



# ELLEA

INGEGNERIA



AEROSPACE

AUTOMOTIVE

POWERTRAIN

RAILWAY

***“...let's not make things any worse by guessing”***

*“Gene Kranz”  
NASA Flight Director*

# ENGINEERING CONSULTING COMPANY

Twenty years of Experience in Design & Virtual Simulation

## AEROSPACE



## AUTOMOTIVE



## POWERTRAIN



## RAILWAY



# AEROSPACE

## CONCEPT & DESIGN DEVELOPMENT

- Wings
- Fuselage
- Empennage
- Tailgates
- Landing Gears

## STRUCTURAL VERIFICATION & VALIDATION

- FE Model Build & Analysis
- Fatigue & Damage Tolerance
- Hand Calculation
- Certification Report
- Production Assistant (MRO&Concessions)

## FLIGHT CERTIFICATION

- Residual Strength Analysis:
  - Wing Fuselage
- Full Scale Static, Fatigue Test:
  - Test Loads discretization
  - non-destructive testing
  - Certificate Report

## CUSTOMERS (TIER 1&2)



# AUTOMOTIVE

## CONCEPT & DESIGN DEVELOPMENT

- Style Feasibility
- Body & Closures
- Exterior Trim
- Production Technology : Plastic, Metallic

## STRUCTURAL VERIFICATION & VALIDATION

- FE Models Determination & Validation
- Static & Stress strength analysis

## SAFETY

- Front, Side & Rear Crash: EuroNCAP
- Bumper Low-Speed Impact: ECE42
- Interior Head impacts: ECE21

## CUSTOMERS (TIER 1&2)





# POWERTRAIN

## CONCEPT&DESIGN DEVELOPMENT

### BASE ENGINE

- Cylinder Head
- Engine Block
- Intake & Exhaust
- Water Pump & Circuit

### ENGINE SYSTEM

- Refueling System
- FLVV Valve & MFI Modules
- Diesel & Adblue Tanks
- Connector & Pipe lines

## STRUCTURAL VERIFICATION&VALIDATION

- Multibody Analysis
- FEA & Noise Vibration Harshness
- Fatigue & Durability (FRF & PSD)
- Biphasic CFD Analysis
- Preliminary Shut Off
- De-Icing Prediction

## HANDLING, COMFORT&PERFORMANCE

- Axle Whine
- Isolation Effectiveness
- Engine Excitation Boom
- Prop Shaft Out of Balance
- Vibration Absorber
- Radiated Noise

## CUSTOMERS (TIER 1&2)



# MECHANICAL DESIGN TOOL SKILLS

MAIN SOFTWARE

CATIA V5

UG NX

ONSHAPE

CREO



# RAILWAY

## CONCEPT & DESIGN DEVELOPMENT

- Carbody Structure ( Bodyshell )
- Interior & Exterior case trim
- Equipments case
- Bogie
- Anti-roll and anti-shake systems
- Electrical & Hydraulic systems
- Lubricating systems and Sanding device
- W & G

## STRUCTURAL VERIFICATION & VALIDATION

- Virtual Simulation
- FEA & Manual Calculation
- Certificate report

European Regulations: EN: 12663,1993 ,1999

## RAILWAY & TRAM CART

- High-Speed train
- Underground Train
- Tramway Train

## CUSTOMERS (TIER 1&2)



**BOMBARDIER**  
TRANSPORTATION



**KNORR-BREMSE**



# VIRTUAL SIMULATION TOOL SKILLS

## MAIN SOFTWARE

### STRUCTURE | MBS & NVH

- NASTRAN
- OPTISTRUCT
- ADAMS
- ABAQUS

### DURABILITY

- VIRTUAL LAB
- FEMFAT
- HAND CALCULATION

### SAFETY

- ABAQUS EXPLICIT
- RADIOSS

### CFD

- FLUENT
- ACUSOLVE



# ELECTRONIC DESIGN TOOL SKILLS

## MAIN FIRMWARE TOOLS

IAR EMBEDDED WORKBENCH



IAR Embedded Workbench

KEIL UVISION5



STM32CUBEMX & IDE



CODEWARRIOR



MPLAB X IDE



## MAIN SOFTWARE TOOLS

VISUAL STUDIO C#-BASIC



LAB WINDOWS/CVI



# ELECTRONIC DESIGN TOOL SKILLS

MAIN HARDWARE TOOL

ALTIUM DESIGNER

**Altium**  
Designer.

MAIN CIRCUIT SIMULATION TOOL

LTSPICE BY ANALOG DEVICES



AHEAD OF WHAT'S POSSIBLE™

MAIN THERMAL SIMULATION TOOL

MENTOR GRAPHICS FLOTHERM XT

**SIEMENS**

# PARTNERSHIP

From 2023 Ellea Ingegneria and Cielle-Tronics become strategic partners

ELLEA INGEGNERIA



MECHANICAL DESIGN  
MECHATRONIC DESIGN SYSTEMS  
VIRTUAL SIMULATION & VALIDATION  
PROJECT MANAGEMENT

CIELLE-TRONICS



HARDWARE & SOFTWARE DESIGN  
ELECTRONIC PROTOTYPING SYSTEMS  
ELECTRONIC PRE SERIES PRODUCTION SYSTEMS  
AUTOMOTIVE LIGHTING DESIGN (OPTICS & PLASTIC PARTS)





AEROSPACE

AUTOMOTIVE

POWERTRAIN

RAILWAY

# COMPANY DIVISION

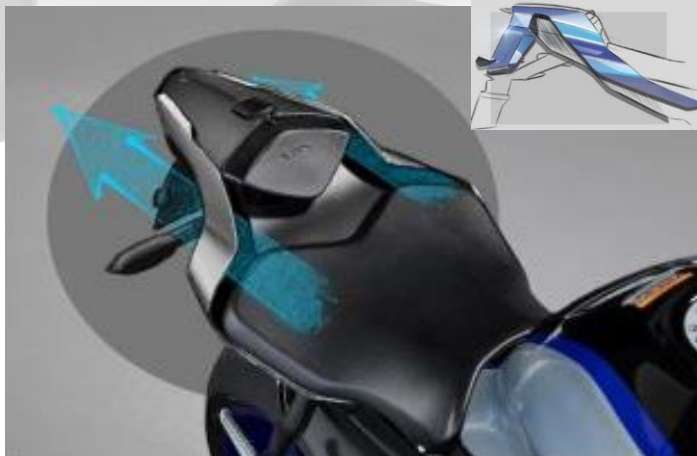
From 2022 Ellea Racing is a new Company Division focused in R&D:

SUPERCAR CONCEPT DESIGN



STYLE RESEARCH  
3D CONCEPT DESIGN  
3D MODELING  
FEASIBILITY

AERODYNAMIC DESIGN COMPONENT



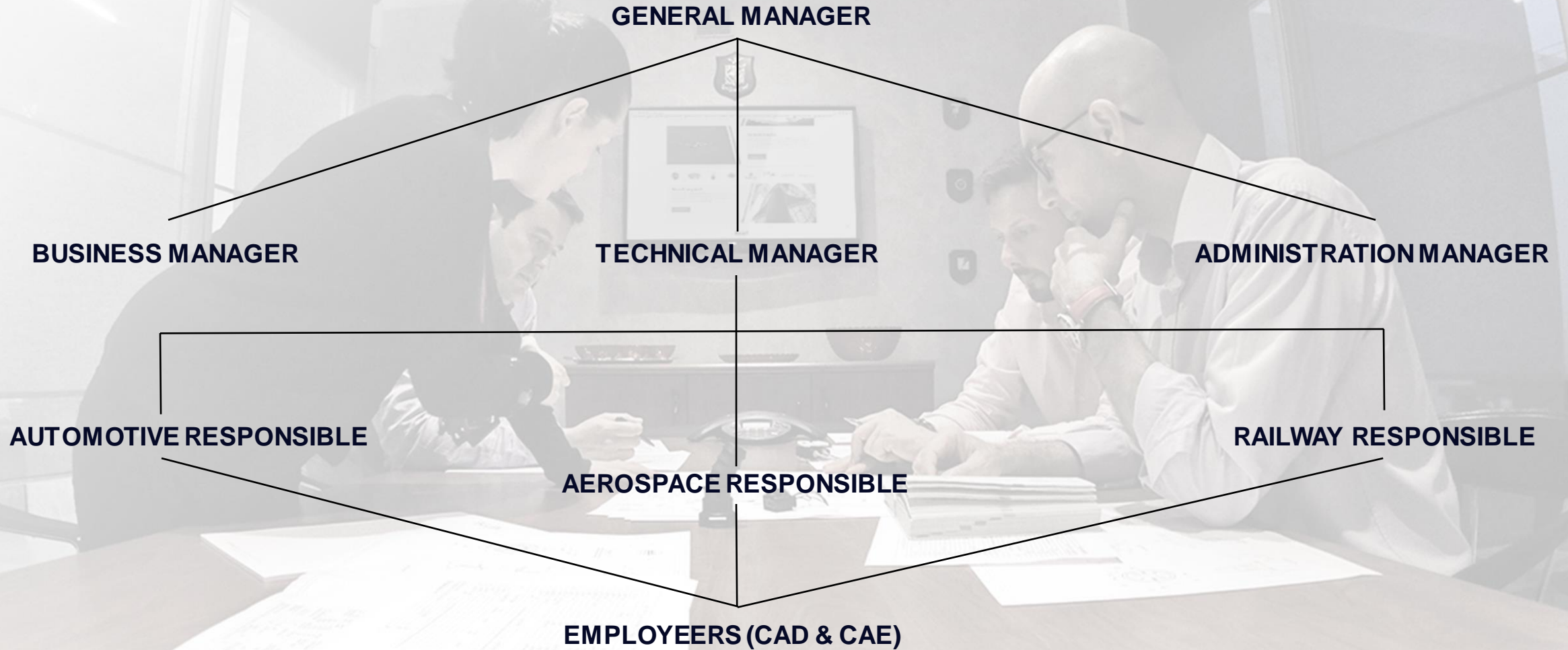
STYLE RESEARCH  
3D CONCEPT DESIGN  
VALIDATION ANALYSIS  
PROTOTYPING & TESTING

ADAS SYSTEMS - MOTORBIKE



COMPONENT DESIGN RESEARCH  
FIRMWARE & SOFTWARE DESIGN  
PROTOTYPING & TESTING

# COMPANY CHART



## **BUSINESS MODEL**

### **INDUSTRY FOCUS**

Aerospace, Automotive, Powertrain, Railway

### **STRATEGY**

Market & Product adaptation

Pick Up and Shift

Global Product & Service

Local Resources Execution

Remote Resources Execution

### **SERVICE**

Best in class delivered through

Flexibility

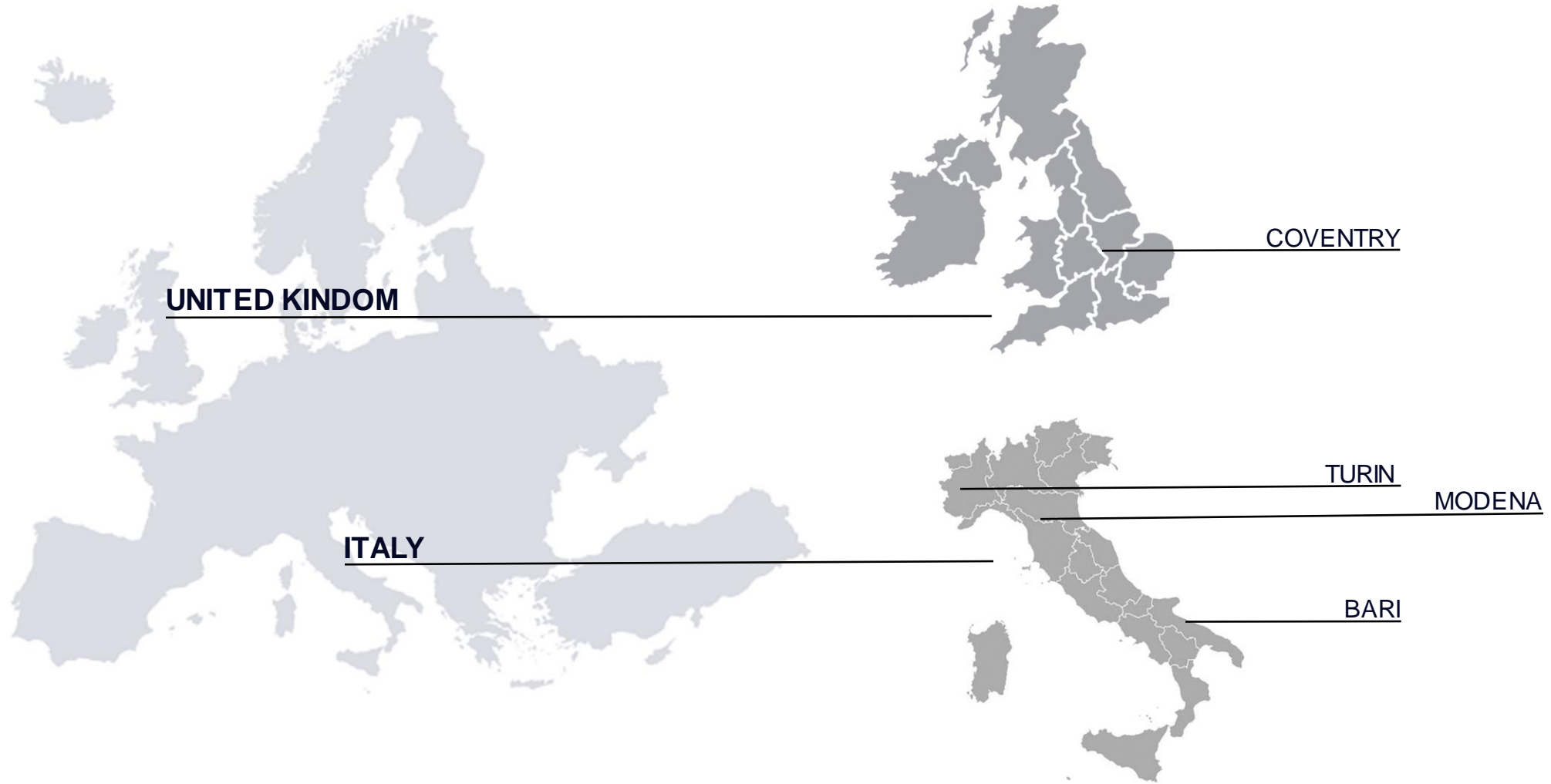
Efficiency

Readiness

Competitiveness



## LOCATIONS



# AEROSPACE

## CASE HISTORY

AEROSPACE

AUTOMOTIVE

POWERTRAIN

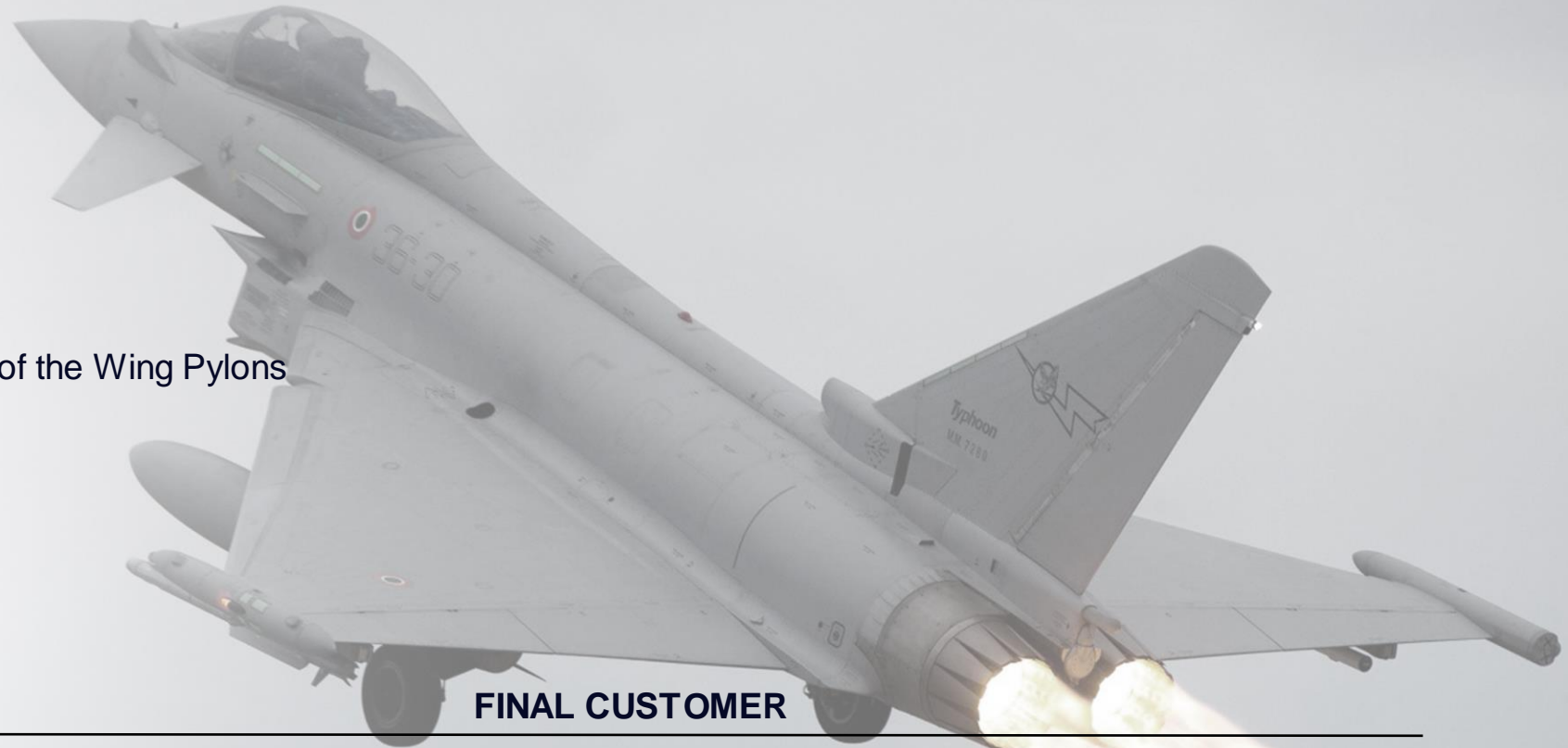
RAILWAY

# EUROFIGHTER

- 1998 -

## DESIGN & STRESS

Design and structural analysis of the Wing Pylons



FINAL CUSTOMER



# AERMACCHI M346

- from 2002 to 2009 -

## DESIGN & STRESS

**FWD Fuselage: structural design, FEM development, check stress, hand calculation, reports on:**

- Canopy
- Cabin Frames and Canted Frames
- Composite Lateral Panels
- Flight Control System
- Flight Deck Instrumentation Installation
- Radome
- Leading Edge

## FLIGHT CERTIFICATION

**Full Scale Static and Fatigue Test for flight certification. Development of test intallations for:**

- Leading Edge
- Flap
- Aileron
- Vertical Tail
- Fixed Leading Edge and Probe

**FINAL CUSTOMER**





# BOEING 787 Dreamliner

## - 2005 -

### STRESS

Involvement from PDR, CDR to flight test.  
FE modelling and analysis of:

- Door Uplock Mechanism
- Landing Gear Uplock
- Section 44 and joints, realized in CFC and Titanium

FINAL CUSTOMER

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# BOMBARDIER CS 100&300

- 2012 -

## STRESS

Involved in JDP and DDP.

FE modelling and analysis and hand calculation on:

- Wing to Body Fairing (metallic and composite)
- Mid Fuselage Circumferential Joints (Static & Fatigue)
- Crease Beam (Static & Fatigue)



FINAL CUSTOMER

**BOMBARDIER**  
AEROSPACE



# AIRBUS A380-800

- from 2004 to 2006 -

## STRESS

### Pax Floor Main Deck (frames 38 to 50):

design, static and fatigue analysis, manufacturing drawings of floor beams, rails, crash links and trolley lift attachment, design of the support structures for aircraft equipments.

### Cargo Floor Main Deck (frames 38 to 45):

design, static and fatigue analysis, manufacturing drawings (cargo beam, main structures), design of the floor handling and transportation devices.

### Engine Nacelle (Rolls-Royce Trent 900 and General Electric GP7200 engines):

flight readiness and certification analysis (static, fatigue, optimizations) and reports.

## FINAL CUSTOMER



# AIRBUS A380-800F

- 2006 -

## DESIGN

### Analysis of the Upper and Main Deck Cargo Doors

- Design (3d CAD, drawings, VPM integration), certification, reports, MRB and concessions.

## STRESS

### Analysis of the Upper and Main Deck Cargo Doors

- FEM modelling (GFEM and DFEM); FE structural analysis; detailed analysis of the door-fuselage interfaces; static, fatigue and damage tolerance reports.

FINAL CUSTOMER



# LEARJET 85

- 2012 -

## STRESS

### FE modelling and analysis on:

- Aft Pressure Bulkhead
- Avionic Pressure Floor
- Keel Beam
- Aft Frame
- Cabin Floor Frames
- EGRESS Provisions
- Fuselage Skin CFC Monolithic & Core

## FINAL CUSTOMER





# AIRBUS A350 XWB

## - from 2012 to 2015 -

### STRESS

#### Airbus A350 XWB-900 (MSN001 to MSN005):

- Pylon Load Transfer Bracket: development of a software for stress check and weight reduction, residual strength analysis
- Track Cans and Funk Plates: DFEM, load definition, stress check and weight reduction
- Fixed leading edge: residual strength analysis
- Fuselage (Section 15): FEM validation and check stress
- Wing: production support (concession)

#### Airbus A350 XWB-900 (MSN001 to MSN005):

- Fixed Leading edge: metallic ribs and composite panel sizing (B-Maturity)
- Rear Spar (Inboard & Outboard Splice Joints, Fuel Quantity Indicator, Flap Tracks 3 & 4)
- FE modelling (IFEM), validation, FE static analysis, hand calculation, reporting

FINAL CUSTOMER



# AERMACCHI M345

- 2012 -

## DESIGN

- Structural Design of front Fuselage:
  - Lateral skin
  - Canopy
  - Internal Frames

## STRESS

- FE Analysis post-processing
- Hand Calculations
- Certification Reports

FINAL CUSTOMER



## MPCV Service Module - from 2013 to 2014 -

### STRESS

- GFEM modification
- Shear Panel FEM validation and test correlation
- Mass saving study
- FE analyses and feasibility studies on Auxiliary Thrust Support, Fuel Tank Support, Engine Support.

FINAL CUSTOMER

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European Space Agency

# AGUSTA WESTLAND AW169

## - 2012 -

### STRESS

#### Fixed Flight Controls

#### Certification of the improved collective design

- Multibody analysis; modelling, analyses set up and run, load extraction
- FE Analysis for static and fatigue evaluation: models preparation, analyses set up and run, postprocessing
- Hand calculations for static and fatigue
- Certification analysis reports (static and fatigue)
- Full scale test for flight certification: preparation of test report for the static and operational tests

#### Custom Version : Guardia di Finanza & Carabinieri

- Structural analysis:  
Cabin & Cockpit floors, underfloor and external skin.
- Preparation of FE models:  
static analyses setup, run & post-processing;  
setup and run of explicit analyses for ditching event simulation; redaction of the certification analyses reports.
- Explicit analyses for simulation of bird strike events on the cockpit windows.

FINAL CUSTOMER





# AGUSTA WESTLAND AW609

- 2012 -

## STRESS

### Fixed Flight Controls

- Static analysis of the cyclic controls:
  - FE models preparation
  - analyses set up and run, post-processing
  - hand calculations
  - certification report
- Full scale test for flight certification:
  - Preparation of test proposals for the static
  - Post-processing of the test results
  - Redaction of the test reports

### Cockpit & Windshield - Bird Strike Simulation

- FE model check and modifications
- DFEM models preparation, GFEM integration
- Explicit analyses set-up and run
- Test/Analysis correlation
- Analysis post-processing

### Fuel Tank - Drop Test

- FE model preparation
- Explicit analysis set-up and run
- Results post-processing

FINAL CUSTOMER





# AGUSTA WESTLAND AW249

## - 2018 -

### DESIGN

#### Structural Design of the Forward Fuselage Primary Structure

- Nose Structure
- Under-Floor
- Upper Deck

### STRESS

#### Fixed Flight Controls:

- Multibody model of the Main Rotor and Tail Rotor controls
- Analyses setup and run; load extraction.
- Support to fatigue test campaign: test data post-processing
- Test report redaction

#### Static analysis of the central fuselage primary structure for design support:

- FE analyses post-processing;
- Hand calculations;
- Implementation into the FEM and
- Redaction of stress reports

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# AGUSTA WESTLAND AW139

- from 2018 -

## STRESS

### Fixed Flight Controls - support to the design and certification of new Main Rotor Collective Controls:

- Multibody model preparation, analyses setup and run
- Creation of FE models for static, fatigue
- Stiffness assessment;
- Creation of the final FE models & post-processing
- Static and fatigue hand calculations
- Support to the full scale test activities
- Analyses and redaction of the test reports

### Bird strike analyses of the FWD Cowling:

- FE model creation
- Explicit analyses of bird strike event damage
- Improved solutions stress-design integration
- Report

### Seat track & cabin floor structural analyses:

- Setup and run of FE simulations
- Post-processing
- Hand calculations
- Stress report redaction

## FINAL CUSTOMER



# AGUSTA WESTLAND AW189

## - from 2019 -

### STRESS

#### Rotor Beanie - composite lay-ups optimization for weight reduction:

- Implementation into an existing FE model of the feasible solution identified
- Static and fatigue hand calculations
- Setup and run of explicit analyses for simulation of bird strike events
- Post-strike assessment: FE model implementation of the bird strike simulation damage
- FE static analyses, post-processing and hand calculations for the damaged structure simulation

FINAL CUSTOMER



# NH INDUSTRIES NH90

## - from 2019 to 2021 -

### STRESS

- **Structural analyses of equipments modifications (Mission Console, Cockpit Console):**
  - Implementation of the design modification into existing FE models
  - Setup and run of static analyses
  - FE analyses results post-processing
  - Hand calculations
  - Redaction of stress reports
- **Rear Ramp structural assessment for new ballistic protection:**
  - Implementation of the modification into an existing FE model
  - Analyses setup and run & post-processing
  - Multibody model of the loads required by the actuators (opening/closing)
  - Redaction of the stress reports
- **Main Rotor Gearbox:**
  - Structural analyses of an MRB sub-assembly
  - FE models including non-linear contacts between engaged gears
  - Setup, run & post-processing of static analyses of the main structural components
  - Redaction of the stress reports

FINAL CUSTOMER





# GIANT MAGELLAN TELESCOPE

- 2022 -

## DESIGN

**Two cover protection systems for the observatory, panels made in honeycomb:**

- Covering system for the central mirror : Six folding units
- Covering system for the external mirror : Six folding units

## STRESS

**Cover protection system static and fatigue simulation:**

- FE model check and modifications
- Panels FEM validation and test correlation
- Reports

FINAL CUSTOMER





# THANK YOU

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*ELLEA Ingegneria Srl*

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<https://www.linkedin.com/company/ellea-ingegneria-srl>



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