



Seminari Interdisciplinari di Cultura Aeronautica 2017

Le prove di laboratorio Verifica sperimentale delle analisi e feedback sul progetto



PAOLO RUGGIERO
LAB TEST ENGINEER



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The main mission of aeronautical laboratories is the testing of structures , systems and materials to support:

- The aerospace research
- The aircraft development activities
- The aircraft certification activities



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To demonstrate the compliance with design including use of models and critical locations and airworthiness requirements including specific environment condition in the above mission we perform:

Material Tests

Is fundamental the research of material allowables and validation of analytical formula describing their fatica and D.T. behaviour related to specific environmental factors (temperature, humidity) and furthermore to characterise their performance in terms of fire , smoke,toxicity.

Development Test

They are performed mainly on subcomponents to validate the design assumption when non conventional structure, with no much confidence on analytical models and not much experience of flight, have to be used (i.e. buckling and post-buckling of stiffened structure)

Certification Test

These tests are required from the certification normative to convalidate mathematical model used in the theoretical calculation , used material allowables ,and critical locations not theoretically analysed.



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- Material test, both for composite and metallic, mainly Ambient-Burning Mechanical Chemical



- System test mainly Acoustic-Electrical/Electronic- Equipment- Hydraulic&Pneumatic



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•Structural test Static-Fatigue-Vibration-Impact

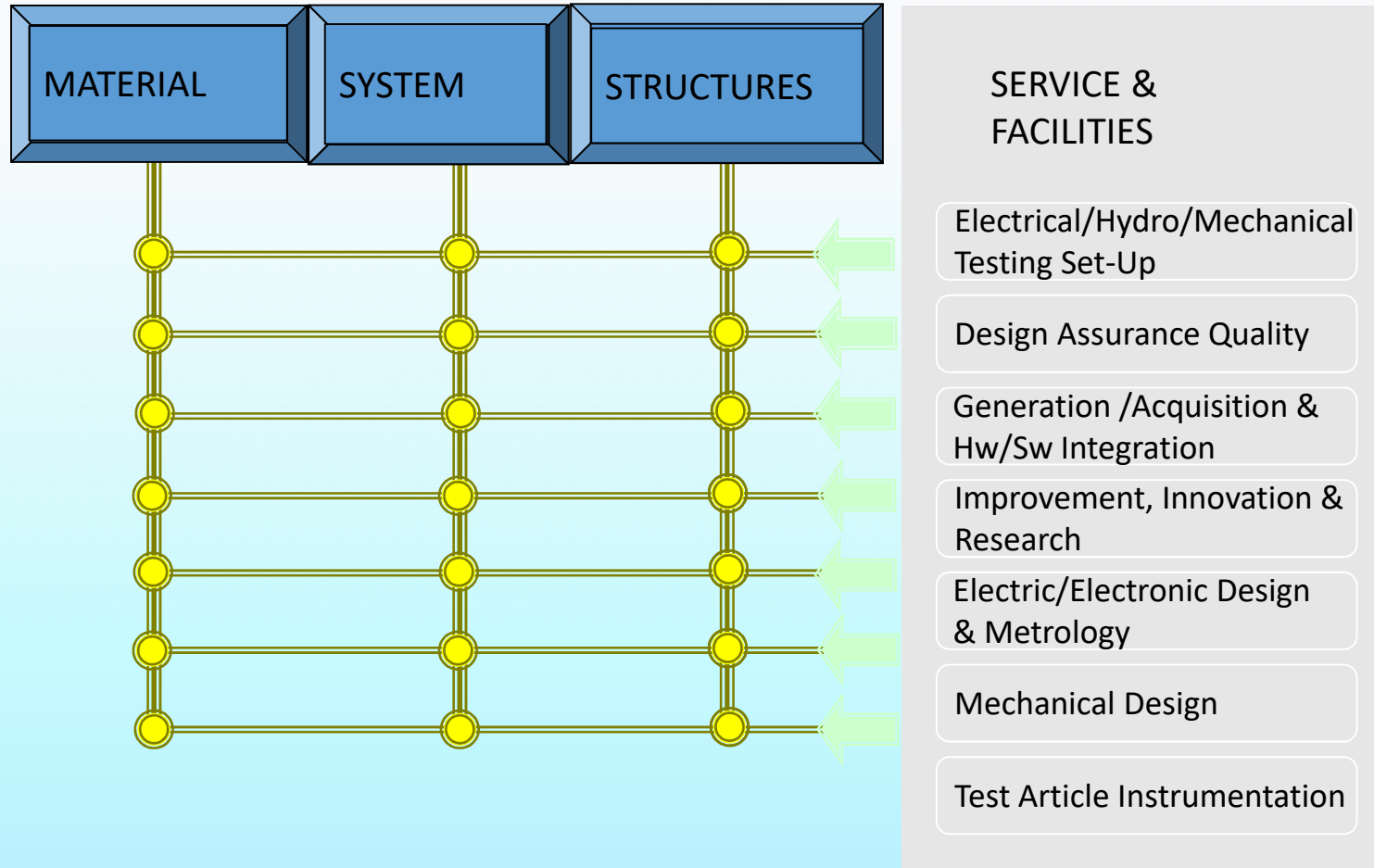


Compression Test



BOX Fatigue Test



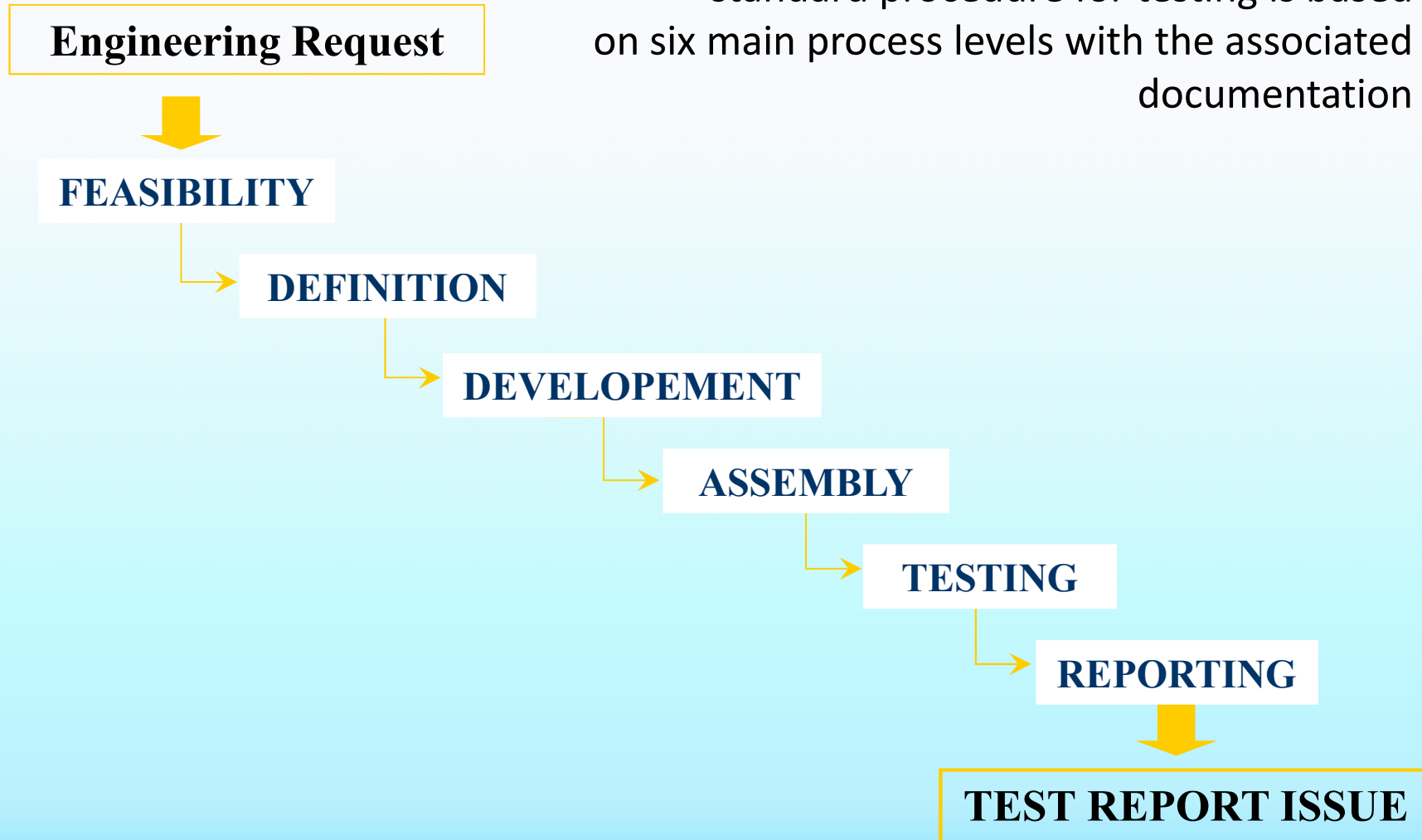


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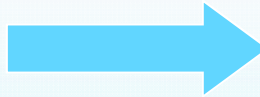
standard procedure for testing is based on six main process levels with the associated documentation





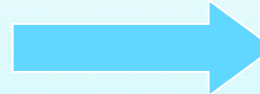
FEASIBILITY PHASE

INPUT



Engineering Request
For Test

OUTPUT



General Lay-out

Requirement
Freezing

Test Schedule

Estimated Cost



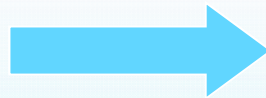
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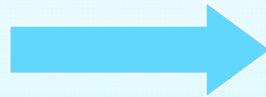
DEFINITION PHASE

INPUT



Official Go-ahead

OUTPUT



Test Set-up Lay-out

Drawing Issue Plan

Test Set-up Inspection Plan

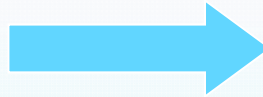
Test Plan And Procedure





DEVELOPMENT PHASE

INPUT



AGREEMENT ON TEST PLAN (Stress,
Authority, Test, Contractor)
INSPECTION PLAN

OUTPUT



TEST SET-UP DRAWINGS ISSUE:
• Test Apparatus
• Loading And Control System
• Data Acquisition System
• Emergency System
• Test Article Instrumentation

Loads Discretization - Software Development –
Issue Of Purchasing Orders - Inspection Method
And Procedure



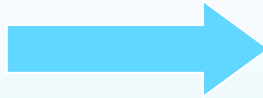
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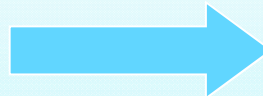
ASSEMBLY PHASE

INPUT



Test Article On Dock
Test Fixture Component &
Equipment On Dock

OUTPUT



Ta Instrumentation Measuring & Test
Equipment Calibration

Test Set-up Assembly, Including:

- Support Structure
- Load Introduction And Control System
- Dummies
- Test Control & Data Acquisition Equipment
- Weight Unloading



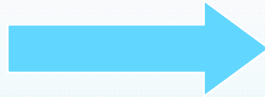
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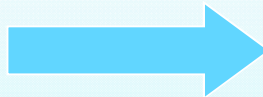
TESTING PHASE

INPUT



Calibration Report
Inspection Report

OUTPUT



Test Execution

Inspection & Ndt

Strain Gage Survey

Data Acquisition



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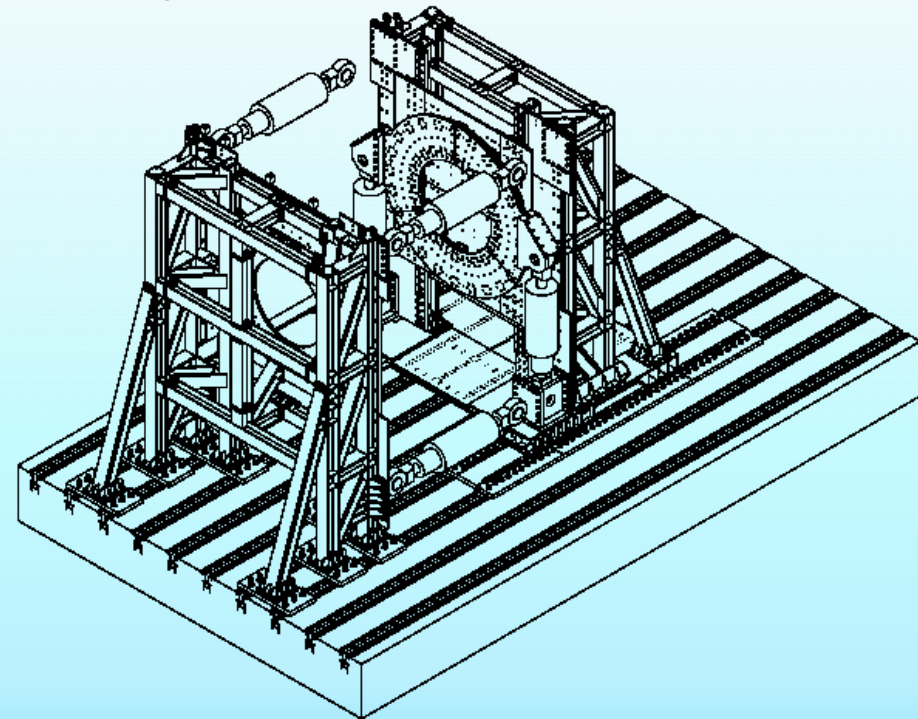


“Large Panel Test”

EXTERNAL MACHINERY FEATURES

- Compression and Tension up to 4500 kN (1012 KIPS);
- Torque up to 6000 kN*m (53.1 MIPSIN)

- length 7.5 m max (25 ft)
- width 5 m (20 ft)
- height 6.5 m (21 ft)
- weight 60 metric tons
(66 short tons)



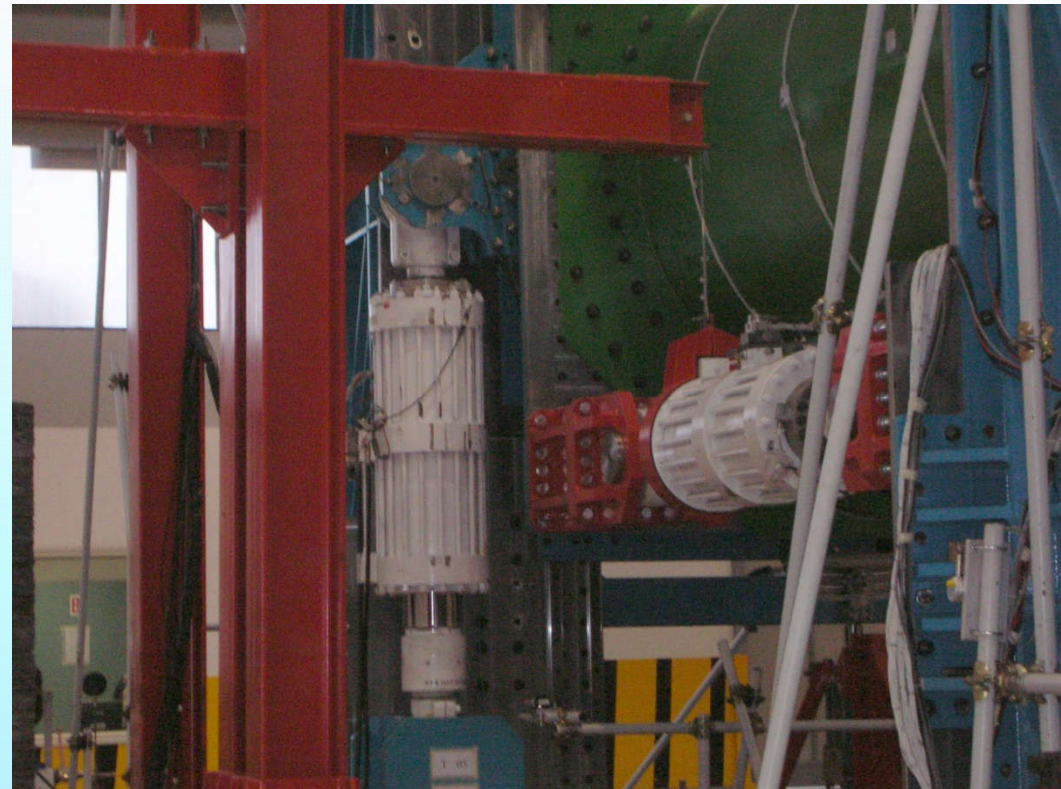
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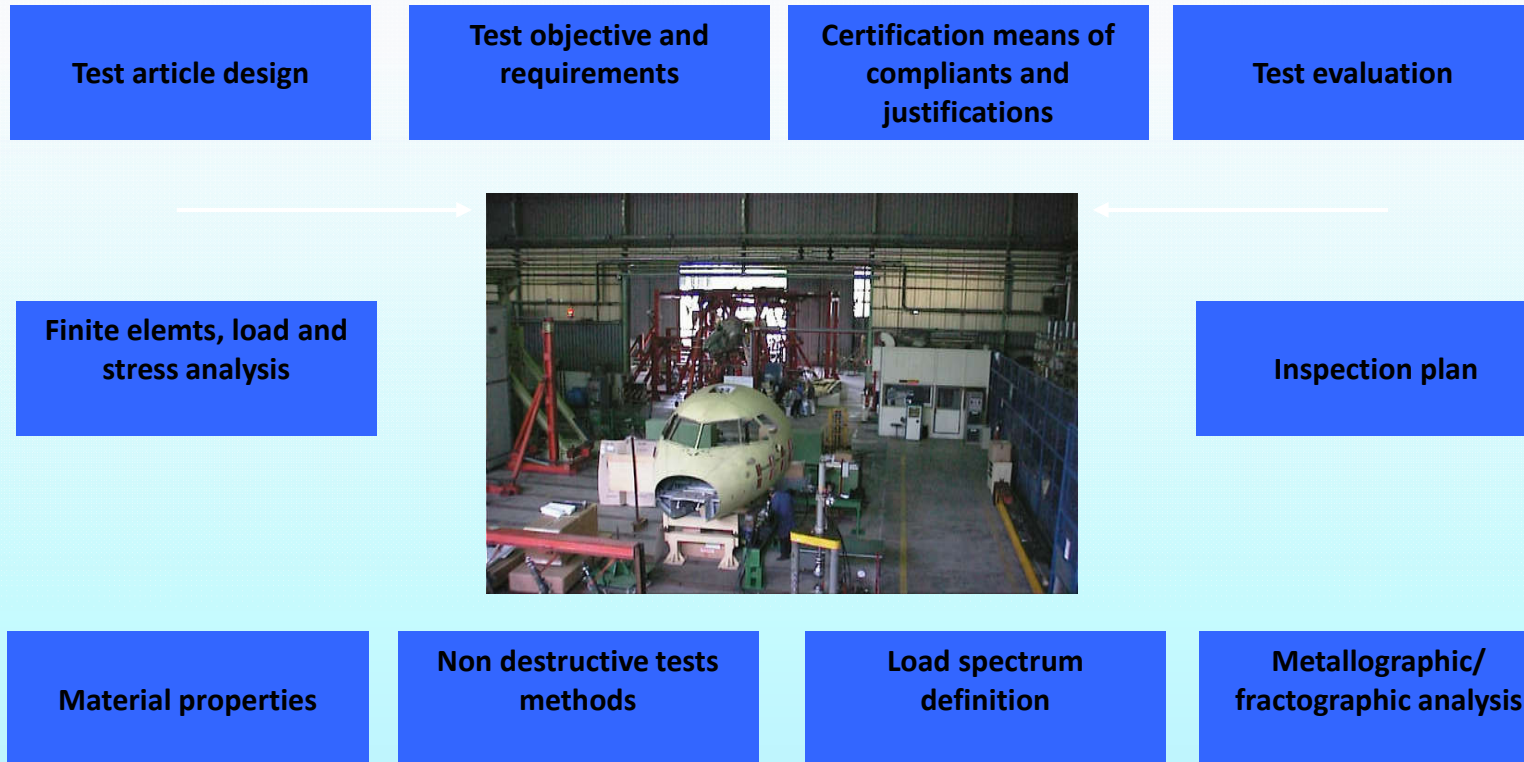
"Large Panel Test"

EXTERNAL MACHINERY



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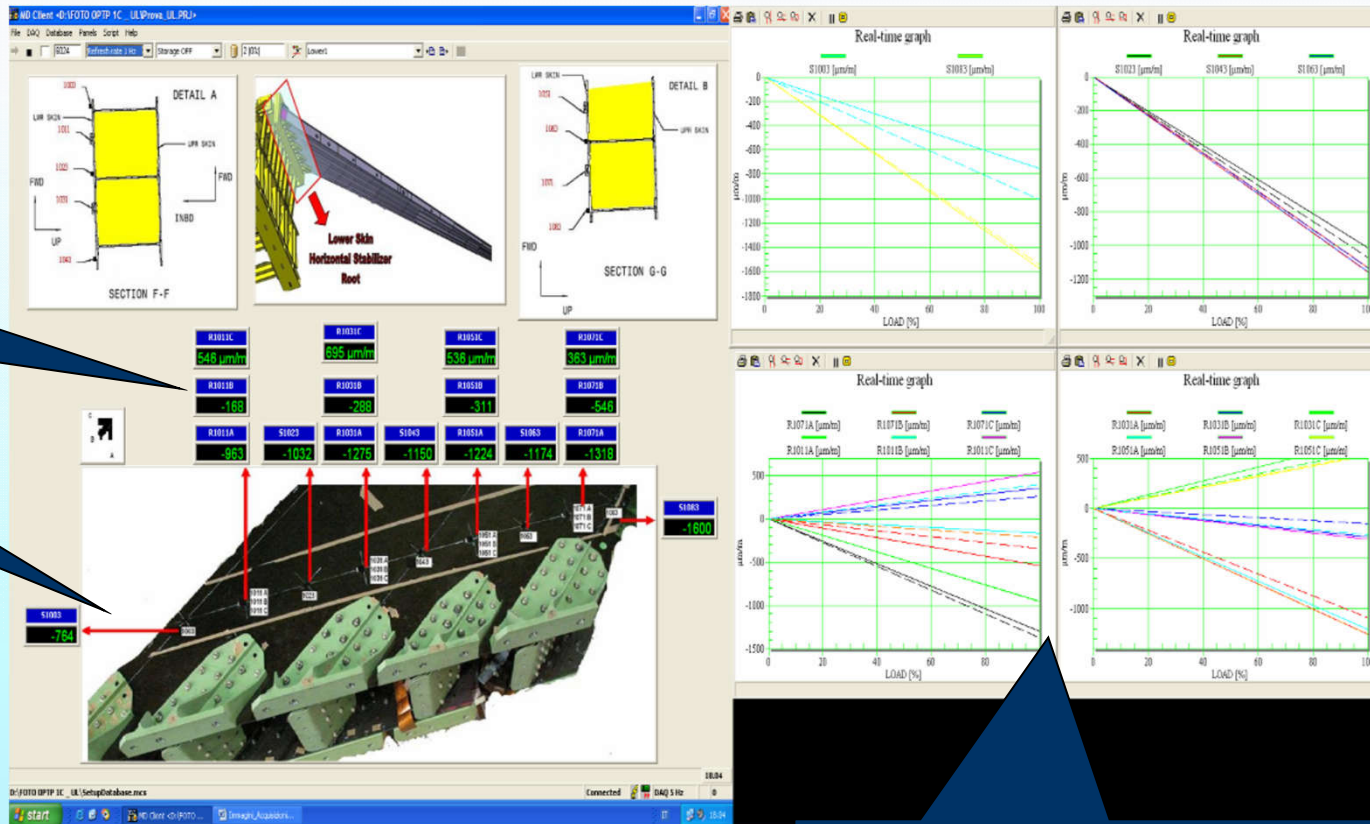




Acquisition System "Typical screen view"

Real Time Values

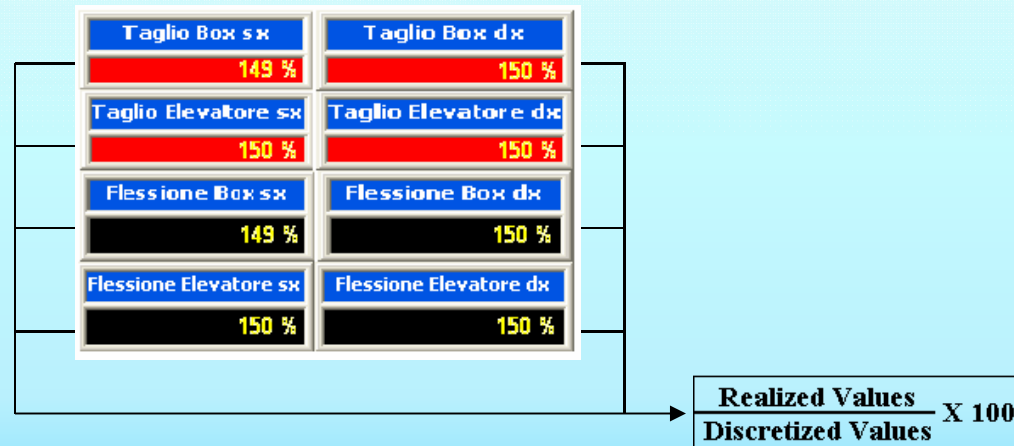
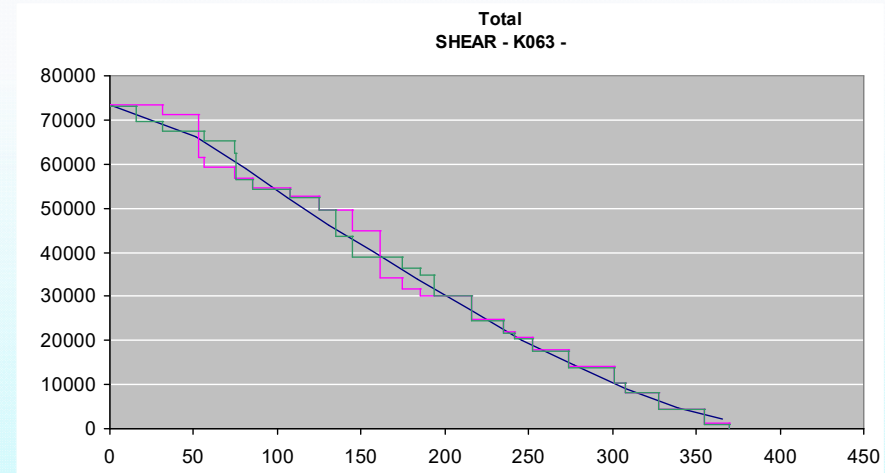
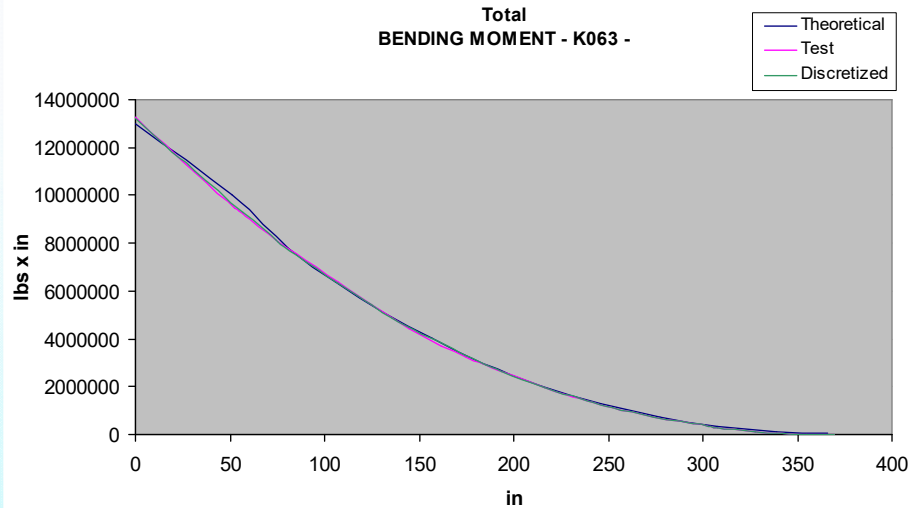
S/G Map



GRAPHS "Real Time Values Vs Predicted stress values"



Acquisition System "Shear and Bending"





REMARKABLE PROGRESS IN THE LAST YEARS IN THE TEST FIELD:

- RELIABILITY AND PRECISION OF DATA (i.e. spectrum of load similar to the reality)
- ACQUIRE AND TO ANALYZE REAL TIME A MASSIVE STRUCTURE OF DATA MORE AND MORE ELEVATED
- REDUCTION OF THE TIMES OF EXECUTION OF THE FATIGUE TEST.



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