



PRESENTATION - AEROSPACE

11/2025



www.5M.cz

SMART TECHNOLOGIES IN
THE
WORLD OF COMPOSITES

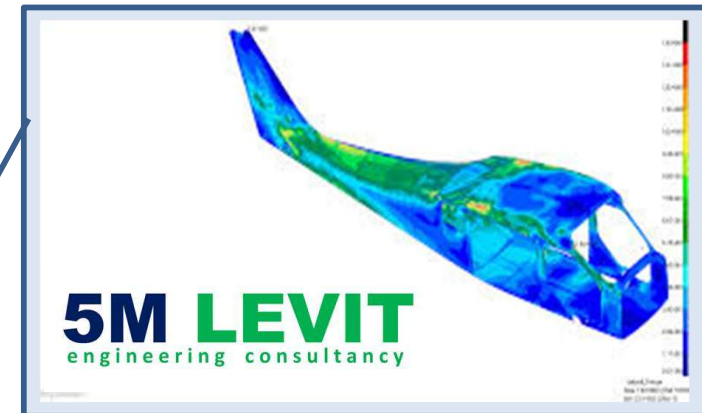
- Czech private company
- Founded 1992
- 270 employees
- Turnover 25 mil.€.
- Member of **BSTG** – more than 400 employees



- Manufacturing company
- 17.000 m2 production space
- AS/EN 9100
- POA Part 21G
- NATO 49926



- Manufacturing
- R&D
- Testing

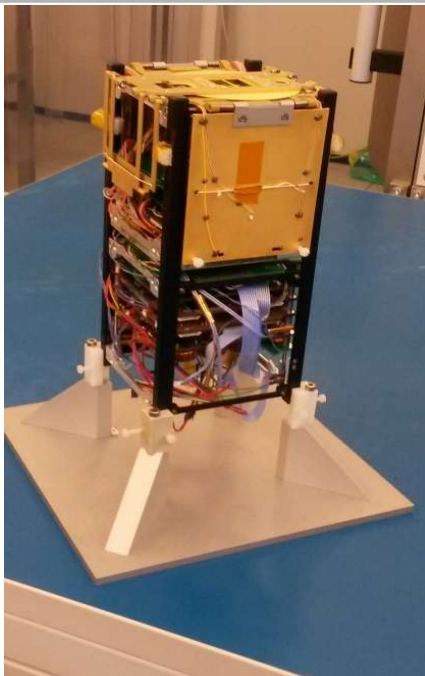


5M Precision

- CNC machining
- CMM



80% Industrial applications
(including 35% of aerospace)



20% Space and new development

Space Subsystems

solar arrays, radiation shielding

Composite Structures

based on prepreg or LF Technology

Adhesives for Space applications

development and production of foil and paste adhesives

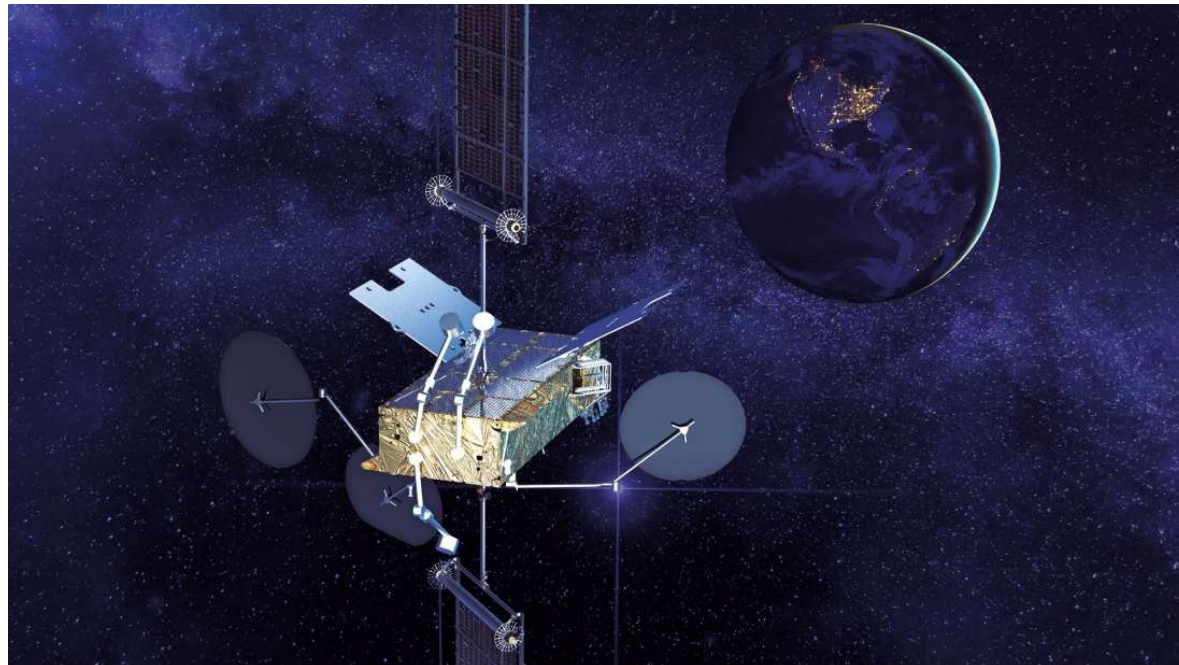
GSE for Space applications

design and manufacturing of manufacturing and testing GSE

BSTG

Brno Space Technology Group

Most of projects done within this consortium



Brno Space Technology Group (BSTG)

- RELIABLE PARTNER FOR YOUR COMPLEX SPACE SYSTEM DEVELOPMENT, PRODUCTION & TESTING
- INDUSTRIAL GROUP OF BRNO AREA COOPERATING ON COMPLEX SPACE PROJECTS
- TOTAL GROUP MANPOWER: > 400 EMPLOYEES
- TOTAL GROUP TURNOVER: > 40 milion €
- GROUP IS A MEMBER OF CZECH SPACE ALLIANCE



- System engineering
- Advanced analysis
- Mechanical and structural design
- Metal Additive Layer Manufacturing



- Precision manufacturing
- Environmental testing
- Clean assembly areas

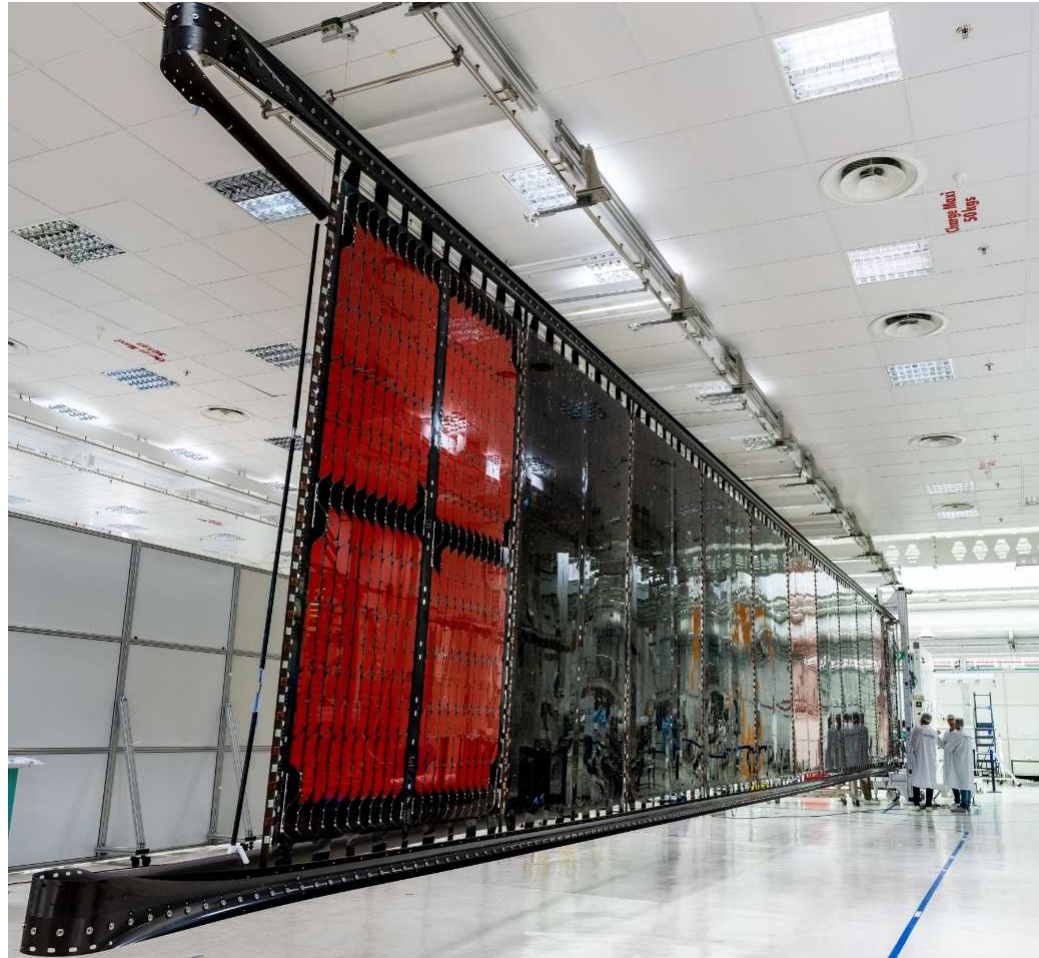


- CFRP components production
- Adhesives
- Mechanical testing
- Geometry inspection

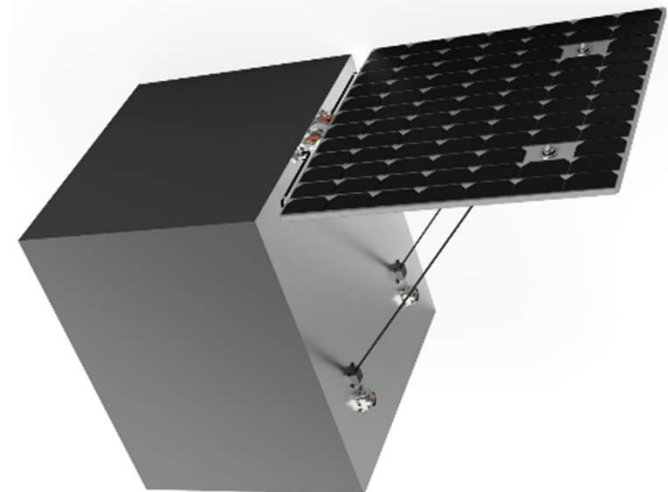
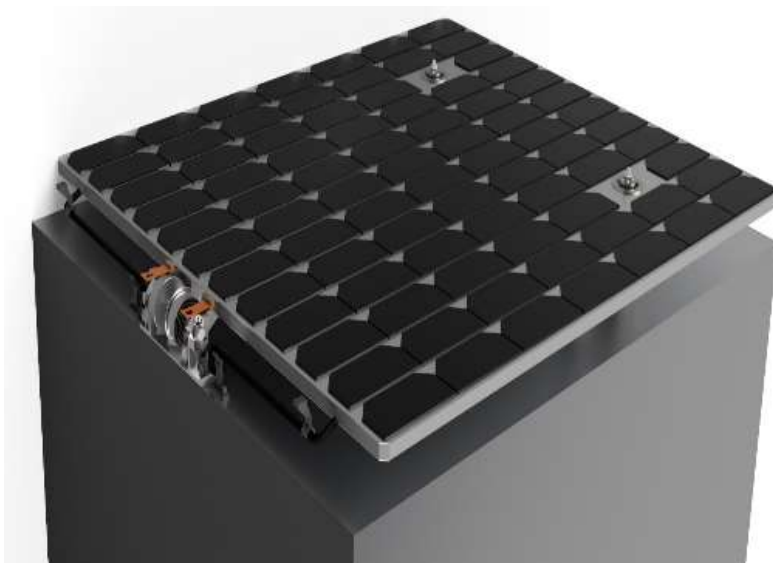
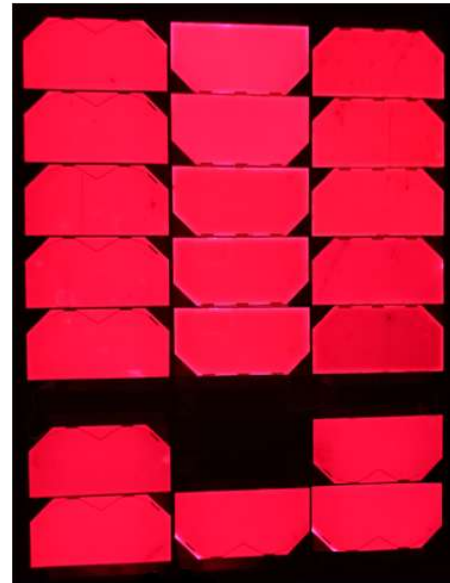


- High reliability electronics
- Power sources
- Sensors
- EGSE
- Clean assembly areas

- **SOLAR ARRAYS - Flexible**
- Range from small to big satellites
 - Cooperation with Thales Alenia Space, France
 - From 2 kW
- NOVACOM II GEO Solar Array
 - 20 m long, 3 m wide, initial power 18kW/wing
 - 5M responsible for development, qualification and supply of complete mechanical subsystem
 - 5M developed and delivered integration and testing GSE for TAS-F
 - 5M is able to supply whole solar array subsystem



- **SOLAR ARRAYS - Rigid**
- Solar Arrays for small satellites
- Deployable and body-mounted
- Power range: 50 - 1000 W
- Various solar cells or module type adaptation (GaAs, Silicone, based on restriction possible suppliers from EU, USA and China)



Radiation shielding

- Qualification of shielding applied to structural panel for JUICE (9/2014-9/2016, Follow up with cooperation on flying HW with ADS)
 - Qualification of shielding technology applied to structural sandwich panel for mission JUICE
 - 5M prime for ESA, Subcontractors: VZLU Prague, TTS Prague

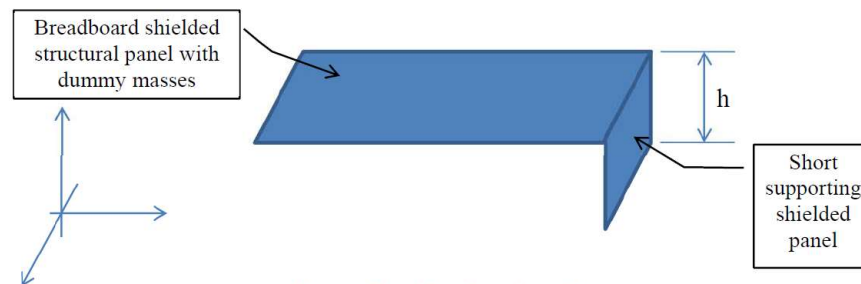
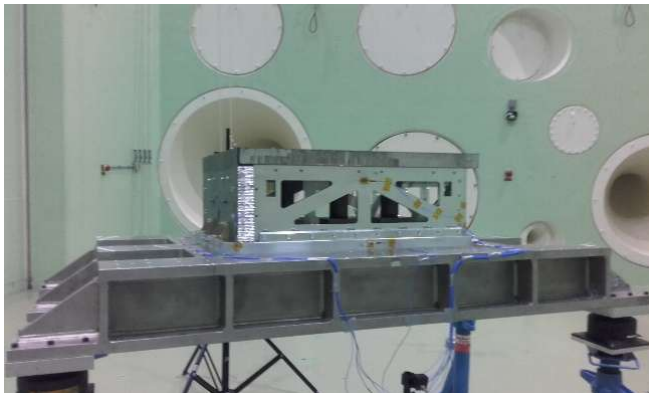
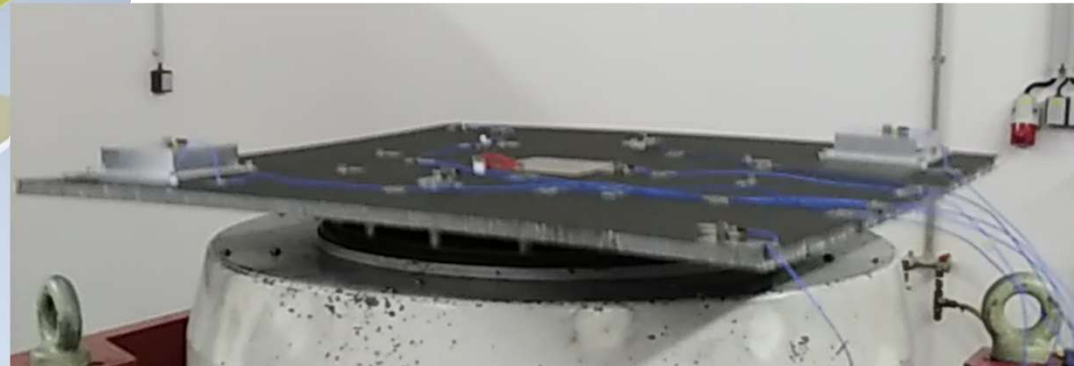
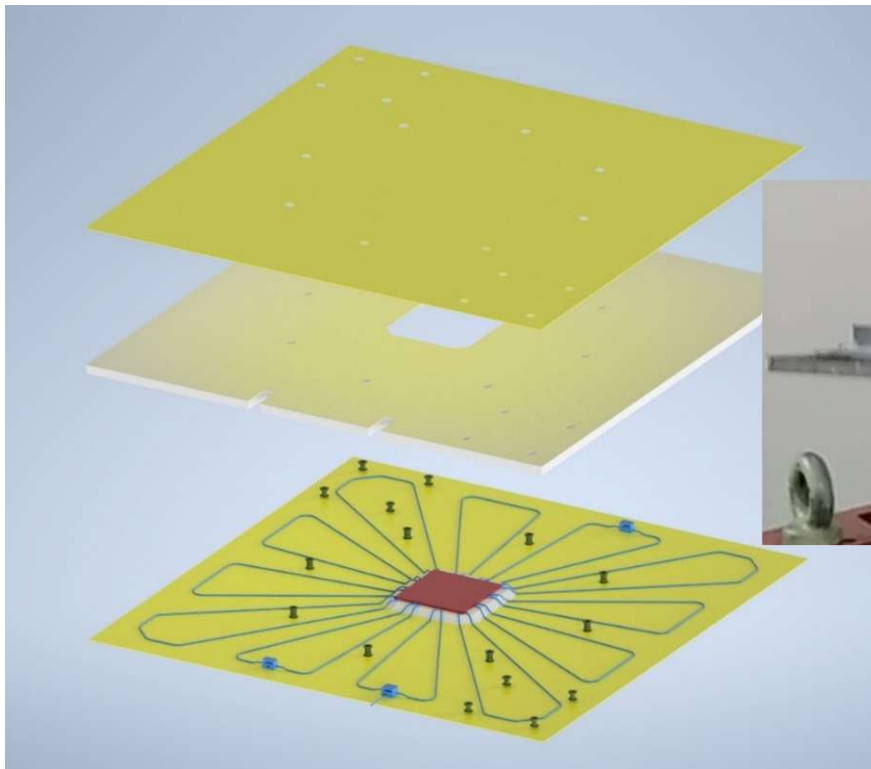


Figure 1. Breadboard configuration

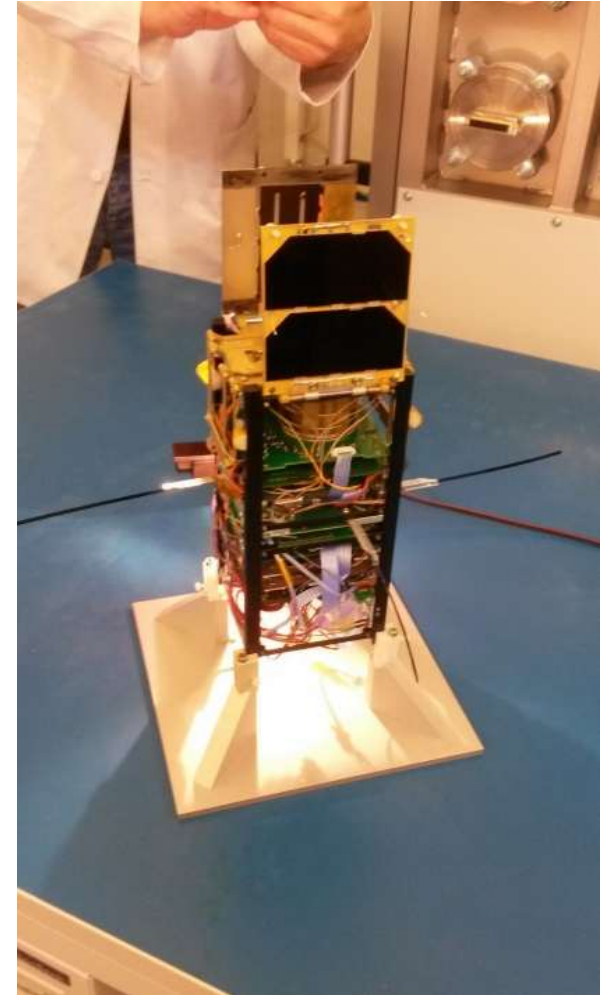


Heat Pipes

- Design, Manufacturing and Qualification of Mechanical Elements for Engineering Model of Pulsating Heat Pipes Panel (9/2019-1/2022)
 - EM manufacturing of CFRP panel with new concept of heat pipes - embedded pulsating heat pipes
 - Prime contractor: Argotec S.r.l. Società Unipersonale

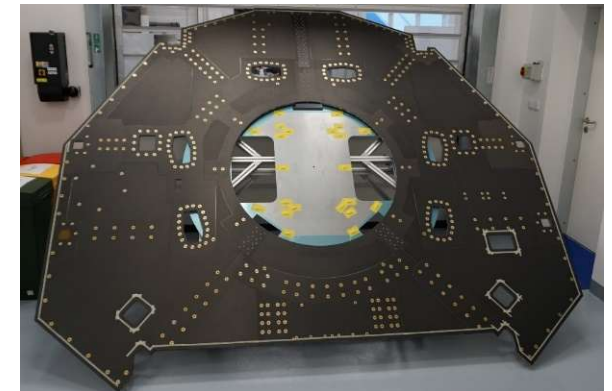
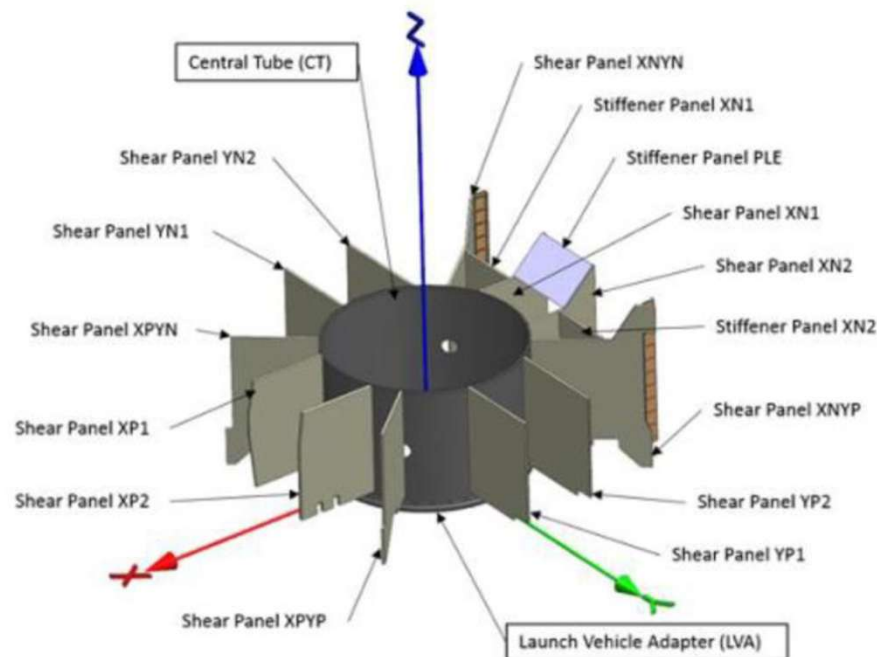


- VZLUSAT 1 (2011-2017)
 - Prime contractor VZLU, Czech Republic
 - www.vzlusat1.cz/en/
 - In operation from 23rd June 2017 on the LEO with the altitude 510 km within the international mission QB50
 - 5M supplied:
 - CFRP foldable and body mounted solar array panels
 - Radiation shielding CFRP panel
 - Health monitoring panel



Structures - sandwiches

- PLATO Service Module (SM) Panels (2020-2023)
 - Qualification of new prepreg for CFRP production process and measurement of allowables
 - SM CFRP panel production and testing
 - 5M prime contractor for ESA



Structures - sandwiches

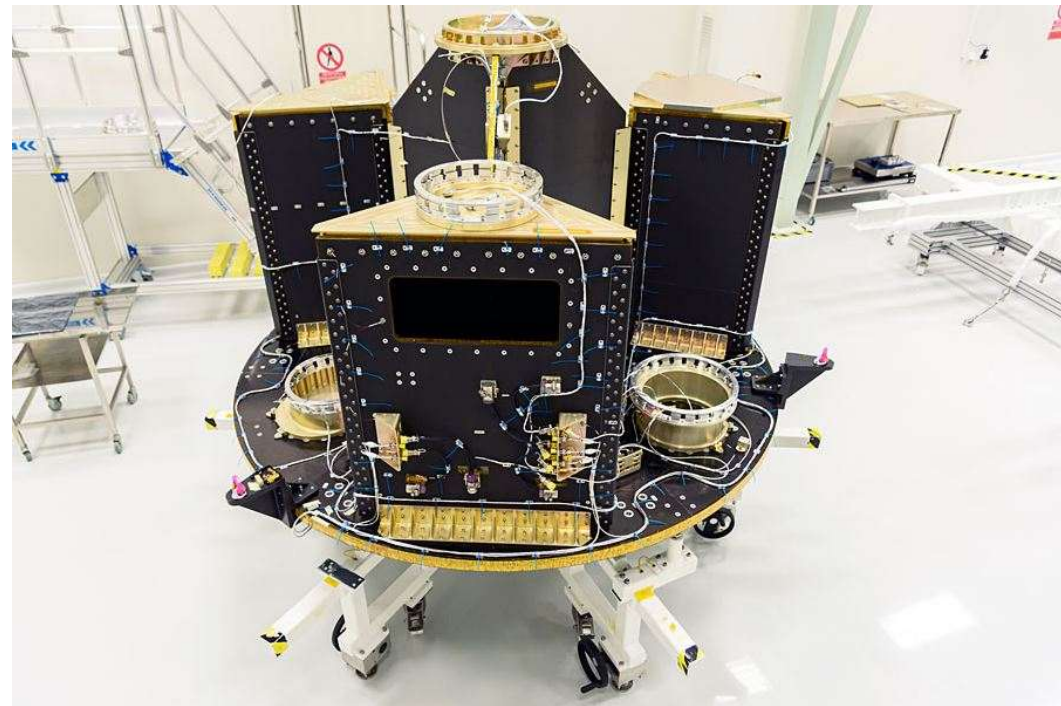
- ROSE-L Secondary Structure Sandwich Panels (from 2023)
 - 5M is sub-contractor for SAB Aerospace and TAS-I
 - Delta qualification campaign
 - CFRP panel production and testing



Structures - sandwiches

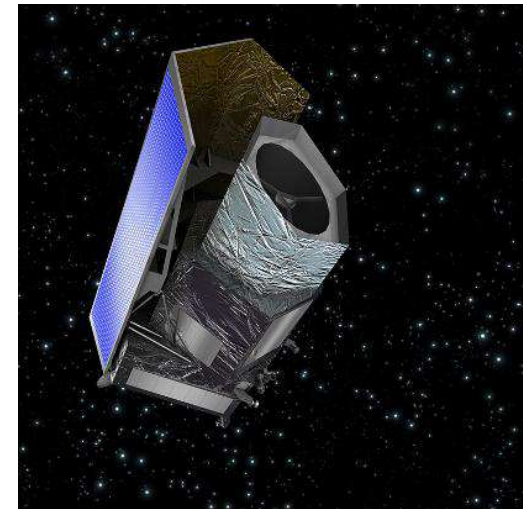
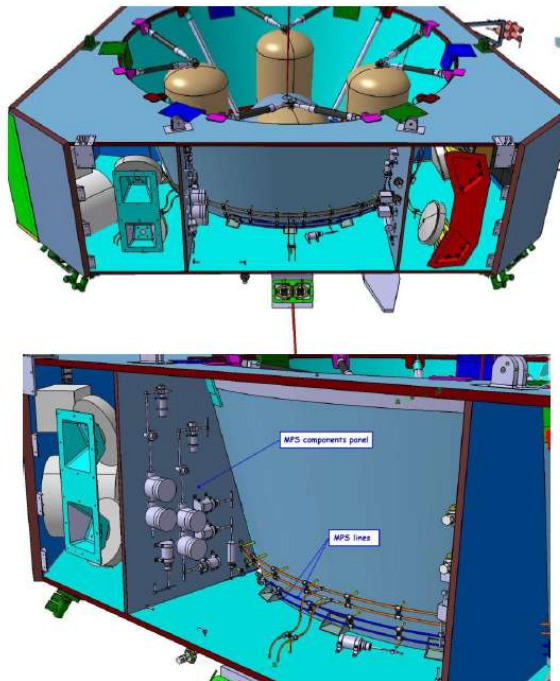
- VEGA Dispenser (from 2015)

- Qualification of 5M CFRP production process for manufacturing of Dispenser structure
- Qualification of Tower Modul
- Preparation for serial production of Dispenser CFRP panels
- Contractor: SAB Aerospace Italy



Structures - sandwiches

- Design, Manufacturing and Qualification of Mechanical Elements for EUCLID (10/2014-9/2016)
 - Qualification of structural sandwich panel for mission EUCLID
 - 5M prime for ESA, Subcontractors: TAS-I, VZLU Prague

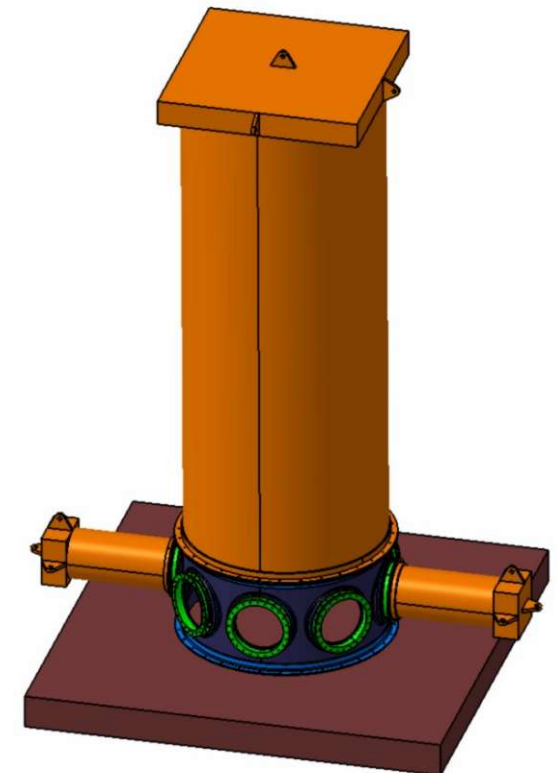


Structures - tubes

- COMPOSITE TECHNOLOGY FOR ARIANE 6 MLS STRUCTURE (9/2023-now)
 - Design, manufacturing and qualification of cylindrical structure for Ariane 6 dispenser (Ariane 6 “Multi-Launch Service”)
 - 5M prime for ESA, Sub-contractors: LK Engineering, VZLU Prague



— Rideshare opportunities for small satellites



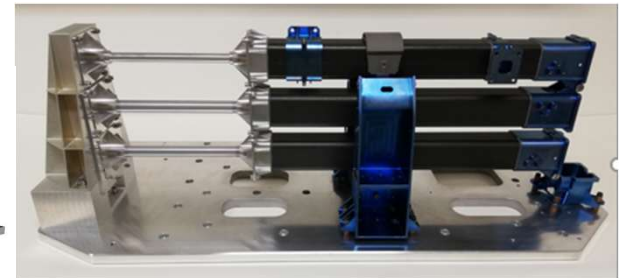
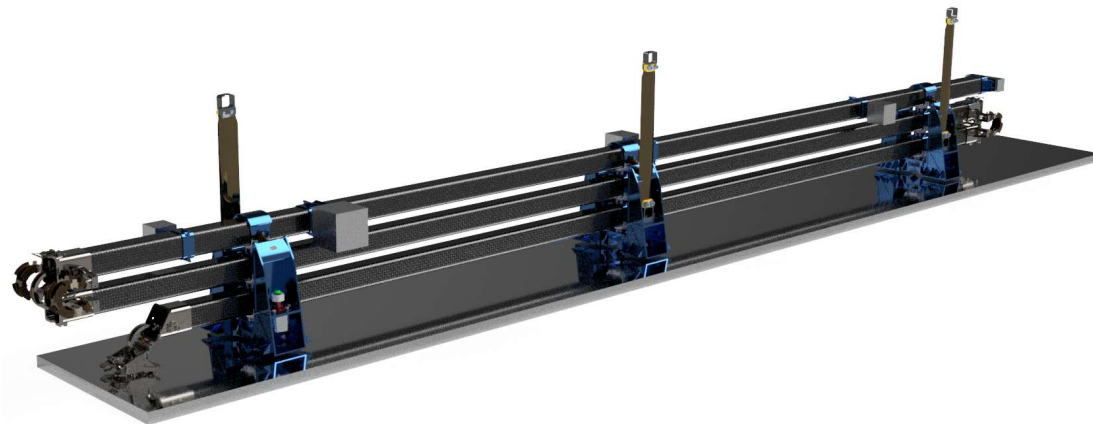
Structures - profiles

- 5M Composite Technology Evaluation (2013-2014)
 - Qualification of 5M composite technology for space applications (Pultrusion, LF Technology)
 - Prime contractor: TAS-F
- Critical Review and Assessment On CFRP and Polymeric Material Usage for Crew Compartments and Manned Transport Systems (2017-2019)
 - 5M role is production and testing CFRP profiles made by pultrusion
 - Prime contractor: TAS-I



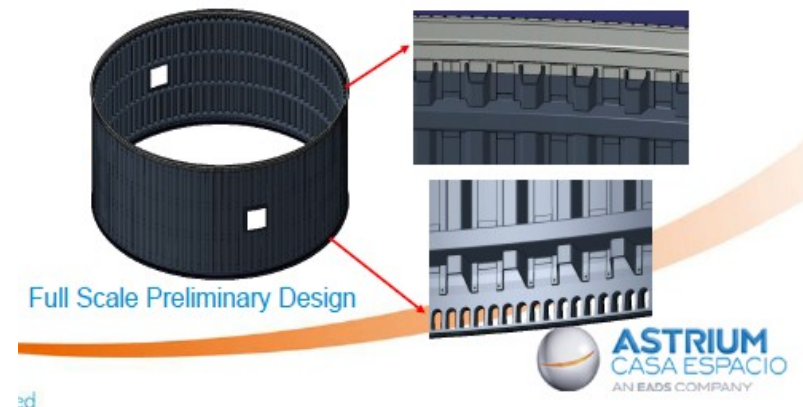
Structures - profiles

- DESIGN AND QUALIFICATION OF MAG BOOM FOR JUICE MAGNETOMETR EXPERIMENT (2015-2021)
 - 5M role is qualification of structural pull-winded profile for Mag Boom at JUICE mission
 - Prime contractor: Frentech, Czech Republic



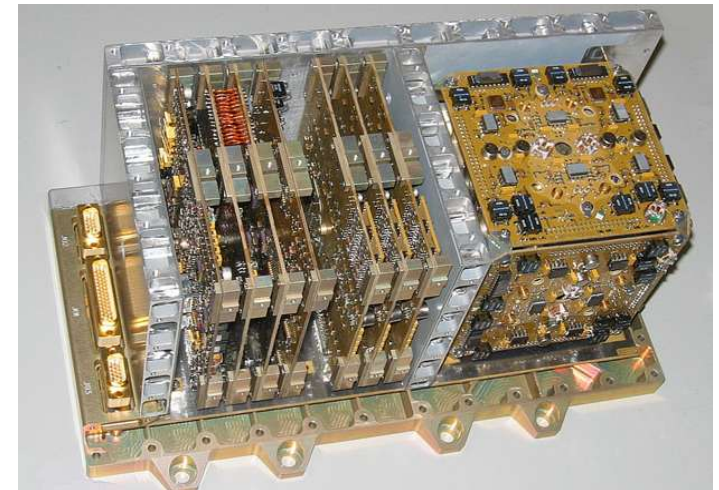
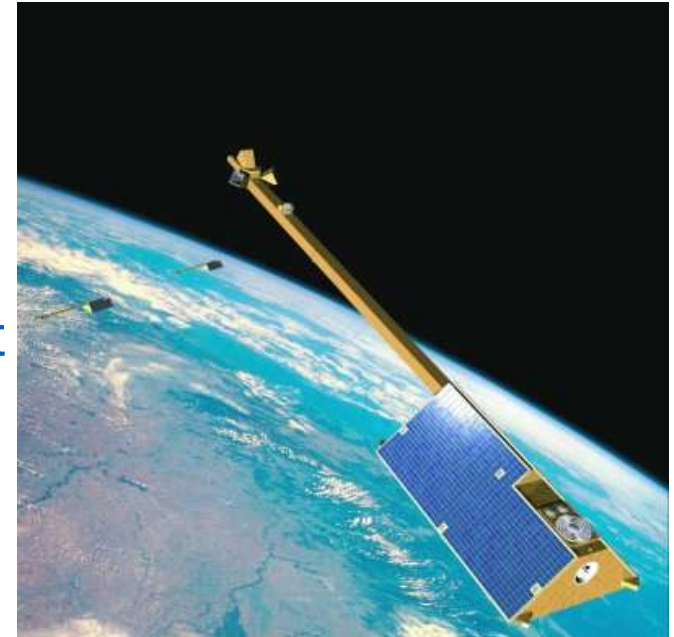
Development of paste adhesives

- Adhesive Bonding of Thermoplastic Composites (2013-2017)
 - Development of adhesive for bonding of PEEK for FLPP (Adhesive Letoxit® PL 84)
 - Prime contractor: EireComposites
- Generic Adhesive for Space Applications (2014-2016)
 - Development of adhesive for non-structural general bonding on satellites (from -150°C to 150°C)
 - Adhesive Letoxit ®LH 317
 - Subcontractor: Airbus DS

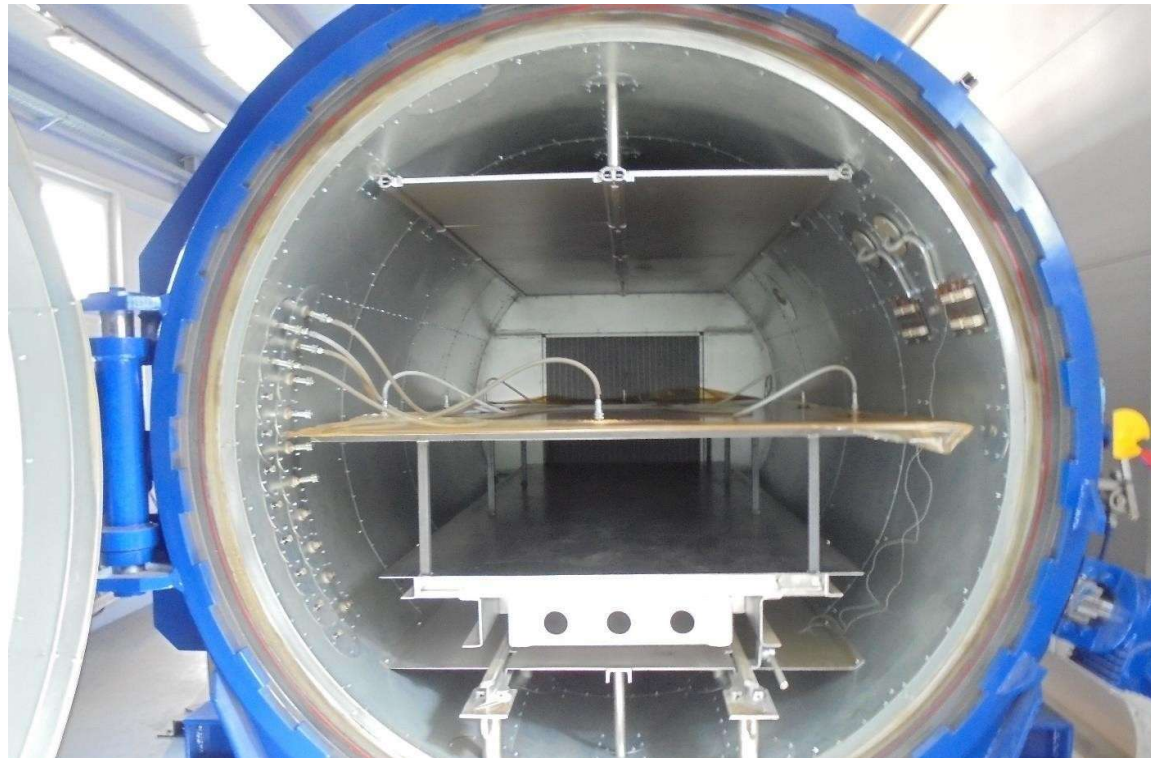


Development of foil adhesives

- Sandwich bonding PLATO
 - Foil Adhesive Letoxit® KFL 120S
- Bonding of Micro accelerometer in MIMOSA
- Airbus DS satellites in SWARM project bonding of micro accelerometer sandwich housing
- Radiation Shielding for JUICE



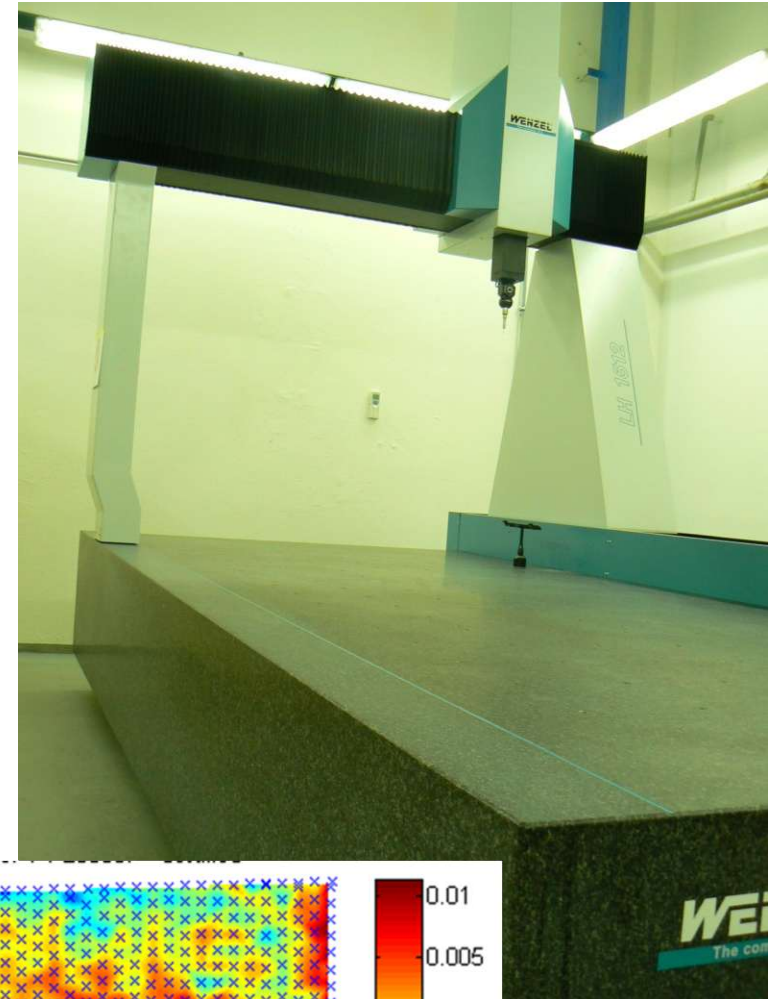
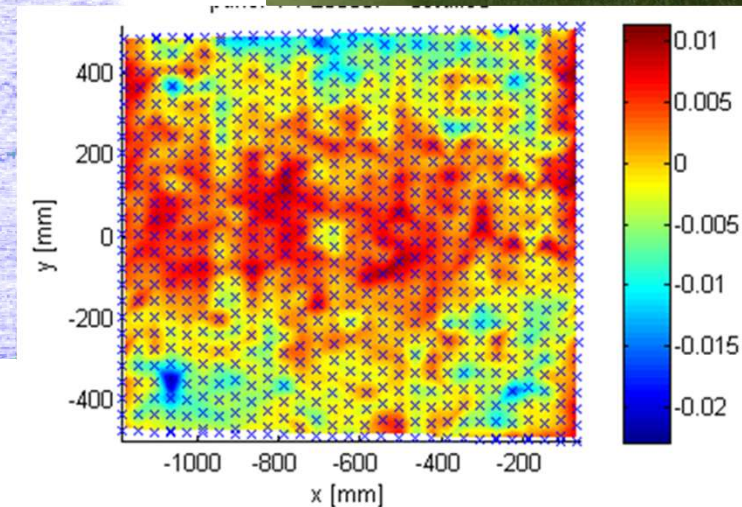
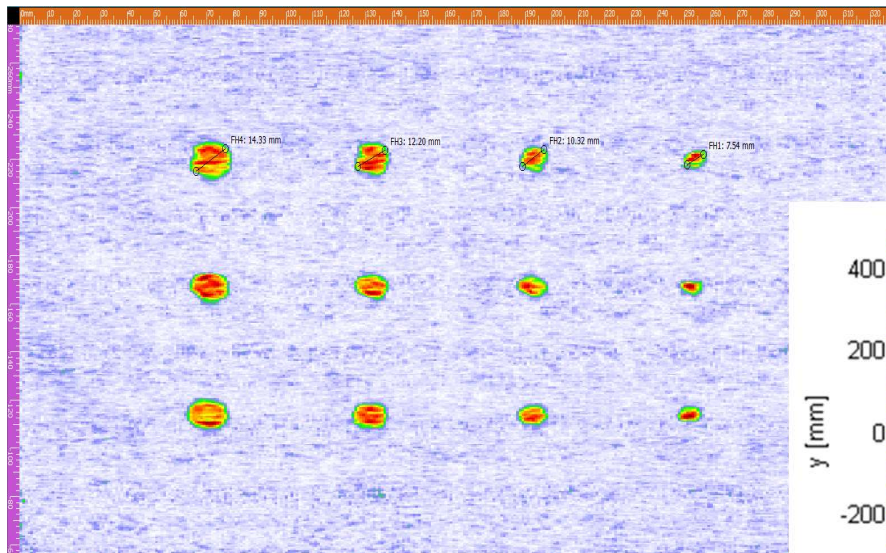
- Production of composites from prepregs cured in press with vacuum assistance
- Autoclave production of composites
- Production of composites with LF Technology
- RTM
- Pultrusion
- Adhesive bonding according to DIN 6701 - Class A1
- CNC and robotic arm machining



- 17.000 m² of working area total
- 3.000 m² of area with control temperature and filtration
- 650 m² clean room ISO 8
- 300 m² labs with control climate
- Autoclave 2.1 m, length 4 m
- 10 pultrusion lines
- 2 heating ovens up to 6 x 3 m
- 3 presses up to 1.7 x 3 m
- 4 CNC Machines, 5 axis, biggest are 6x 2.5m and 8 x 1.8m
- Kuka Robotic Arm



- 100 % input and output quality control
- NDI
 - Ultrasound
 - Thermography
- Precise 3D measuring device
 - 3.5 x 1.5 x 1 m, scanning and measurement mode



- 8% of turnover invested in R&D
- 14% of products younger than 1 year
- National and international cooperation with research institutions and universities
- Analytical laboratory equipped with DSC, DMA, TGA, FTIR, CTE, Rheometry etc.
- Laboratory of mechanical testing
- Testing machines up to 100 kN (-170°C/+250°C)
- 3 TVC chambers from -220°C up to 200°C
- Technology demonstration lab



Industrial applications





COMPOSITE SANDWICHES



ALUMINIUM SANDWICHES



LIGHT STRUCTURES in build to print or build to spec.

Crew Rest Compartment panels

- A350
- Core filler application
- Inserts bonding
- Over size flat panels up to 3000 x 1700 mm
- 3D shapes
- CNC finishing



LIGHT STRUCTURES in build to print or build to spec.

Toilet module panels & Doghouses

- A 380
- A 350
- A 330



LIGHT STRUCTURES in build to print or build to spec.

L 410 NG composite parts

- Exterior
 - nose of the aircraft
 - Side panels
 - gondola covers
- Interior
 - internal panels



LIGHT STRUCTURES in build to print or build to spec.

Other applications

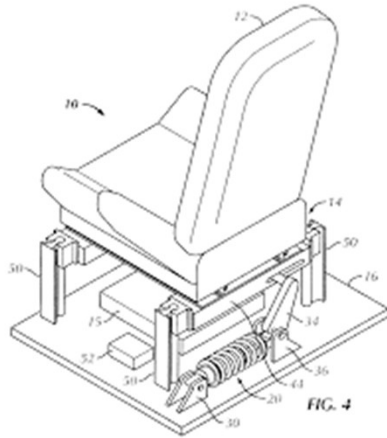
- Train interiors
- Radomes



ALUMINIUM PANELS

Safety crashworthy seats kinetic energy absorbers for EV55

- Also used in L 410 UVP-E20 and L 410 NG

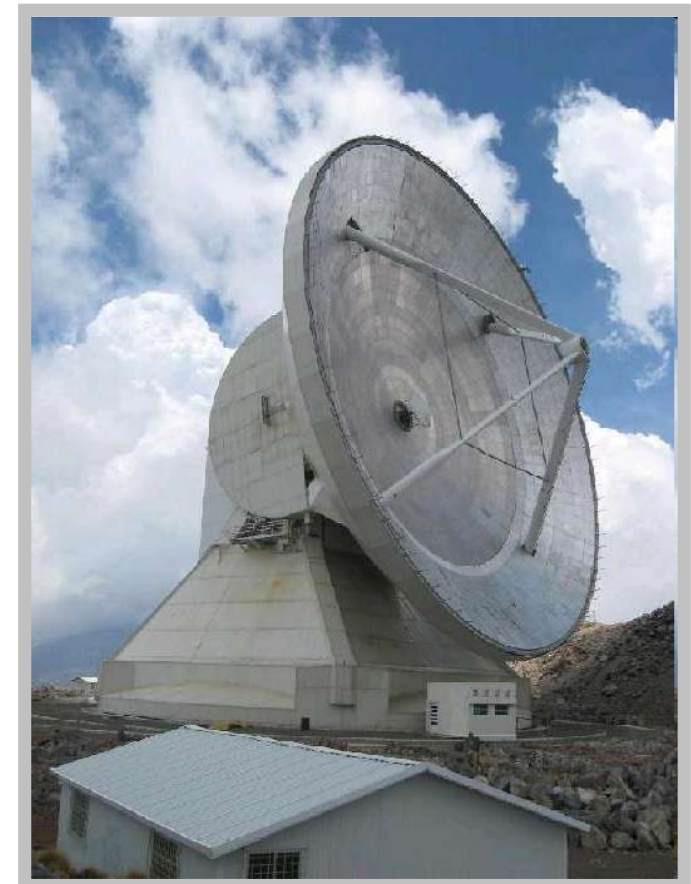


OTHER APPLICATIONS

Primary mirror of LMT radio telescope Alfonso Serrano, Mexico

Habitat for chemically affected environment

- foldable
- easy to transport





- LIGHT STRUCTURE (app. 40 % lighter than plywood)
- great mechanical properties
- NON-FLAMMABLE VERSIONS (FAR 25, DIN 5510-2, EN 45 545)
- substantial stiffness and impact resistance
- customizable
- 3D shapes
- thermal insulation
- waterproof (even in salt water)
- acoustic insulation
- easy to glue



SIEMENS



Pultruded carbon profiles for wing spar

- Special epoxy resin
- Roughened surface for high adhesion
- Available as lamella and squared rod



LEGEND

SUNWARD

hark

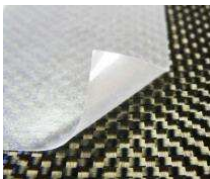




Lamination systems (RTM, infusion, hand lay-up, self-extinguishing, etc.)
Casting systems
Foaming systems 3K, 4K



High strength adhesives 1K (foil or paste), 2K
Adhesives 1K, 2K, sealants



LF Technology - 1K epoxy (fenolic) systems



SEMIPREG = fabric impregnated from one side by foil resin (LF Technology)

EPOXY RESIN SYSTEMS



Over 8 airplanes made of Letoxit® resins certified



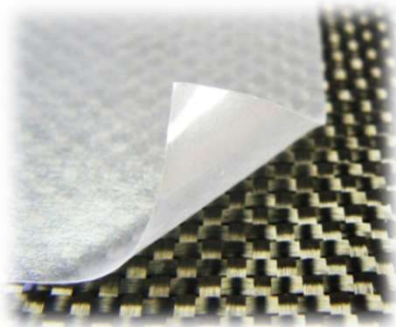
Resin Film Infusion



LETOXIT® LFX is unique resin in the form of flexible epoxy resin foil, which softens at increased temperature and it is able to **impregnate** originally dry reinforcement (glass, carbon fabric) and **cure in one step**.

LFX foils

- Out of autoclave
- Non flammable FAR 23, 25
- Substitutes prepregs with freedom in kind of used fabric
- No hazard vapours
- Very friendly to use

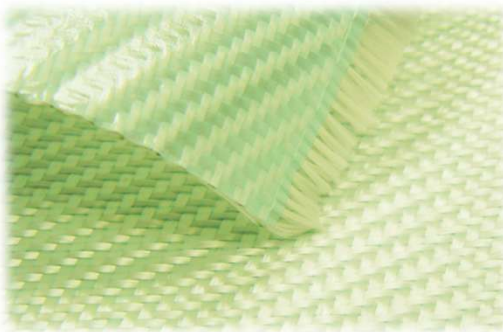


Resin Film Infusion



SEMIPREGS = one-side impregnated fabric

- Flooring & sandwich panels
- Windows side panels



EPOXY ADHESIVES



Structural bonding with Letoxit®

- **Foil adhesives 160 & 360 g/m²**
- **1K adhesives**
- **2K adhesives**
- **Core filler**



CERTIFIED

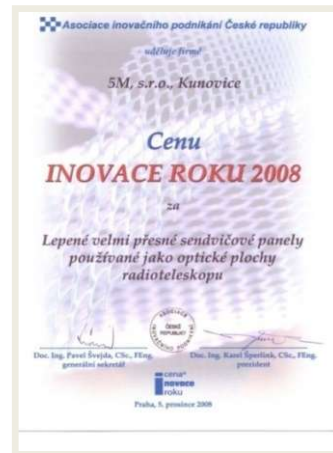
DIN 6701 A1	IRIS (railway industry)	IATF 16949 (automotive)	AS 9100 (copyright Lloyd's RegisterLRQA)	ISO 9001 : 2015	POA PAR 21.G EASA 748/2012 (aviation)
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IMPLEMENTED

CSN EN ISO 14001 (environmental protection)	CSN EN ISO 18001 (safety management)	Approved supplier for ČD	Approved supplier ACR (NATO 49926)
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Innovation of
the Year 2005



Innovation of
the Year 2008



Innovation
company of the
Zlin region 2009



Salon of
Innovations
Silver medal



COMPANY OF THE YEAR 2010 IN THE CZECH
REPUBLIC

5M

REFERENCES

TRANSPORTATION



ŠKODA TRANSPORTATION a.s.

SIEMENS



ŠKODA



HITACHI
Inspire the Next

BOMBARDIER

IVECO



BUS & COACH

AEROSPACE



ThalesAlenia
Space
A Thales / Finmeccanica Company



VODOCHODY



SPORT



OTHER

Internorm



GROZ-BECKERT®



RIETER



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