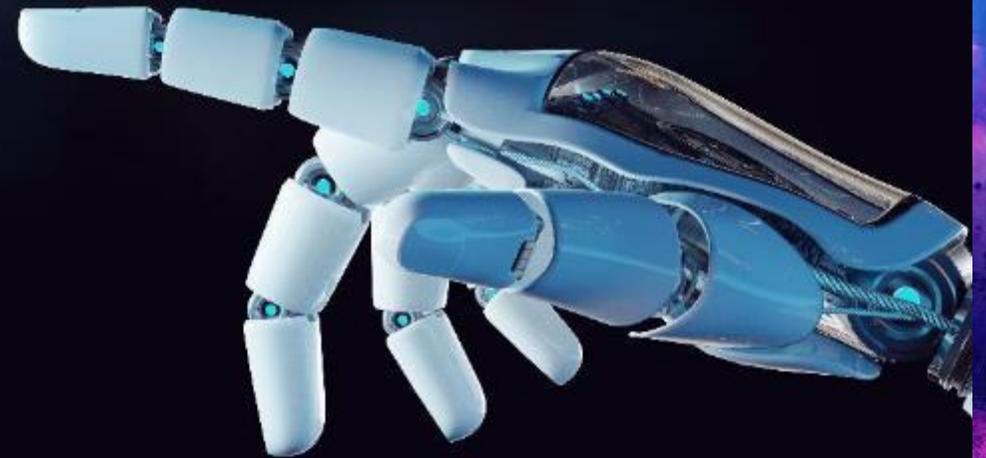


**Smart digital
solutions to
transform your
value chain**



(expleo)

Think bold, act reliable

Contents

Transforming your value chain – 3

Smart Tools from Expleo – 4

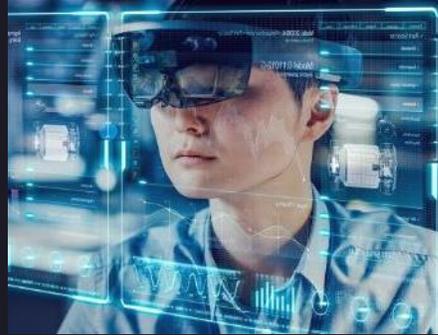
Success stories

Aerospace – 5-18

Defence – 19-29

Automotive – 30-32

Transform the whole value chain for your customers.



Nurture
innovation



Quickly
troubleshoot



Streamline
efficiencies



Upskilled
workforce



Reduction in
errors



Process-wide
digital
integration

SmartTools from Expleo

Bringing +50 years of engineering expertise and technical know-how together to turn challenges into opportunity.

#ThinkSmartThinkExpleo



1

BuildSmart

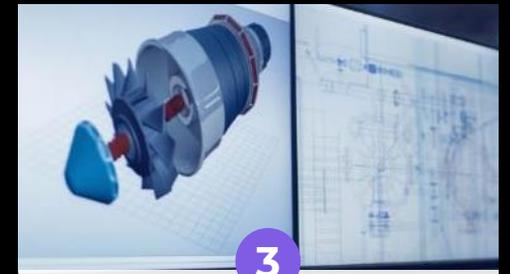
Interactive 3D work instructions and rigorous process controls to your engineers' fingertips



2

DataSmart

Power analytics and solve issues of non-conformance in engineering processes anywhere there is data.



3

DesignSmart / SimulationSmart

Automate manual engineering processes in product development and design analysis.



4

RepairSmart

Expedite root cause analysis and implement corrective action.



5

SmartPortal

Relevant Smart Dashboarding tailored for you.



6

RPA

Automate manual, repetitive processes with Robotic Process Automation.

Aerospace

Success stories in the making





AEROSPACE

Case study

Database Access Management System

Bold ambitions

- The client's Business Units (BU) were struggling to get easy access to internal databases and information such as stocks, reporting, finances, etc. with no proper PNL

Reliable solutions

- Expleo created an access management system where apps are created within the frame of the manufacturing environment
- It gives industrial leaders greater visibility on budget, documentation and other key information
- Each application is adapted to the BU processes
- **Architecture and IT development** in a manufacturing environment
- **Systems engineering**
- **Strategic consultancy & Project Management**
- **Part of Expleo's digital offering:**

DataSmart

Client benefits

- Apps allow the client to better steer business strategy
- Common tool for use across organisation
- Secure access for multiple users
- Multi-profile setup, ensuring each user only has access to relevant data
- Processes and user guide organised in accordance to customer FAQ
- Common data organised in dedicated configurable directories
- Complete control of all data implemented
- Avoids multiplication of macros that can be integrated directly into applications such as Excel, Word, IMS etc.

Apps allow the client to better steer business strategy

Common tool for use across organisation

Secure access for multiple users



AEROSPACE

Case study

Cybersecurity compliance checking for long-range business jet

Bold ambitions

- Security breaches are increasingly frequent with potentially disastrous consequences onboard an aircraft
- Cybersecurity regulations are developing fast for Falcon 6X aircraft programme, which feature innovative performance and safety features
- Programmes at certification phase: need to comply with certain specifications so all IT systems are in line with regulators' standards

Reliable solutions

- Expleo must ensure ultimate cybersecurity compliance to obtain certification and validation
- **Cybersecurity**
- **Architecture and Integration**
- IT development in a manufacturing environment
- **Consultancy: Project Management**
- **Advanced UI and total experience**
- **Systems engineering**
- **Compliance, quality control**
- **Part of Expleo's digital offering:**

Client benefits

- Strong analysis of cybersecurity plans and production of associated comment sheets
- Compliance-type audits according to the applicable cybersecurity certification base and production of detailed reports
- Monitoring of client's partners and call to actions when necessary

Expleo must ensure ultimate cybersecurity compliance to obtain certification and validation

DataSMART



AEROSPACE

Real E2E digital continuity for harness definition as part of new digital toolsets implementation

Case study

DDMS Digital Tools for Electrical Harness

Bold ambitions

- Electrical Harnesses: bundle of single electrical wires fulfilling an aircraft signal or power connectivity function
- Mismatch within engineering data set is one of the most expensive manufacturing pain points in Aerospace, often creating delays in production
- As the process involves many stakeholders, securing data consistency throughout is essential to avoid discrepancies, installation and fitting issues

Reliable solutions

- Expleo created the E-check app to centralise and simplify the process
- The app compares millions of data points from many inputs/sources with a model-based systems engineering (MBSE) approach
- App automates consistency, produces real-time reports, provides data analysis and checks quality - helping anticipate problems
- App constantly updated; 4th release
- **Consulting:** Global Methodology proposal incl. automation and tutorial for the process steps, on-request root cause & corrective actions defined
- **Systems Engineering** & development of application (Taksy/CatiaV5)
- **Architecture & Integration:** Full stack and front-end coding
- **Product & Process Lifecycle Management**
- Data Analytics
- ESI Quality
- **Part of Expleo's digital offerings:**

DataSmart

DesignSmart

RPA

Client benefits

- Real E2E digital continuity for harness definition as part of new digital toolsets implementation
- Very positive feedback: app helpful in real production; increasing number of users in different departments
- Can be combined to innovative 3D Viewer to generate proper topologies for enhanced ESI quality, data continuity and global cost saving
- Could be used by other clients and sectors



AEROSPACE

Reduction of analysis lead time,
therefore improvement in quality
with increase of root cause
correction; associated costs
savings

Case study

Automation of Practical Problem Solving (PPS)

Bold ambitions

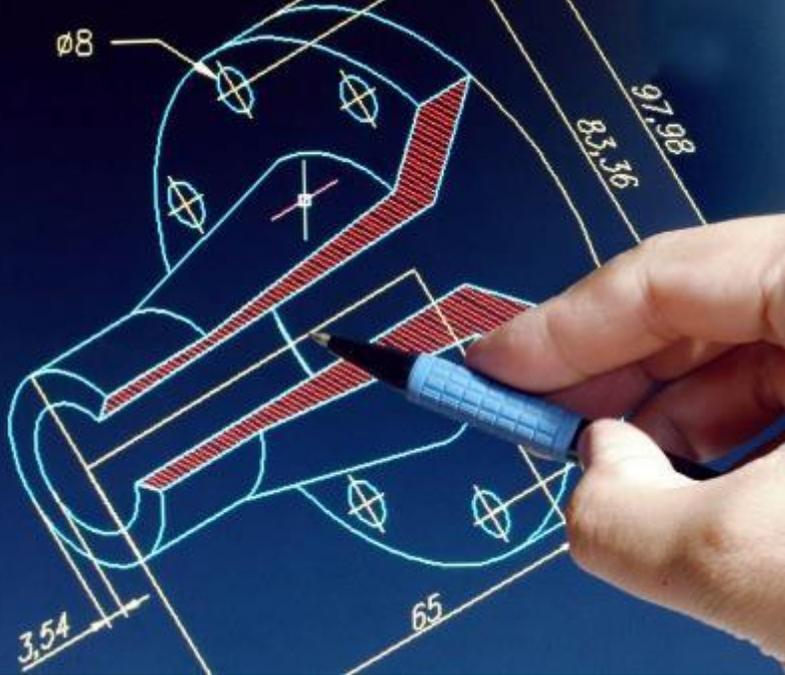
- Issues of non-conformity often arise on the final assembly line
- Checking if similar issues occurred in the past to investigate their root cause is a lengthy manual process involving a search through Excel files
- The management of non-conformities in production is complex due to the volume of historical data to process: coverage is low and cause analysis is only partial

Reliable solutions

- Expleo therefore created an automated advanced search tool for Practical Problem Solving (PPS)
- Based on the Skywise data platform, it provides 100% coverage to identify more potential solutions
- Users can easily find a solution using their own words thanks to Natural Language Processing
- The tool is constantly fine-tuning as it includes Machine Learning
- **Digital transformation**
- **Big Data Analytics, AI and Advanced Algorithms**
- **Architecture & Integration**
- **Product Design & Engineering**
- Analysis of operation requirement & Validation from Expleo's operational experience
- **Quality performance management:** NC analysis services with increased performance
- **Part of Expleo's digital offering:** **DataSmart**

Client benefits

- Reduction of analysis lead time, therefore improvement in quality with increase of root cause correction; associated costs savings
- Self-improving: accuracy of the system will keep improving over time
- Standardisation support
- Innovative tool that can be used as competitive advantage by Expleo



AEROSPACE

90%

savings on each BOM task for ESI

Measured on **928** cases

Quality increase through data continuity and less manual work

Case study

Fully-automated BOM (AutoBOM) for Electrical Installation Drawings

Bold ambitions

- Ensuring digital continuity for the Bill Of Material (BOM) of parts and components at every stage of the development life cycle is a major challenge
- Transferring Electrical System Installation drawings between the various software solutions in use (3D, 2D, PDM) used to require a manual process, leading to errors and requiring a huge amount of time, and therefore money
- Data consistency was not ensured between the 3D definition models and the 2D models

Reliable solutions

- Expleo designed a system that fully automates the process, ensuring data continuity and consistency: **the AutoBOM App**
- The app can be used to create a full automated BOM or only as an automated check from F3D Set BOM and Auto2D BOM
- **Product Design and Process Engineering**
- **Process Life Cycle Management**
- **Manufacturing and Engineering**
- Global Methodology proposal incl. automation
- development of application (Taksy/CatiaV5) **Architecture and Integration:**
- **Testing & Validation:** Implementation tests and maintenance
- **Part of Expleo's digital offering:** **DataSmart**

Client benefits

- 90% savings on each BOM task for ESI measured on 928 cases
- Automated BOM generation, and transfer to PDM System
- Quality increase through data continuity and less manual work (DQN Reduction)
- App developed during COVID-19 crisis in an “amazingly short timeframe with nothing comparable available from any other source” a Digital Transformation Leader for the client said



AEROSPACE

Expleo combines technical expertise and digital proficiency to address innovation challenges

Case study

Hydrogen-powered aircraft: Preliminary study

Bold ambitions

- A major European aerospace client is committed to develop a new generation of aircrafts with no GHG emissions
- This bold ambition requires breakthrough innovation for both the Product itself, and the Industrial System
- New constraints have to be integrated from the early stages of the projects to address the stakes along the whole lifecycle
- Model-Based Systems Engineering (MBSE) and simulation enable new ways of development to achieve maturity quicker

Reliable solutions

- **Systems Engineering:** Use of modelling supported by technical expertise to ensure relevance of the studies
- Simulation and assessment performed with virtual mock-ups
- **Architecture & Integration:** Software development in C of bespoke control modules for prototypes
- **Product & Process Lifecycle Management:** Development of tools to support quick assessment of industrial setup (user-friendly PERT-like production scheduler) to analyse production flow and Line Balancing
- **Sustainable Design:** helping the client achieve their goal to reduce their carbon footprint
- **Part of Expleo's digital offering:** **SimulationSmart**

Client benefits

- Reliable early trade-offs for the future industrial system
- Cost and time saving development process
- Better industrial strategy

What's next?

- Support to the client to develop concurrently its future products and way of working
- Build prototypes and test rigs to validate preliminary concepts



AEROSPACE

Aerospace programme management requires **20-30** pages of reports weekly

Expleo designed a cloud-based KPI portal with **24/7** availability

Save **10-20%** of programme management hours

Case study

Aerospace Smart Portal

Bold ambitions

- Aerospace programme management requires many KPIs – 20-30 pages of reports weekly
- Time consuming and brings risk of error

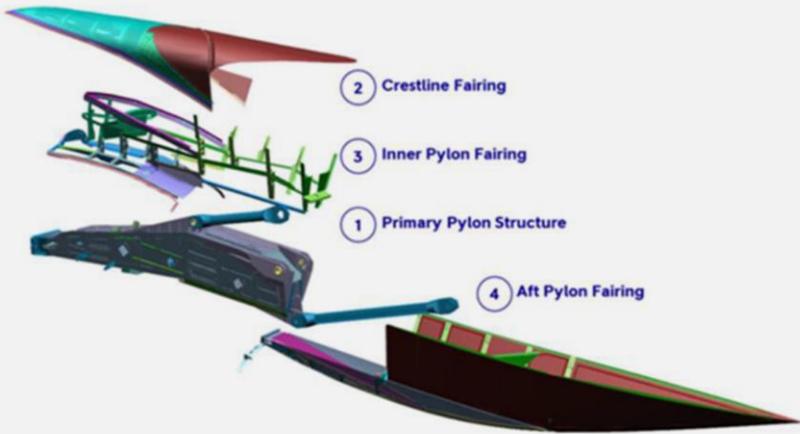
Reliable solutions

- Expleo designed a KPI portal that ensures all the relevant information is live and accessible, and easier to report
- KPIs are now interactive and engaging – teams can make updates to planning, embed documents and raise issues digitally
- Embedding AI to extract data and make the process automated, removing the need for daily updates by an employee
- **In-house capability to cover both the engineering and IT expertise**
- Cloud-based portal with 24/7 availability to facilitate programme management
- **Systems engineering**
- **Process lifecycle management**
- **AI & advanced algorithms**
- **Part of Expleo's digital offering:**

Client benefits

- Save 10-20% of programme management hours
- Secure access for Expleo and client teams
- Information and access can be tailored according to role or programme complexity
- Real-time metrics and reporting
- Automated data collection
- The client can comment immediately, which improves efficiency
- Issues are flagged daily, rather than at the end of the week

SmartPortal



AEROSPACE

The system is interrogated every day and updates to parts are automatically uploaded and shared

Case study

Digital Thread for Digital Mockup (DMU)

Bold ambitions

- With several partners working on hundreds of different digital models of parts, version control is critical
- A digital thread reduces the risk of extensive rework and loss of time
- Partners can design their parts against a different interface if the updates are not communicated in a timely way

Reliable solutions

- Expleo has written automated scripts that allow regular daily updates of DMU
- The system is interrogated every day and updates to parts are automatically uploaded and shared
- **System engineering**
- **Digital thread**
- **Advanced algorithms**
- **Part of Expleo's digital offerings:**

DesignSmart

SimulationSmart

RPA

Client benefits

- More intelligent way of operating
- All parties are working on latest version
- Time saved through added efficiency and reduction in reworks



AEROSPACE

The company chose us based on our landing gear expertise, for certification of the NLG when integrated with the electric drive system

Case study

Development of the WheelTug taxiing system



Bold ambitions

- WheelTug® is a novel taxiing system that consists of nose wheel mounted motors, powered by the aircraft's Auxiliary Power Unit
- The company approached Stirling Dynamics, an Expleo company, based on our landing gear expertise, for certification of the NLG when integrated with the electric drive system

Reliable solutions

- The development of a process to achieve the FAA-certified STC for certification of the landing gear
- **Systems Engineering**
- **Digital Twin & Digital Thread**
- **Software Monitoring & Maintenance**
- **Part of Expleo's digital offering:**

DesignSmart

SimulationSmart

Client benefits

- Generated the landing gear certification plan, which has been accepted by the FAA
- Airframe and landing gear modelling for ground loads analysis
- Calculation of landing gear and wheel bookcase loads
- Modelling of landing gear systems
- Analysis and design input for the WheelTug system mechanical design, including the safety disconnect clutch
- System Safety Analysis, including FHA and SSA
- Designed a new titanium nose wheel for integration with the WheelTug system



AEROSPACE

Recommendations to the client for further model validation, rotor loads testing or operational vibration measurements on the GVT and demonstrator aircraft

Case study

Understanding vibration in a novel aircraft

Bold ambitions

- To support a groundbreaking aerospace company with their understanding of the complex elastic behaviour of their current design with specific reference to the interaction between fuselage and rotor dynamics
- Increased use of **digital twins** to support design and certification
- Due to the novel nature of the aircraft and its potential behaviour, a unique method will be required to firstly understand the aircraft from a vibration perspective

Reliable solutions

- Creation of the airframe FEM and its integration to the aerodynamic model to yield the aeroelastic model that used to analyse the aircraft in various conditions. Using inhouse tools and of MSC/Nastran
- Vibration analysis intended to assess the zonal vibration spectra to ensure a safe flight will be carried out based on an unvalidated model under a limited set of operating conditions

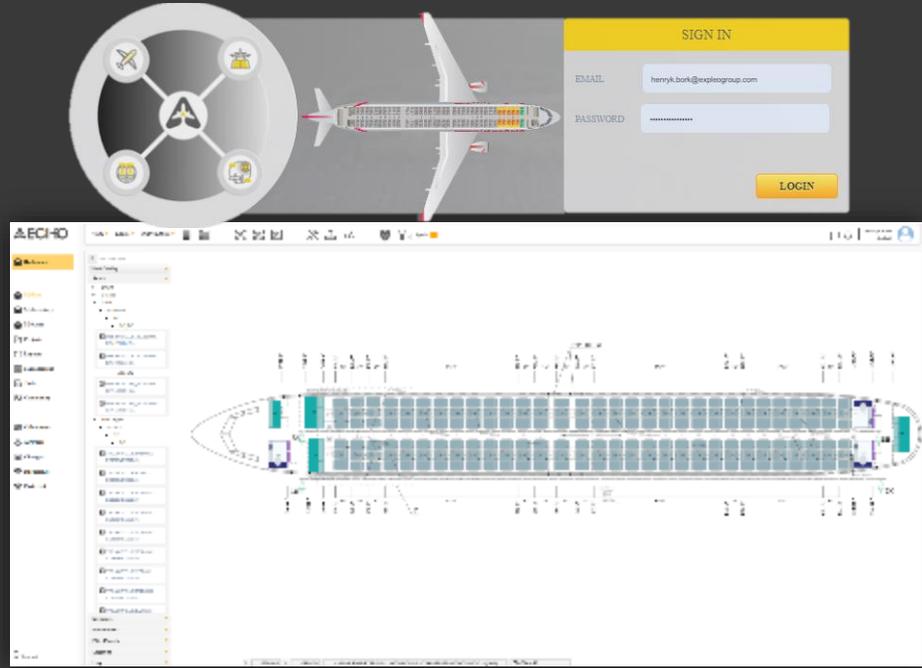
- A series of analysis cases assembled to combine harmonic loads for asynchronous rotors, each with frequency content related to its respective rotational speed. The aircraft configurations include the range of states between its VTOL configuration through transition to forward flight
- The series of analysis cases generated to represent various combinations of rotor speeds, assuming these are controlled independently of one another. Combinations of rotor speed selected to provide resonant excitation of airframe normal modes due to beating frequencies of asynchronous rotors
- **Digital Twin & Digital Thread**
- **Part of Expleo's digital offerings:**

DesignSmart

SimulationSmart

Client benefits

- Recommendations for further model validation, rotor loads testing or operational vibration measurements on the GVT and demonstrator aircraft
- Assist in the establishment of best practices for test activities to avoid problematic conditions, highlight any safety issues and any opportunities to maximise value gained from tests



AEROSPACE

Customer expectations in terms of facilitating decision-making based on CLM best-case scenarios were fully met. This was the key to assigning the entire campaign as a turnkey project

Case study

Cabin Layout Management

Bold ambitions

- Cabin Layout Management (CLM) is the centrepiece of a digital platform constituting a new ecosystem called Cabin Mod Hub (CMH)
- Cabin Layout Management automates cabin layout creation from business case verification through design to certification
- Full extension of the CLM method on the CMH can set a new standard of collaboration in the aviation industry by implemented Supply Chain Management functionality to provide turnkey solutions
- Complete fleets can be digitised and standardised, which delivers efficiency for common fleet-wide mods

Reliable solutions

- **Architecture & Integration:** Trustworthy combination of technology leap and certification expertise under the “umbrella” of an EASA approved Design Organisation
- Referenced aircraft documentation and other documents can be linked to relevant configuration
- **Cloud Computing:** “Platform as a Service” based on secured cloud architecture to create reliable cabin mod ecosystem
- **Part of Expleo’s digital offerings:**

DesignSmart

DataSmart

Client benefits

- Significantly reduces time from enquiry to certification through effective digital management
- Linking with various product catalogues and services allows an approximate best-case scenario
- Instant and reliable information for change requests in terms of feasibility, certifiability, availability and cost
- Facilitates controlled configuration management enabling modification interchangeability
- Allows sharing of repair solutions & spares supply across airline fleets



AEROSPACE

Agile Process

shortened project lifecycle

6

FTE

2 Years

Project Development Duration

Case study

Cloud Migration - Engine Health Monitoring

Bold ambitions

- To achieve increased productivity & effectiveness through migrating engine data from on-premise environment to a cloud based target environment
- Develop & maintain an automated build, test, deployment & release pipeline
- Support integration of sync service with migration & extraction of data
- Support migration performance improvements for data loading iteratively as continuous improvements
- Support validation & improvements of each engine type

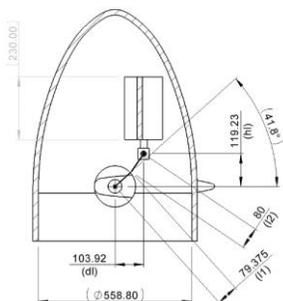
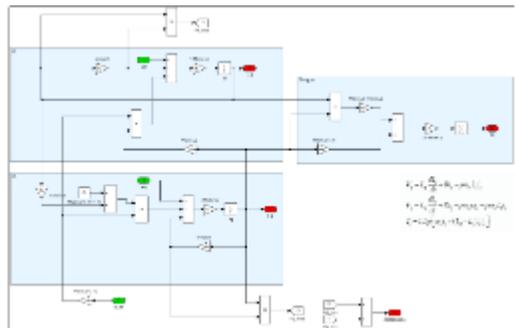
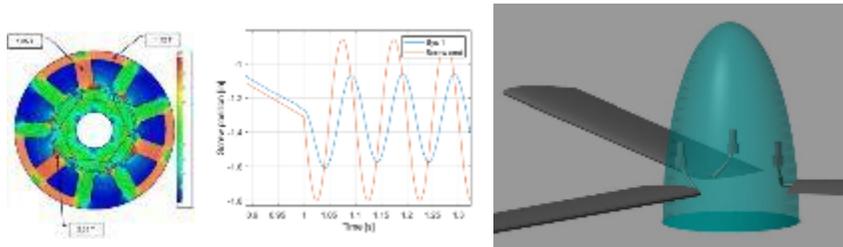
Reliable solutions

- **Software Testing & Integration:** Agile Development Methodology
- **Architecture & Integration:** Implementation in C#
- **Cloud Computing:** Azure Environment
 - Building ADF pipelines & releases
 - Troubleshooting
 - Customer support
 - Automation within Azure
 - COSMOS
 - HDInsight\HIVE
 - Cloud networks, VMs
 - ASE & Apps and storage
 - Azure Active Directory
 - ETL Tools – ADF\SSIS
- **Systems Engineering**
- **Part of Expleo's digital offering:**

Client benefits

- Moving away from HP/DXC data centres to the Cloud in-line with the latest Technology and Capability
- Moving into the Cloud provides the client cost savings to retrofit DXC hardware and software (cost savings is RR commercial confidential)
- Provide technical skills to accelerate migration for different Engine types – Data are the crown jewels used to provide services to airlines
- This is also in-line with the client's product cycle EHM technology stack offered to Airlines
- Latest technology brings the client and airline customers on to a common platform and eases communication

DataSmart



AEROSPACE

Solid, Finite Element, Simulink (Performance /Thermal) and Magnetic models

Concept iterations analysed and evaluated

Selected concept refined

Case study

Electro-mechanical Actuator for Individual Rotor Blade Control

Bold ambitions

- Trade study investigations into various electro-mechanical actuator configurations (e.g. geared and direct drive)
- Product requirements validation and flow down to individual component elements (e.g. Permanent Magnet Synchronous Motor [PMSM] and Roller Screw)
- Performance, thermal and structural analysis of design concept iterations
- Redundancy and reliability evaluation and recommendations

Reliable solutions

- **Digital Twin & Digital Thread**
- **Product Design & Engineering**

The purpose of the simulation models were to:

- Optimise the PMSM design
- Test performance aspects such as rated speed, frequency response, stall force and accuracy
- Evaluate thermal aspects at various operating conditions to help define passive/active cooling requirements

The purpose of the CAD models were to:

- Develop and explore the physical packaging of the actuator and integration into the rotor hub
- Optimise structural aspects and to minimise weight
- **Part of Expleo's digital offering:**

SimulationSmart

Client benefits

- Design space and options thoroughly investigated
- Requirements evaluated and refined
- Recommended concept defined based on a specifically designed PMSM and Roller Screw configuration selected from a leading manufacturer

What's next?

The project is ongoing. Next steps are:

- Revisit and update any evolving technical requirements from our customer
- Update design concept, re-analyse as required
- Detailed thermal analysis
- Mechanical design to be matured
- Structural fatigue analysis

Defence – Sea and land

Success stories in the making





NAVAL

Case study

Platform Management System - Control and Instrumentation System Modelling

Bold ambitions

- The Platform Management System performs many of the propulsion, electrical, HVAC, auxiliary systems, damage control and hotel functions on a submarine
- Expleo provides **model-based systems engineering (MBSE)** for level 3-5 requirement definition and design – the iterative development stages prior to supplier specification; and level 6-7 – supplier, product and component specification

Client benefits

- Ability to capture different system interfaces, runs scenarios and identifies redundant data paths
- Capture, visualise and manage complex systems
- Support re-use of model structures, product line identification, and provide basis for design of variants
- Improves clarity for optioneering and review process. Reduced quality issues, improved time to market and reduced rework/redesign cycles
- Accelerates the requirements and design process
- The model provides a digital thread
- Potential to form a single digital twin for future planning, obsolescence, software monitoring, predictive maintenance and changes in design impact
- Scalable to encompass design at all levels

Reliable solutions

- Enterprise Architect (Sparx) used to define the requirements in the standard SYSML modelling language
- Augments definition by wordy documents, providing multiple views of the model to aid definition and understanding of requirements and design
- **Systems Engineering**
- **Digital Twin & Digital Thread**
- **Predictive Maintenance**
- **Software Monitoring & Maintenance**
- **Part of Expleo's digital offerings:**

DesignSmart

SimulationSmart

Capture, visualise and manage complex systems

The model provides a **digital thread**

Scalable to encompass design at **all levels**



NAVAL

Case study

Digital Twin - Submarine Control Systems

Bold ambitions

- Working with the customer to formalise Auto Pilot (AP) design
- Developing digital twin models of the boat for analysis, trials and demonstrations
- Developing design considerations for hydroplane limits gain scheduling etc.

Reliable solutions

- Detailed design of state estimators and command filters
- Detailed design of Depth AP modes: Depth Keeping, Depth Change (Pitch) Mode
- Implementation of additional AP modes: Depth Change (Heave), MaxRoC, Course Changing, Course Keeping
- Supporting development of the OTE design inc enhanced functionality for manoeuvring
- Design and Implementation of mode logic (switching between modes)
- Design and Implementation of automatic mode switching (pitch/heave)
- Supporting synthetic boat model developments for the generation of a **digital twin**
- **Part of Expleo's digital offerings:**

DesignSmart

SimulationSmart

Client benefits

- Utilising Stirling Dynamics' (a wholly owned subsidiary of Expleo) extensive experience in submarine control has meant that the customer has been able to draw on background experience to assess design
- Industry-leading control solutions have been employed by Stirling Dynamics and integrated into the control design and production of the boat models to help develop a digital twin

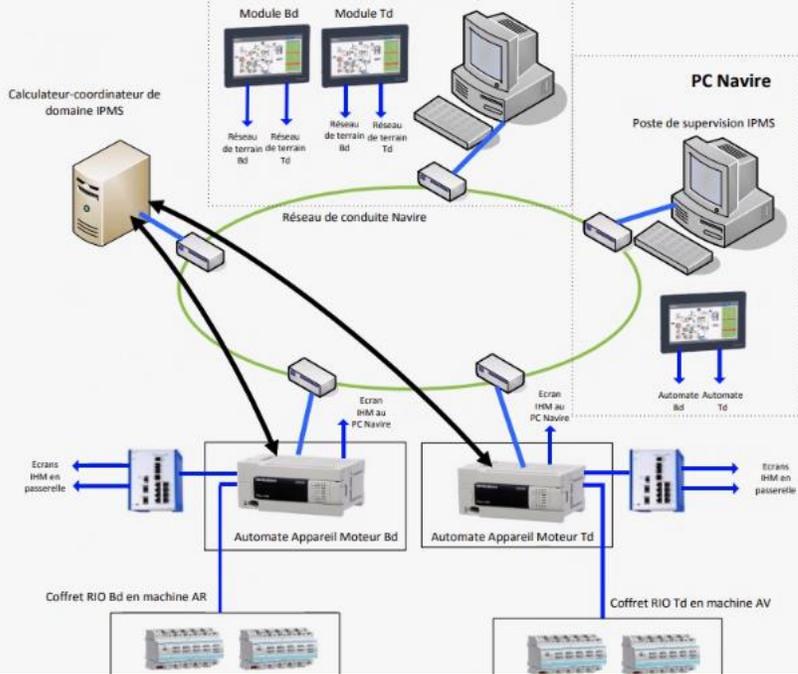
What's next?

- Continue working with the customer to complete control design for instillation onto the boat. Refine models as design develops to ensure model based design is being used throughout

Steering and Diving control including **Hover Algorithms**

Boat Models / **Digital Twin**

Out of Trim estimates, Sea state estimates and **Hover control**



NAVAL

30% cost and time savings

Delivered **on time** and **on budget**

State-of-the-art ship steering and safety overseeing

Case study

Integrated Platform Management System (IPMS) Digital Platform

Bold ambitions

- Expleo delivered the detailed design phase as well as the software development of propulsion command & control and Programmable Logic Controller (PLC) part of the Integrated Platform Management System
- The IPMS provides state-of-the-art Ship Steering and Safety Overseeing
- In the future, every ship being unique, understanding its blueprint by placing sensors and collecting data (IoT) is the next challenge to tackle to improve operations and lay the ground for **predictive maintenance**

Reliable solutions

- **IT Architecture and Integration:** PLC software development
- **Product Design & Engineering:** HMI detailed design
- **Testing & Validation:** detailed design of a simulator and software development validation
- **Part of Expleo's digital offerings:**

DesignSmart

SimulationSmart

RepairSmart

Client benefits

- Work packages commitment: project delivered **on time** – despite short deadline and COVID-19 – and **on budget** with a trusted long-term partner
- Expleo building up its strong expertise in digital naval systems
- In the future, around **30% cost and time savings** through predictive maintenance could be expected: parts only replaced at the right time and less breakdowns or operational issues



NAVAL

We model the submarine – using digital twins and simulation – considering influences such as buoyancy, hydrodynamics, hydrostatics and sea states

Case study

Digital Twin: Marine Control Systems

Bold ambitions

- Stirling Dynamics is an Expleo company that designs control systems to provide course autopilot and hover control for a range of submarine platforms
- Using our developed submarine dynamic simulation modelling toolsets and capabilities we provide mathematical models from which we develop the control algorithms and safety critical software that will be deployed direct to the control computers
- Our simulation models can be further deployed for synthetic evaluation and training systems
- For existing platforms we can support initial project stages, undertaking system identification sea trials to determine the boat dynamic characteristics. These trials might be necessary in the absence of the specific manufacturer's data, effectively "reverse-engineering" the submarine model
- Capability delivered to 11 different navies around the world

Reliable solutions

- We model the submarine – using **digital twins and simulation** – considering influences such as buoyancy, hydrodynamics, hydrostatics and sea states
- Representation of further platform management systems and actuation systems allows us to assess and analyse the submarine performance in a virtual environment
- At-Sea Trials Support and Post Trials Tuning of control systems
- **Part of Expleo's digital offerings:**

DesignSmart

SimulationSmart

Client benefits

- Robust control system that has been applauded by commanders
- Demonstrated modelling toolsets and capabilities
- Systems that can provide increased autonomy, reducing operator workload and operational costs



NAVAL

Case study

RPA for a major defence client – stage 2 & 3 Design

Bold ambitions

- In the competitive defence market, digital technology has become a critical asset in the drive to reduce costs
- Expleo has taken responsibility for the outsourcing of a major design element on a critical project for a large defence OEM
- The client set its engineering teams the challenge of securing process efficiencies through innovative digital solutions

Reliable solutions

- Having provided proof of value, our engineering and quality teams introduced RPA as part of a pilot scheme for the client to reduce repetitive tasks that would typically take up 30% of an engineer's time
- **Digital Transformation**
- **Hyperautomation**
- **Transformation consultancy: Training & upskill**
- **Product Design and Engineering**
- **Part of Expleo's digital offering:**

Client benefits

- RPA has the potential to save up to £1m in a single process automation
- Digital Kanban dashboards showing real-time data on client KPIs
- 50-60% improvements across the project, in the form of quality improvements and reduced rework costs
- 35,000+ Stage 3 production outputs directly into the client's operations teams
- 40,000 hours of complex Stage 2 change requests delivered to date
- Outputs delivered on time and above customer-set quality 95% right-first-time (RFT) target

RPA

£1m
potential
savings with
RPA

95%
Right first-time
outputs

50-60%
improvements
across the
project



DEFENCE

Expleo brings its expertise in the field to make the connected vehicles of tomorrow safer

Case study

Cybersecurity for connected vehicles

Bold ambitions

- Our client has been notified to ensure vehicle safety
- Cybersecurity activities of our client for connected vehicles (ACV), dedicated to first and second generation “Connected Car Services” systems
- Consistent compliance with future regulations for connected vehicles by mastering all technical issues, whether in terms of architecture or validation tests
- Propose safety measures / recommendations for specific components or functions of the vehicle and associated connected services

Reliable solutions

- **Cybersecurity**
- Ebios methodology
- Risk analysis
- Systems engineering
- Software, Hardware skills
- Project Management
- **Part of Expleo’s digital offering:**

DataSmart

Client benefits

- Secure systems are a critical next step for achieving full autonomy and creating ever-more connected vehicles
- Support the client to develop and strengthen their security
- Eliminate security breaches
- Develop a skills center



DEFENCE

Expleo is positioned on the digital transformation of a major defence and security client by providing all its expertise

Case study

Data Management

Bold ambitions

- Our client is launching a data process which will allow the deployment of new methodologies for defense programs
- To be able to deploy new processes allowing internal best practices through the different business lines
- This approach is made up of 4 families of projects: Data Governance / Data management / Enablers / Animation
- Manage data allowing all the client's expertise to be integrated into their offers
- This model must be simple and understandable by all users. The data must be managed in such a way as to be accessible by all

Reliable solutions

- **IoT & Edge Computing**
- **Big Data Analytics, AI & Advanced Algorithms**
- Data management
- Data governance
- IT Solution
- **Systems engineering**
- **Part of Expleo's digital offering:**

DataSmart

Client benefits

- Support the client in transforming the process
- Help to define their new road map for 2022
- Being at the heart of the client's processes
- Control of all data implemented
- Multi-profile, ensuring each user only has access to relevant data



DEFENCE

More than
1,000
containers to
track

**Enhanced
logistics**
and better stock
management

**More
quality**
optimising
cost/performance
ratio

Case study

Tracking Containers

Bold ambitions

- In the support activity, repairable parts circulate between our client - a land defence leader - customers, and suppliers in customer-owned shuttle boxes. The majority are made of wood or metal. The size of these boxes and containers vary
- Within the framework of the missions of the Supply Chain Services (SCS) department, and in order to meet the requirements of certain contracts, it is necessary to monitor the flow of customer containers dedicated to the transport and packaging of repairables entrusted to our client. This flow monitoring must be carried out during empty or loaded movements with repairables, but also during storage phases

Reliable solutions

- Expleo developed a dedicated and efficient platform to access and manage information
- **Supply Chain Excellence**
- **Architecture & Integration:** Tracking system
- **Consultancy: Business Analysis & Transformation, Project Management**
- **Part of Expleo's digital offerings:**

SmartPortal

DataSmart

Client benefits

- Enhanced logistics: reduction of loss containers, better stock management, optimised shipments
- Interactive service for tracking containers: more ergonomic & user-friendly interface for end and internal users
- Have a view of the status of the packaging: empty, with repairable part, under repair (for the packaging), scrapped (with associated defect library)
- Optimising cost/performance ratio



DEFENCE

Work package 1
Literature review

Work package 2
Concept Generation

Work package 3
Concept Development

Case study

Systems on a Chip

Bold ambitions

- A Defence organisation requested Expleo to help them understand the potential benefits of System on Chip (SoC) technology and the Internet of Things (IoT) to develop a range of new concepts for the application of this technology within a specific defence system

Reliable solutions

- Expleo, working in collaboration with another consultancy, will deliver several work packages following a systematic process:
 - Work Package 1 – Literature Review
 - Work Package 2 – Concept Generation
 - Work Package 3 – Concept Development
- The team of experienced **FPGA** Engineers and Solution Architects will work in an **agile fashion** in conjunction with our partner in order to allow all parties to maximise the value of the work performed
- **Architecture & Integration**
- **IoT & Edge Computing**
- **Part of Expleo’s digital offerings:**

DesignSmart

SimulationSmart

Client benefits

- **Work Package 1 – Literature Review:** Horizon scan of IoT, current trends and technological developments such as FPSoC and emerging technologies within this field with respect to the current defence capability and “directions of travel” considering near, medium and long term strategic threats and outcomes
- **Work Package 2 – Concept Generation:** Generation of a list of concepts for the application of SoC technologies within the defence domain. Initial assessment and scoring against technology readiness level (TRL), potential benefit, uniqueness of capability, breadth of application, etc
- **Work Package 3 – Concept Development** for the most promising. Further development will include activities to obtain a deeper understanding of the technology as well as technology road maps, system architectures and conceptual narratives to guide future development



DEFENCE

Expleo created, developed and maintains a Smart Secure Portal that simplifies the logistics process and offers more transparency for the stakeholders

Case study

A Smart Digital Portal for vehicle maintenance

Bold ambitions

- Maintaining Defence & Security vehicles in operational condition is key to the successful completion of every mission
- However, low volumes of military vehicles produced (vs. civilian) makes logistics (storage and supply) involved in replacing or repairing parts a complicated process

Reliable solutions

- Expleo created, developed and maintains a Smart Secure Portal that simplifies the process and offers more transparency for the stakeholders involved
- A dedicated and efficient platform to access and manage information incl. spare parts catalogue, room rate, availability status, quotation requests, stock level, order tracking and fleet management
- **Supply chain excellence**
- **Systems engineering**
- **Architecture & Integration:** platform development
- **Consultancy: business analysis, digital transformation and engineering, project management**
- **Advanced UI and total experience**
- **Part of Expleo's digital offering:**

SmartPortal

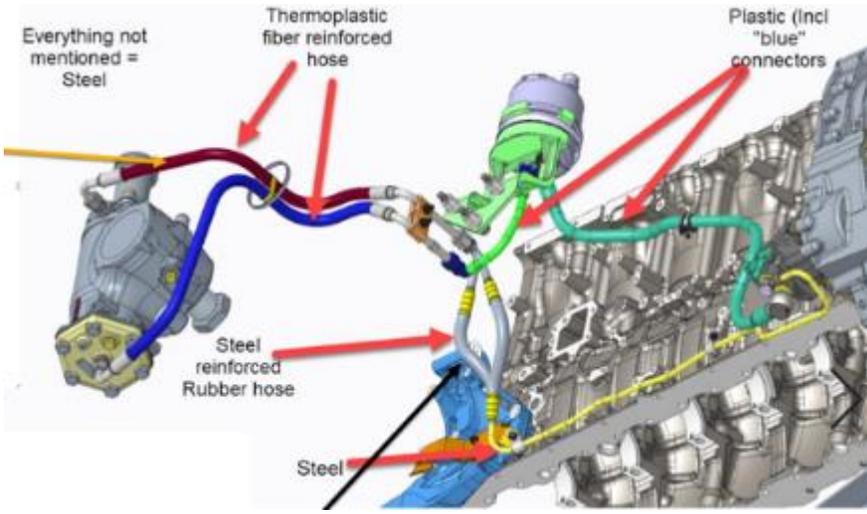
Client benefits

- Enhanced logistics: reduction of orders' time, better stock management, optimised shipments
- Supply chain can be adapted to customers' needs, optimising cost/performance ratio
- Interactive service for ordering spare parts online: more ergonomic & user-friendly interface for end and internal users
- Could be deployed to other clients in Aerospace or automotive

Automotive

Success stories in the making





Case study

Truck Hydraulic System Modelling and Analysis

Bold ambitions

- To find the cause of excessive pressure oscillations and vibration within the steering system of a customer truck that rendered the system unacceptable to users
- This investigation would involve creating a digital twin of the fluid components of hydraulic steering system in order to observe the structural response of pipe system to external vibration

Client benefits

- Access to specialist capability and experience
- Analysis performed with Stirling's CFD system to cross validate the pressure drops through the system
- This project concluded that the vibrations were caused by acoustic standing waves in the system, with a number of different options studied to find a way to reduce these oscillations

Reliable solutions

Stirling Dynamics (a wholly owned subsidiary of Expleo) used its extensive modelling and simulation capability and advanced modelling tools and processes to create a **digital twin** that was used to:

- Investigate the cause of excessive vibration caused by the hydraulic pump when at specific speeds and the interactions of the pipe network
- Carry out sensitivity studies on system elements such as pipe length, pipe diameter, pipe material properties, pipe bends, and assess impact on vibrations
- Define a solution to minimise mechanical vibrations from pump transferred to the steering gear

• **Part of Expleo's digital offering:**

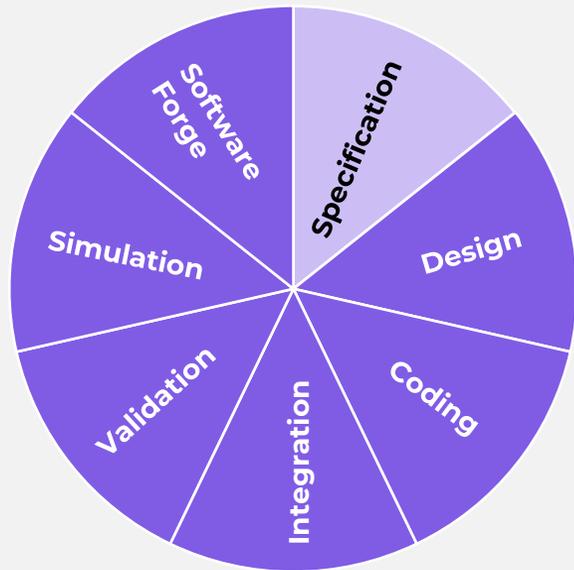
SimulationSmart

What's next?

- To continue the engagement with the customer to design Helmholtz Resonator which, when placed in the steering system, should cancel the wave at a given frequency and reduce the associated amplitude of oscillation

AUTOMOTIVE

<p>Digital Twin to investigate fluid structural interaction</p>	<p>Correlated to test results</p>	<p>Multiple solutions proposed</p>
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AUTOMOTIVE

Our experienced automotive cybersecurity engineers bring valuable knowledge on internal procedures, electrical architectures, critical infrastructures, supply chains and security systems

Case study

Cybersecurity Management System (CSMS) Establishment Support

Bold ambitions

- All automotive manufacturers must ensure new vehicle models are compliant to UNECE Regulation 155 and ISO 21434 by July 2022
- These regulations demand higher standards in cybersecurity in response to the rapid growth in connected, automated and autonomous vehicles. Both onboard and external systems must be secure to the threat of attack
- Expleo has worked within a large automotive OEM in the UK for three years
- Our experienced automotive cybersecurity engineers bring valuable knowledge on internal procedures, electrical architectures, critical infrastructures, supply chains and security systems
- Awareness of the relationship between safety and security

Reliable solutions

- Supply of specialist resources to support the establishment of these regulations
- Expleo provides compliance, posture and risk assessments
- Introducing the right **cybersecurity** governance to meet the checklists of the Vehicle Certification Authority
- Provide gap analysis of areas to improve for compliance
- **Part of Expleo's digital offering:**

DataSmart

Client benefits

- Compliance will allow OEMs to launch new models with break-through technology. E.g. Over-air software updates to reduce maintenance costs and improve the customer experience
- Secure systems are a critical next step for achieving full autonomy and creating ever-more connected vehicles
- Ensure the current security status of a vehicle is known, including any vulnerabilities

(expleo)

Think bold, act reliable