

TEACHING COMPOSITE MATERIALS USING TECHNOLOGY

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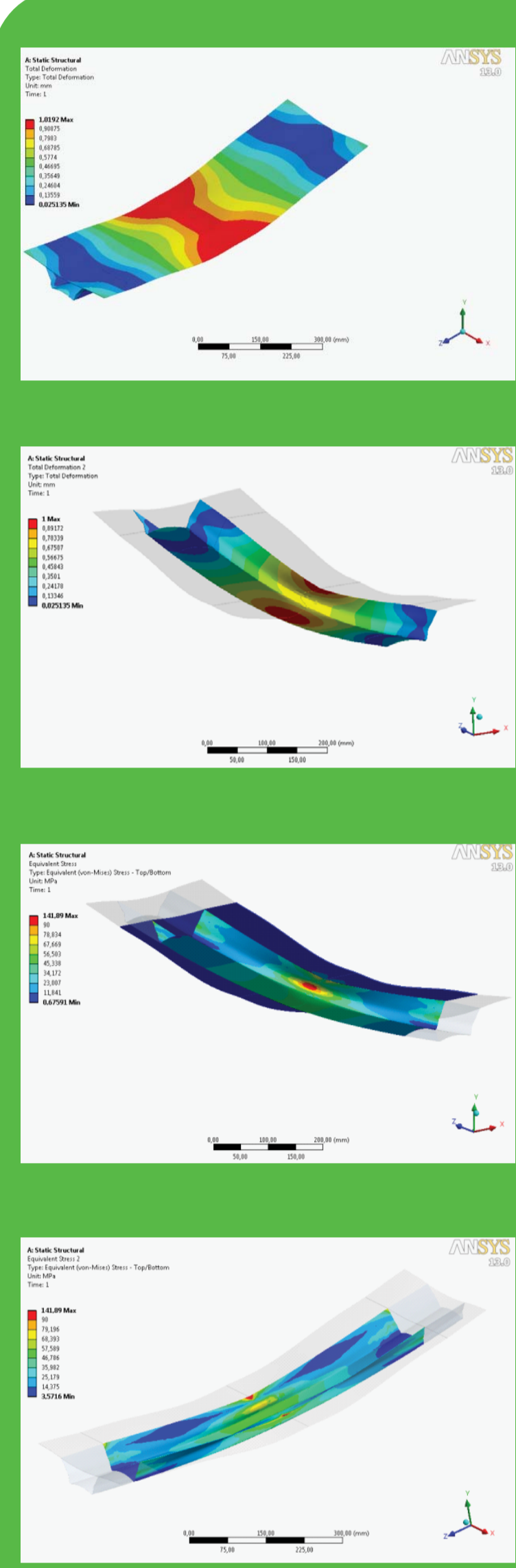
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COMPUTER SIMULATION

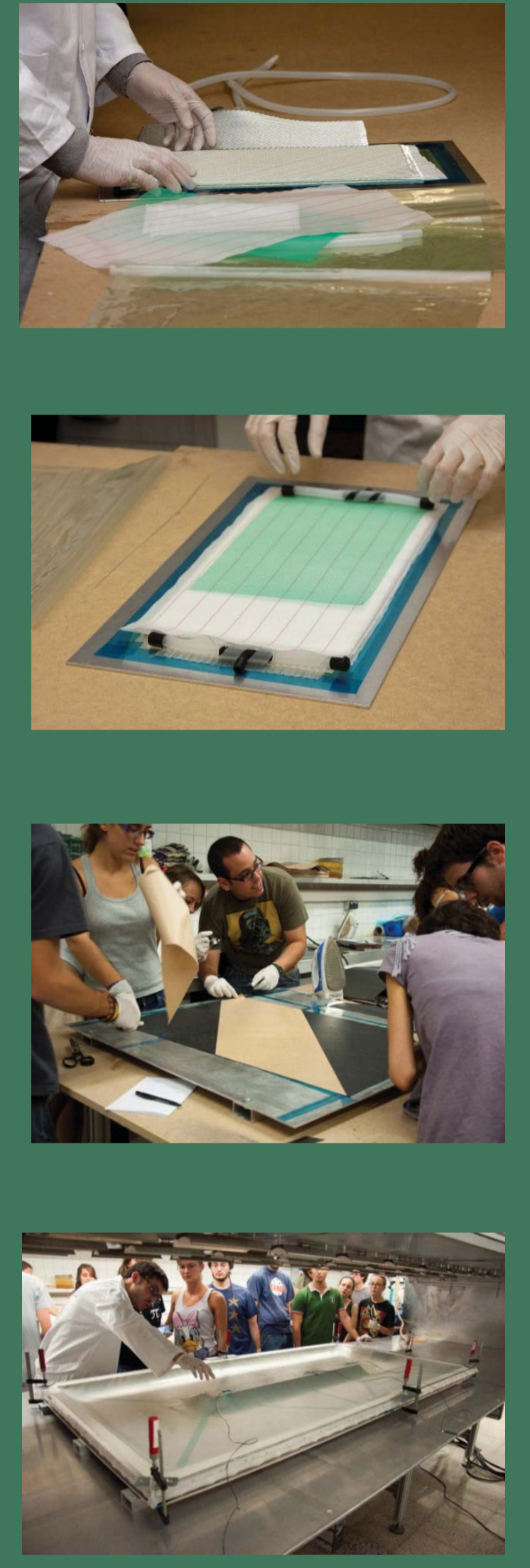


Modelling of stringers of an airplane wing using finite elements (type shell). Analytical calculation of the elastic properties of the composite with micromodelling. Fiber orientation produces orthotropic material properties.

Boundary conditions according real mechanical test.

Manufacturing of a multilayer of glass fibers and epoxy resin. Vacuum infusion process.

Layering and moulding for manufacturing a stringer with pre-pregs. Longitudinal reinforcement.



MATERIAL DESIGN

SIMULATION

ENGINEER
EXPLAIN IT

RAW
MATERIALS

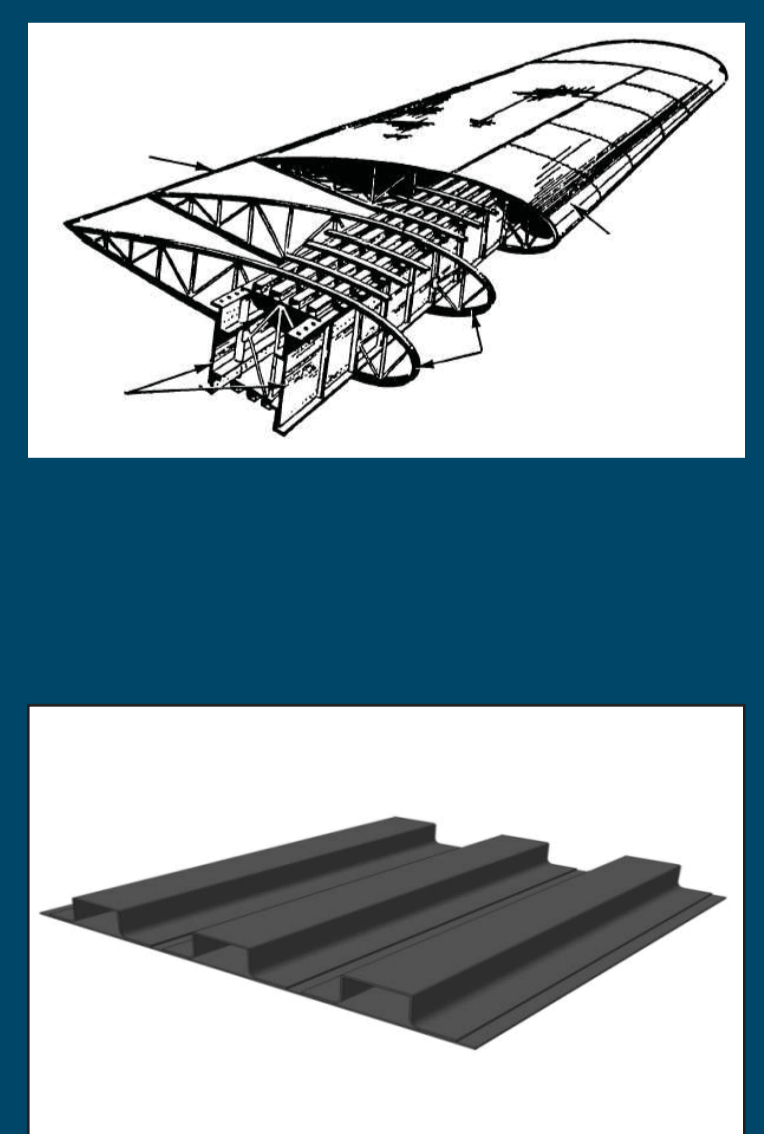
MANUFACTURING

COMPOSITE
MATERIALS
FROM RAW TO MARKET

MECHANICAL
TEST

MOLDING
AND
CURING

ULTRASOUND
NDT



STRUCTURAL DESIGN

EXPERIMENTAL TESTING



The experimental work performs two activities: firstly, a non-destructive inspection with ultrasounds to identify defects and manufacturing damages; secondly, a mechanical destructive three-points bending test.

Non destructive test NDT performs a phase-array 3D scan of the stringer.

Use Mic-Mac software to calculate the structural performance of a stringer of an aircraft component part with composite laminates. Evaluate the stacking sequence, ply properties and failure criteria.

Material	Thickness	Orientation	Modulus E1	Modulus E2	Modulus E3	Poisson's ratio nu12	Poisson's ratio nu13	Poisson's ratio nu23	Strength X	Strength Y	Strength Z	Strength S1	Strength S2	Strength S3
Carbon Fiber	0.125	0	140000	100000	140000	0.2	0.2	0.2	3500	3500	3500	150	150	150
Epoxy Resin	0.005	0	3000	3000	3000	0.3	0.3	0.3	100	100	100	10	10	10