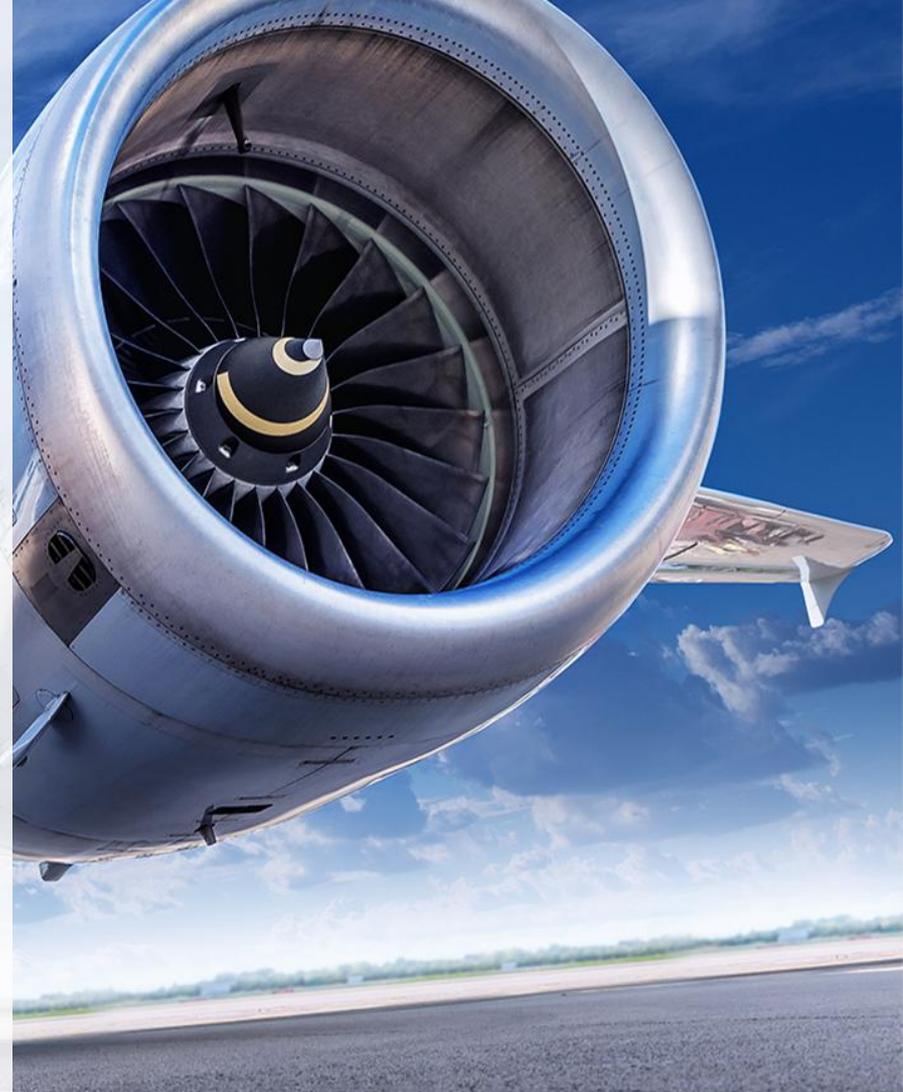
HYDROGEN & PROPULSION

Design of single fuel cells, including testing and trial

Airbus UpNext HyPower new demonstrator to explore hydrogen fuel cell technology for APUs

LH_2 system design, cryogenic materials, eqipment and process design, coupled with advanced CFD simulations

Implementation of plasma electrolysis, focused on the development of electrical engineering and software
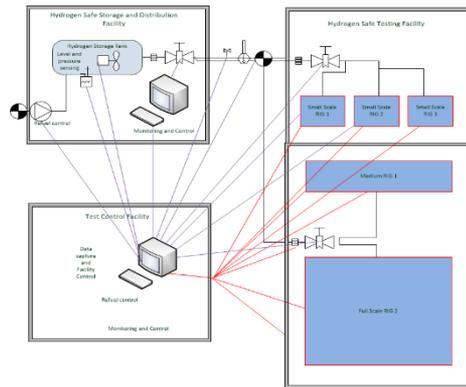
H₂ & PROPULSION SERVICES

PROJECT EXAMPLES

ZEROE

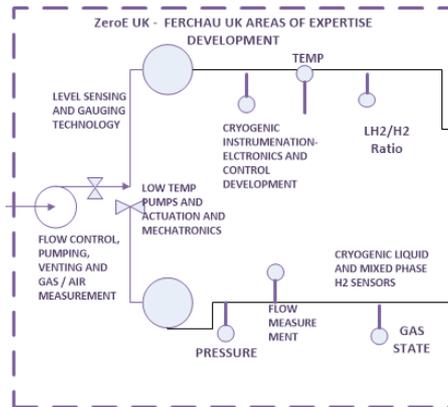- Development of Hydrogen facility

- Development of test strategy

- Provide Airbus with key liaison between ZeroE project and facility design

AIRCRAFT DESIGN

- Hydrogen flow control and CFD

- Sensor technology development

- Cryogenic instrumentation and equipment

H$_2$ FUEL SYSTEM

- Design and development of H$_2$ tank

- Pressure management and vent system

- Re-heat and boil-off of gaseous H$_2$
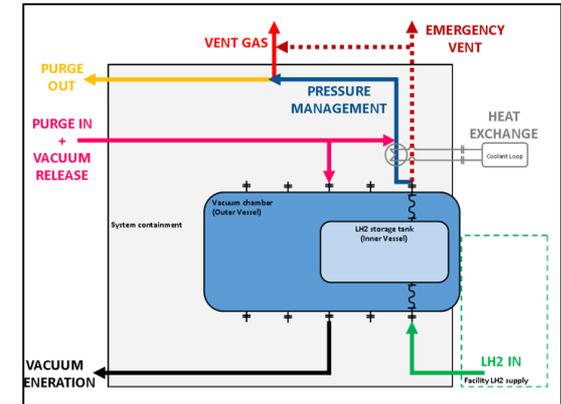
MAINTENANCE AND SIMULATION

Eurofighter end-to-end development of key modules of the trainer

R&D in sensor simulation and digital twin technology to streamline prototypes

PROJECT EXAMPLES

MAINTENANCE SYSTEM TRAINER FOR THE EUROFIGHTER

- Development of key modules in the areas of navigation, communication, attack & identification, DASS (Defensive Aid Subsystem), hydraulics, secondary power system and fuel

- Programming simulation units

- Implementation of a sophisticated three-stage software test system

DIGITAL TWIN SENSORS

- Map behavior of sensors virtually in real time

- Component interaction using open standards as Functional Mockup Interface (FMI) and Asset Administration Shell (AAS)

- Test interaction between environment and sensors
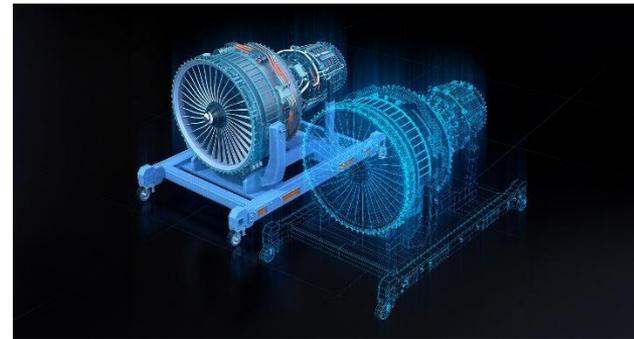
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DRONE R&D

Eurodrone design, development & validation of local intake models for efficiency, integrating them into larger aerodynamic and thermal simulations

FERCHAU is also working with specialized consultants who have EASA A1-A3 aerodrome certification and help with logistics at the aerodrome

PROJECT LIQUIDRONE

LiquiDrone is a collaborative project with RST, BaltiCo, the University of Rostock, the Center of Applied Aeronautical Sciences (ZAL)

Development of LH_2 tank system with integrated level measurement for extended flight times and optimized mission planning

INTERNET OF THINGS

Development of IoT systems, minimum viable products, hardware components, cloud hosting solution, a web interface and a mobile app

Development and implementation of robust, multi-platform solution with a unified backend

IoT technologies and off-the-shelf components to enable seamless wireless integration of sensors and actuators into modern aircraft cabin systems

PROJECT EXAMPLES

OPTIMIZED ROBOTS

- Detection of data and faults to support maintenance teams

- Management and maintenances of intelligent picking robots

- Plan capacities in advance and play through possible application scenarios

IOT MANAGEMENT SYSTEM

- Develop a new warehouse management system

- Track inventory and automatically trigger orders

- Minimum Viable Product consisting of in-house developed hardware and software

BACKEND DEVELOPMENT

- Guarantee reliable communication between database and IoT devices

- Application development for multiple platforms

- Agile development

CYBERSECURITY

Projects such as the certification and re-accreditation of computer systems classified as 'NATO SECRET'

Identification and documentation of all IT assets

Supporting the management of classified systems and classified information

Review of security controls such as authentication, authorization, encryption and network monitoring, surveillance and mapping of the classified network

CYBERSECURITY PORTFOLIO

- Core Defense & Security Services
  - Management, operation, supervision, and maintenance of the Integral Defense Information Infrastructure (I3D)
- Capabilities for Secure Environments
  - Management of core IT infrastructure and cloud operations, providing the foundation for secure deployments
  - Expertise in databases, data analysis and networks essential for securing data, implementation and communications
  - Application development, QA audits, and Application Management Services (AMS) that ensure software quality and integrity, a critical component of security
  - Application of Artificial Intelligence to enhance threat detection and response capabilities
- Other Capabilities
  - Security Risk Management, Business Continuity, System Hardening and Disaster Recovery planning
  - Ensuring Regulatory Compliance with standards like ISO 27001, NIST, and GDPR
  - Full-cycle Vulnerability Management, Ethical Hacking, and Pentesting
  - End-to-end Security Incident Management and Forensic analysis

SYSTEM INTEGRATION & DEPLOYMENT

- Post-Quantum Cryptography (PQC) & Tactical Cybersecurity
  - PQC Deployment: Integrating NIST-standard post-quantum algorithms directly over the TSN network management layer to thwart harvest-now-decrypt-later attacks
  - Zero Trust Architecture: Hardening systems and deploying zero-trust network architectures tailored for contested military environments
- Embedded HW Development & Radio Frequency (RF)
  - SWaP Optimization: Transforming lab systems into deployable gear by designing embedded hardware to integrate Quantum Key Distribution (QKD) modules and TSN nodes on highly constrained mobile platforms
  - Signal Integrity: Engineering RF and Software-Defined Radio solutions to guarantee signal integrity across disrupted and contested spectrrums
- Dynamic Routing & Advanced Algortihms
  - Low-Level Software: Developing embedded C/C++ architectures for high-reliability tactical interfaces
  - AI/Quantum Inspired Routing: Applying hybrid solvers and advanced mathematical decomposition to dynamically reconfigure TSN network routes in milliseconds during node attrition

EXPERTISE IN HIGH-SECURITY & DEFENSE ENVIRONMENTS

- Classified Systems Administration: Complete administration of classified systems for the Defense sector, covering both the physical and logical security levels

- National & NATO Compliance: Expertise in system hardening in strict accordance with national (CCN-STIC) and international (NCIA - NATO) security guidelines.

- Secure Infrastructure Management:

  - Administration of secure virtual infrastructures using VMware Cloud Foundation and vSphere across different networks

  - Management of Active Directory domain services , including secure restructuring of file systems

- Advanced Technical Support: Delivery of Level 2 incident resolution and Level 3 incident management in coordination with manufacturers for critical infrastructure issues

FEATURED PROJECTS

- Administration & Securing of Defense Systems

  - Manage, maintain, and secure critical infrastructure for a client in the Defense sector

  - Hardening of equipment according to CCN-STIC and NCIA guides , maintaining virtual and physical infrastructure , and managing Level 2 support and troubleshooting for all systems

- Security & PCI Documentation

  - Update and maintain all security and PCI-related plans and documentation across multiple buildings

  - Modifying building layouts in CAD to reflect new equipment , creating dynamic blocks to store equipment data (model, serial number) , and providing documentation support for security audits

- Data Resilience & Backup Management

  - Ensure data availability, integrity, and recoverability for business continuity and cybersecurity strategy

  - Installation and configuration of Networker backup software , management of backup policies and workflows , configuration and replication management of Data Domain systems , and execution of periodic restoration tests to validate data integrity

IT

Development and integration of innovative solutions using Artificial Intelligence, Machine Learning, Augmented Reality, and IIoT/5G technologies

Management and operation of hybrid IT infrastructures, from on-premise datacenters to cloud environments

End-to-end application lifecycle management, including custom software development

Strategic consulting for key business systems (BI, CRM, ERP)
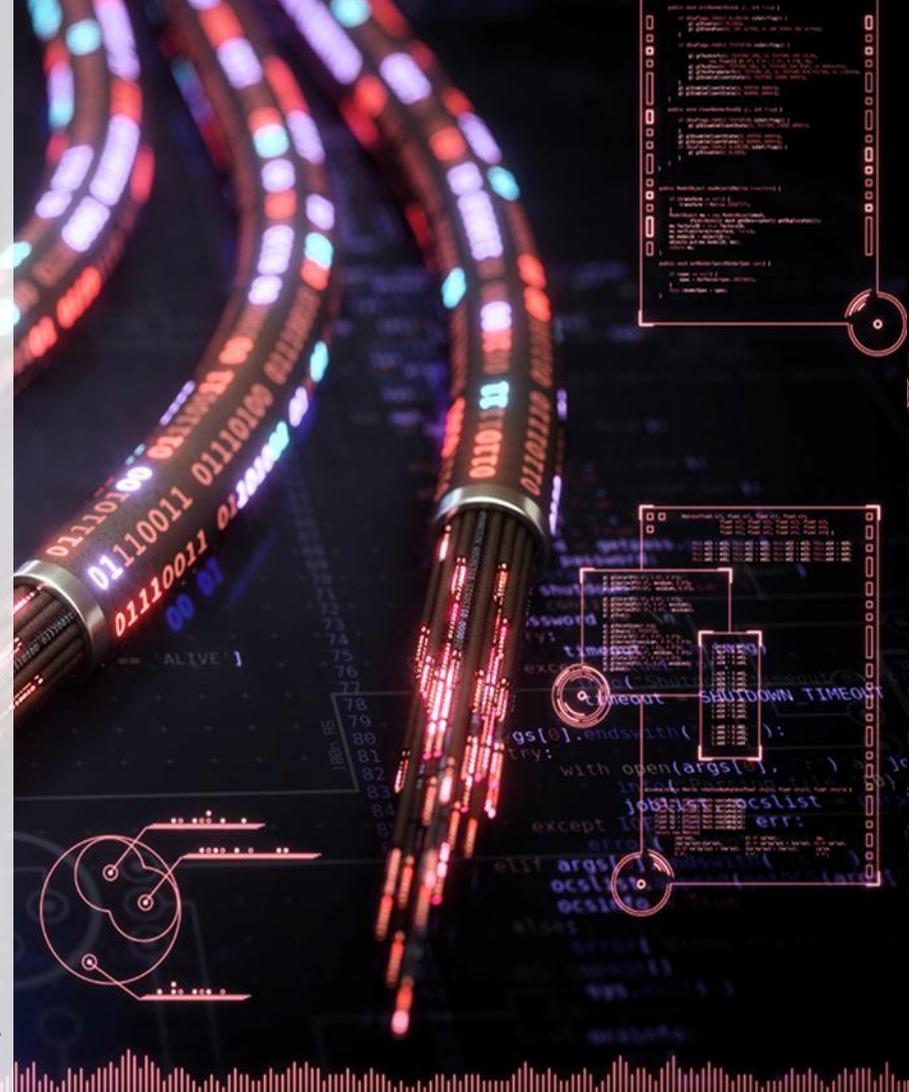
IT PORTFOLIO

- Artificial Intelligence
  - IIoT - 5G
  - Machine Learning
  - Augmented Reality
- Applications
  - Software Development
  - QA Audits
  - Migration and AMS (Application Management Services)
- Cloud Infrastructure
  - IT Infrastructure and Operations
  - Database and Networks
- Consulting
  - BI, CRM, ERP
  - Business and Data Analysis

EXPERTISE IN IT OPERATIONS

- Datacenter Operations:
  - Providing comprehensive service for the operation and maintenance of datacenters
  - Activities include coordinating equipment installation, proactive monitoring of server rooms, managing network/storage connectivity, and executing disaster recovery tests
- International Service Desk:
  - Delivering Level 1 and Level 2 IT infrastructure support internationally
  - Expertise in incident troubleshooting across diverse technologies including Windows/Mac, Active Directory, O365, and PowerShell scripting
- Backup & Recovery Services:
  - Full lifecycle management of backup solutions, including installing and configuring Networker software and managing Data Domain systems
  - Executing backup and restoration tests and managing backup media
- General Systems Administration:
  - Managing hybrid infrastructure including on-premise (Windows, Linux) and cloud (Azure) servers
  - Overseeing LAN/WLAN networks, Active Directory, and corporate hardware/software assets

CUSTOM APPLICATION DEVELOPMENT & PROCESS AUTOMATION

- Versatile Application Development:
  - Full-Stack: Designing and developing corporate web applications (PHP, JavaScript, SQL Server)
  - Embedded Systems: C++ development for railway Passenger Information & Audio Systems (PIS/PAS), including SIP/VOIP features
  - Integrated Kiosk/Gate Systems: C#/.NET development for software managing passenger flow at airports
- Robotic Process Automation (RPA):
  - Deployed bots to automate claims management
  - Developed bots to download, analyze, and distribute electronic notifications from government agencies
  - Automated financial processes such as the management of SEPA remittances and the checking of Host batch job results
- Digitalization & ERP Rollout:
  - Designed and documented a new product codification process to be integrated into an ERP
  - Planned and managed the multi-country European rollout of the company's ERP system

ADVANCED MOBILITY R&D

Initial concept and feasibility assessments to prototyping and thorough testing

Design, simulate, and optimize components such as drive trains, thermomanagement, and NVH systems

Advancing towards autonomy driving level 4, developing robust on-board storage technologies and secure data and communication

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ADDITIVE MANUFACTURING

Design of additive manufacturing systems, the electrical engineering design or the optimization of circuit diagrams and cabling

Design for additive manufacturing implementation, initial concept exploration to prototype development and final design validation
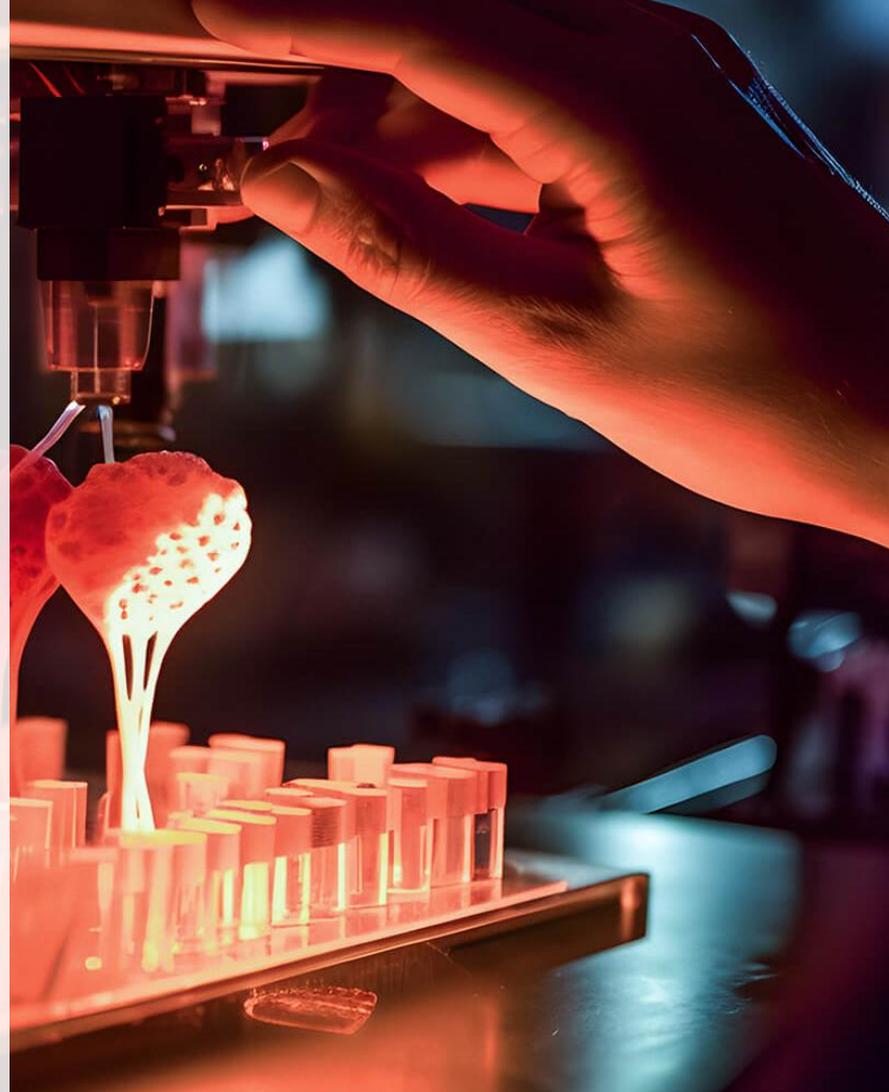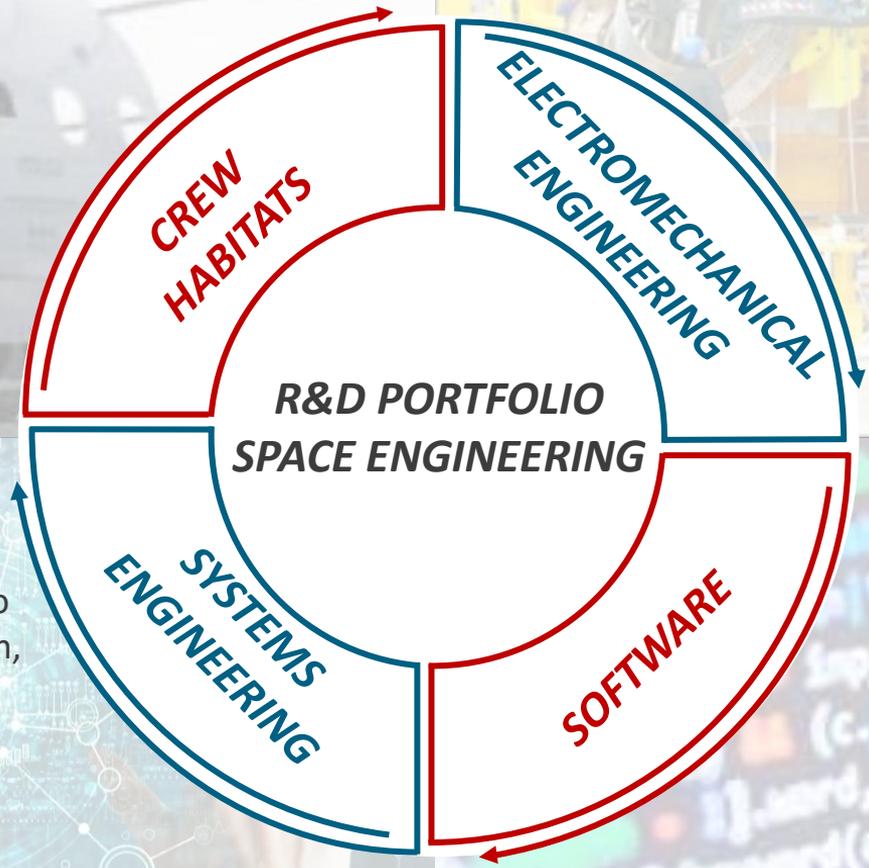
R&D IN SPACE ENGINEERING

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R&D & Innovation: Design, Simulation, and Testing
Automation : Robotic Design

R&D & Innovation: Design, Simulation, and Testing
Electronics: Embedded Systems, PCB Layout

CREW HABITATS

ELECTROMECHANICAL ENGINEERING

R&D PORTFOLIO SPACE ENGINEERING

SYSTEMS ENGINEERING

SOFTWARE

Lifecycle Management: End to End Development Coordination, V&V, Processes and Audits
Risk Analysis: FMEA / FMECA

Processes: AGILE
HW & SW Integration: FPGA, HMI, Database, and Web-Based Tech Integration
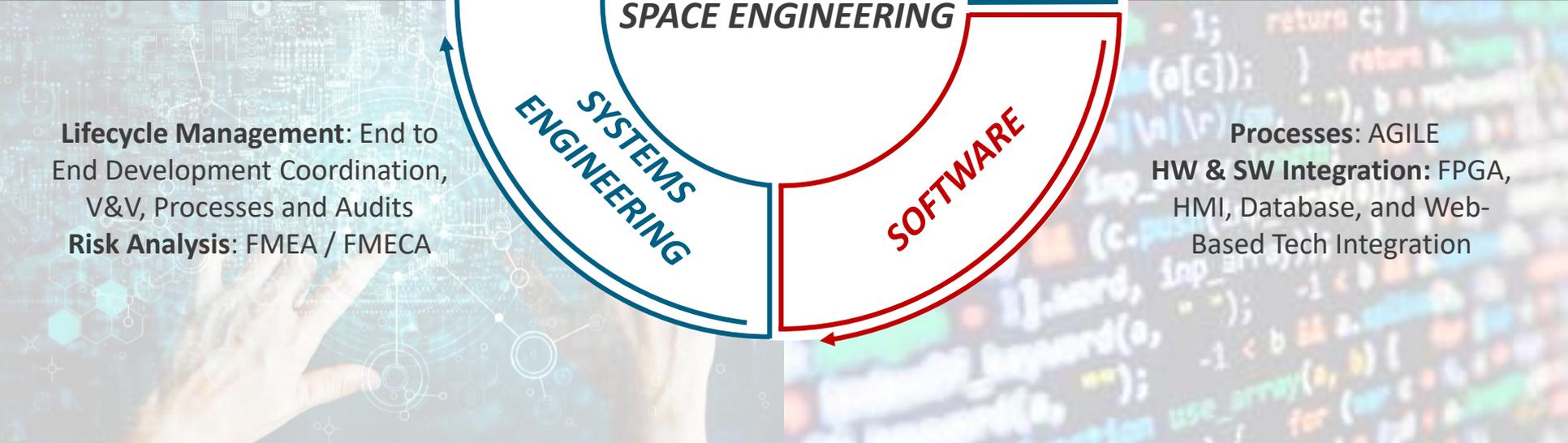
COLLABORATIONS

- EGNOS
- GALILEO
- SpainSAT NG
- STARLAB
- ESM ORION
- ARIANE 5 & 6
- COLUMBUS
- ENVISAT
- Sentinel 4 / 5
- JASON-CS(SENTINEL 6)
- MetOp-SG
- MERLIN
- SARah

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SPACE CAPABILITIES

- Main Programs
  - EGNOS
  - Galileo
  - SpainSAT NG

- Capabilities
  - Mechanical Engineering and Testing
  - Electrical Engineering and Testing
  - Comms Payload
  - RF & Microwave
  - Radar Surveillance and Tracking
  - Specialization in Military Communications
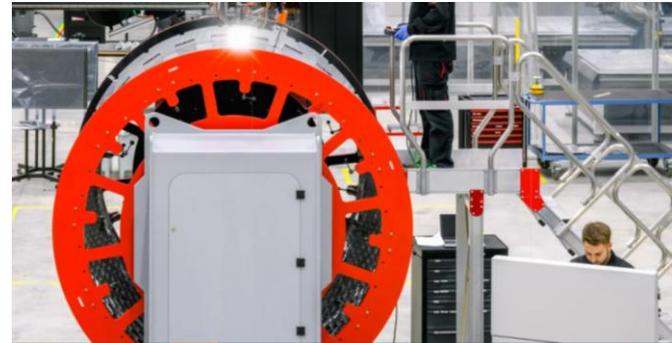
SPACE PROJECT EXAMPLES

SPACE SCIENCE PAYLOADS

- Flumias ISS Phase C/D
  - Design, development and deployment of the Payload System Software and Ground Support Equipment Software
  - Design and manufacturing of the Experiment Block Controller, Electronic Modules for the Payload Computer Control, etc…

- AtmoFlow
  - Design, development and deployment of the Payload Control Software, Ground Support Equipment Software and Payload Computer Control

CONTAINER SYSTEMS / WIRE HARNESSES / GROUND SUPPORT EQUIPMENT

- Integration Trolley
- Zero-G lifting device
- Stands
- Harnesses for Payloads, Equipment's and Experiments

THE PROJECTS TYPICALLY INCLUDE:

- Engineering consultancy
- Specification
- Design
- Manufacturing
- Commissioning
- After sales support

ISTAR PROGRAM

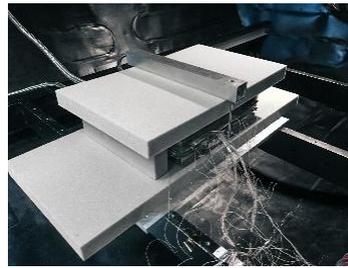- In-flight Systems & Technology Airborne Research (ISTAR)

- Collaboration with German Aerospace Center (DLR)

- World's only platform for research into flight physics, flight control, flight guidance and unmanned aerial systems.

INNOVATIVE ENERGY-SAVING TECHNOLOGY

- Together with the ArianeGroup and the Fraunhofer Institute for Applied Material Research

- RST has developed innovative insulation materials using phase change material (PCM) for space application

- This enables temperature stabilisation in the cryogenic area.
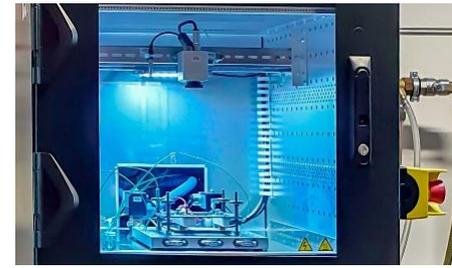
TEST BENCH FOR THERMAL SPRAYING

- Project sponsored by the German Research Foundation (DFG)

- RST developed a test bench which enables the determination of electrical parameters within the scope of thermal spraying of surface coatings of components.

Connecting People and Technologies for the Next Level

Alessandro Zago García

Head of R&D

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