AERONAUTICS DAYS 2006

Aircraft Reliability Through Intelligent Materials Application

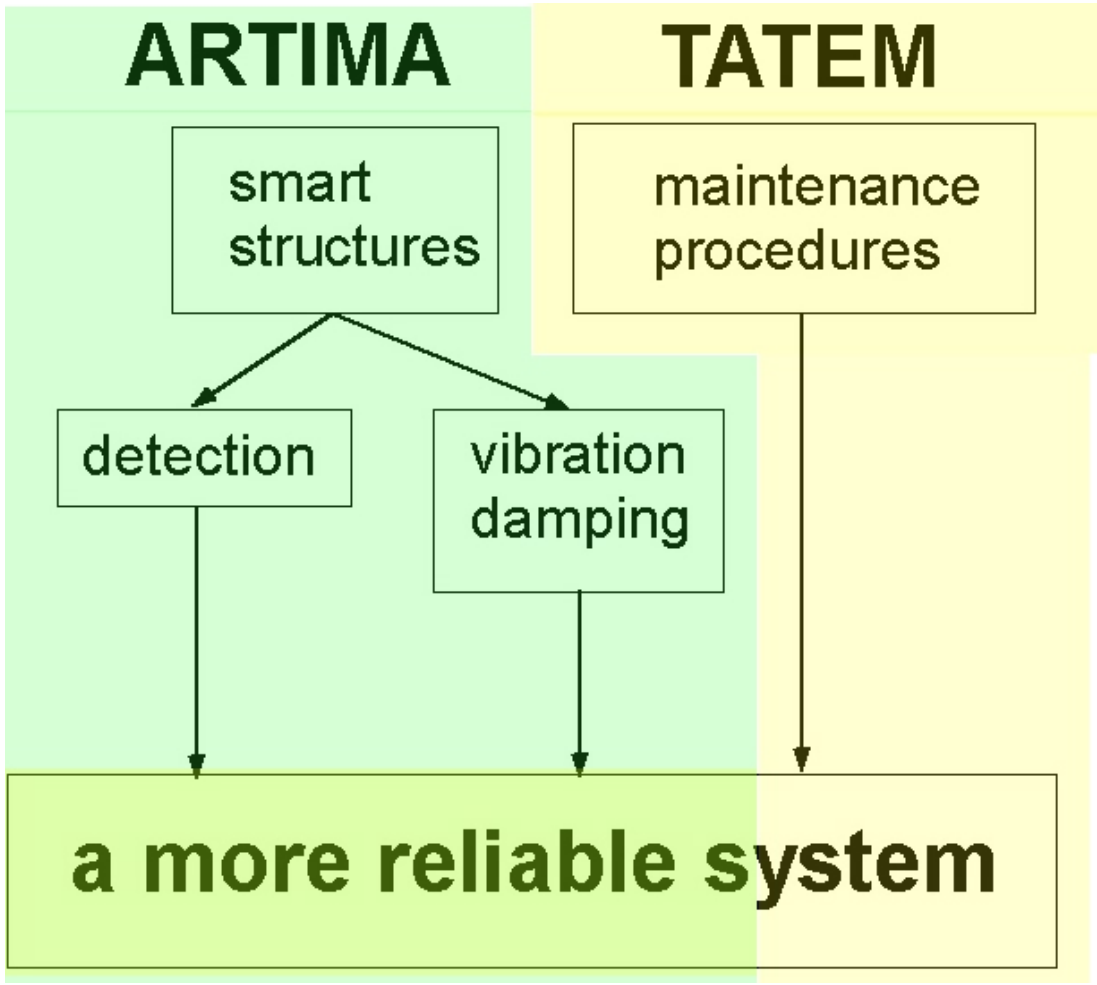
Gregorio Kawiecki

Gamesa Desarrollos Aeronáuticos

OUTLINE

- Project motivation
- Project organization
- Work thrusts
- Conclusions

MOTIVATION


ARTIMA
TATEM
smart structures
maintenance procedures
detection
vibration damping
a more reliable system

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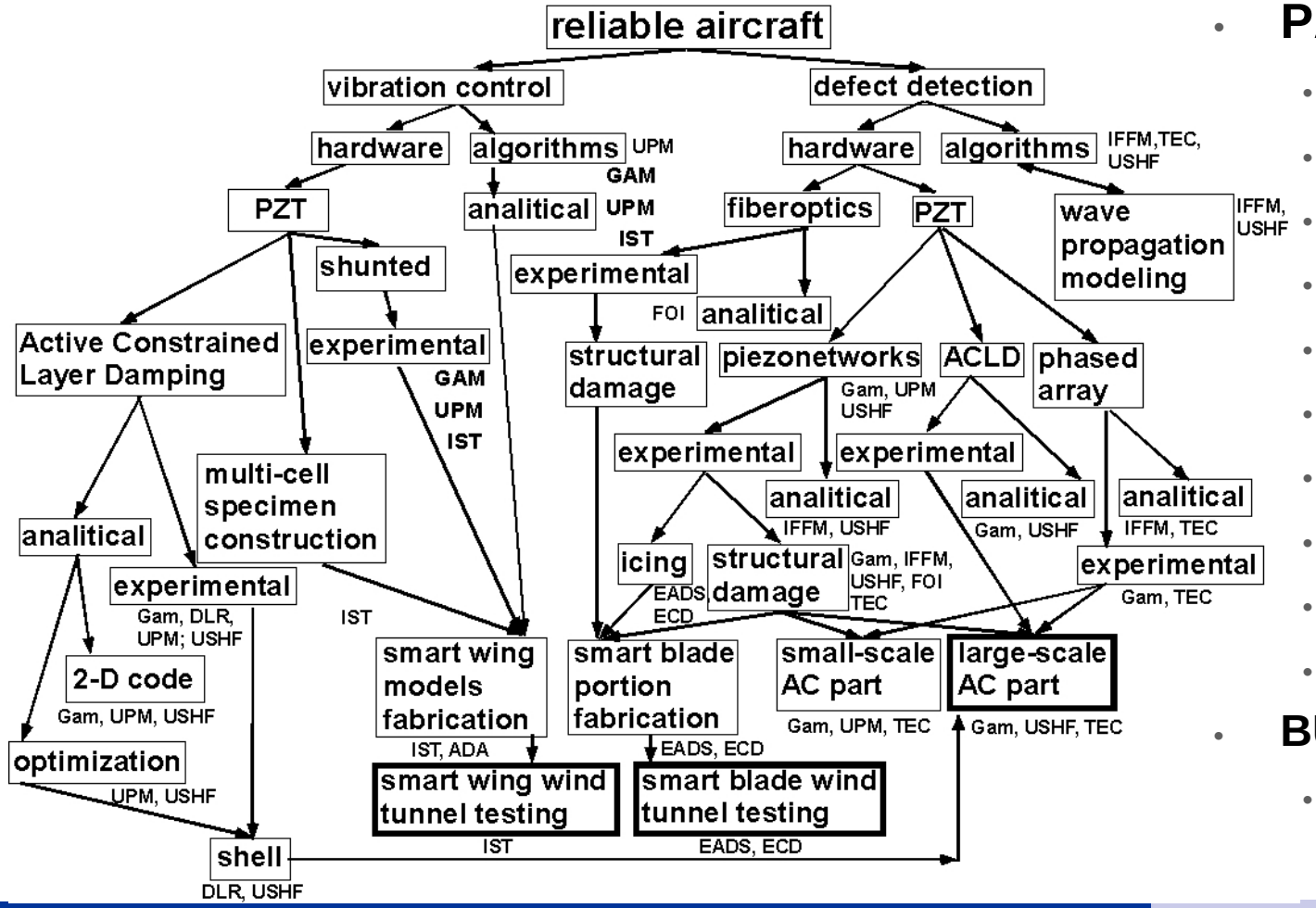
ORGANIZATION



- **PARTNERS:**
  - **GAM (E)**
  - **DLR (D)**
  - **EADS (D)**
  - **ECD (D)**
  - **FOI (S)**
  - **IFFM (PL)**
  - **IST (P)**
  - **TEC (E)**
  - **UPM (E)**
  - **USHF (UK)**
- **BUDGET:**
  - **5 *10^6 euro**

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THRUSTS

- **Vibration control**
  - **Piezoviscoelastic treatments**
  - **Pressure/icing sensors**
  - **Smart spars**
- **Damage detection**
  - **Arrays of piezotransducers/phased arrays**

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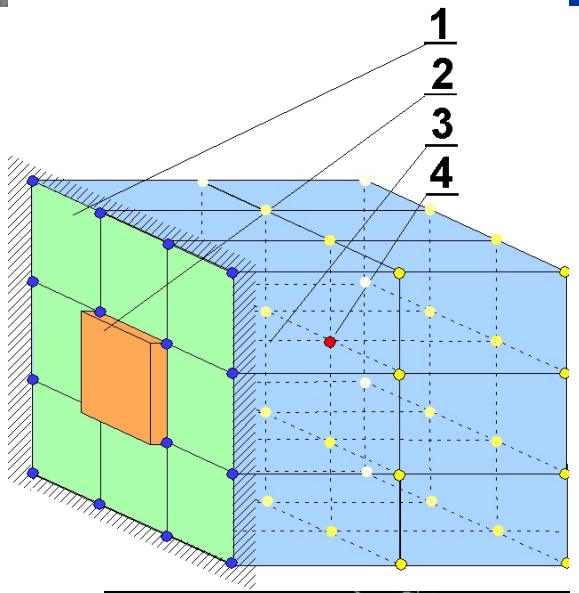
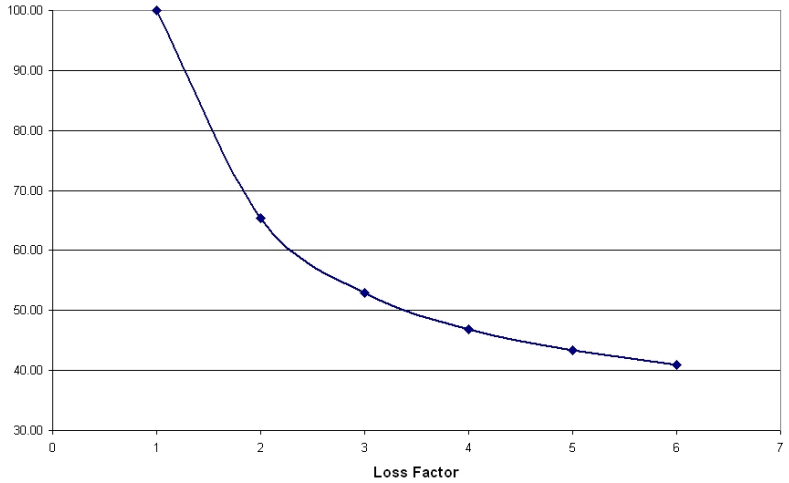
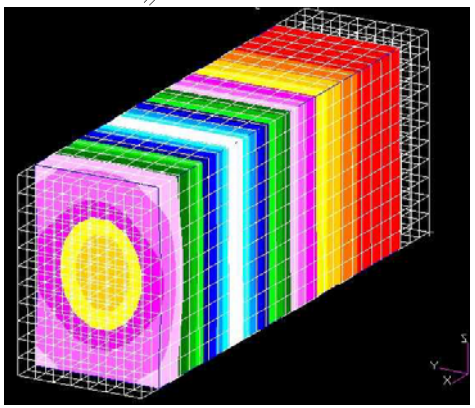
VIBRATION CONTROL

MODELING

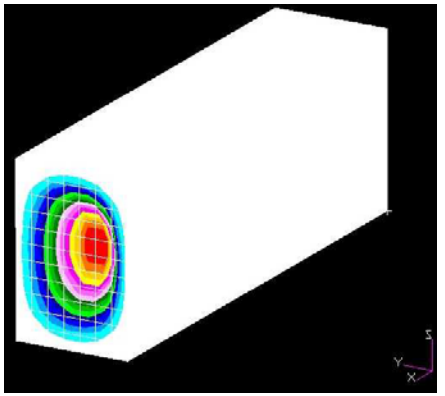






mode 1

cavity ⟷ plate



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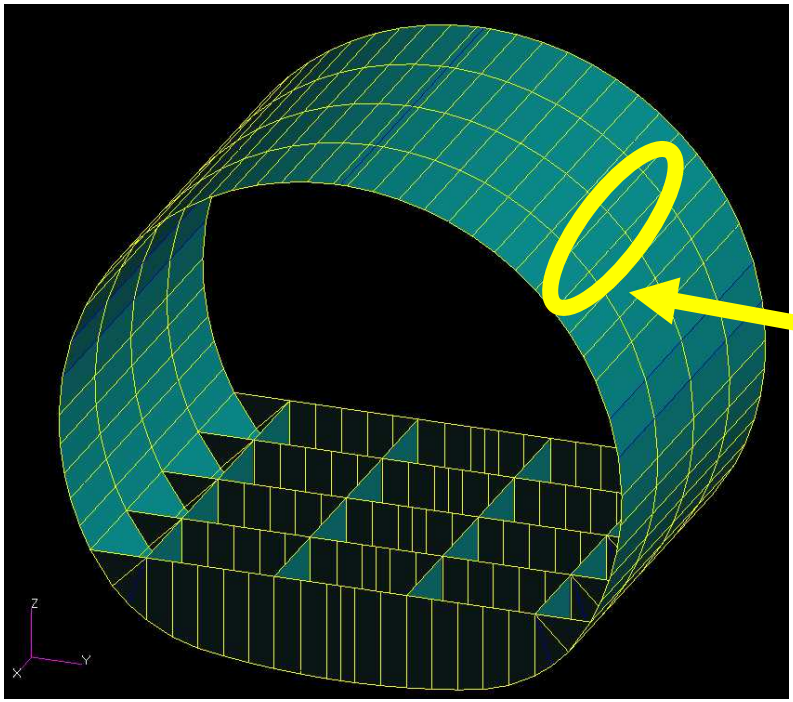
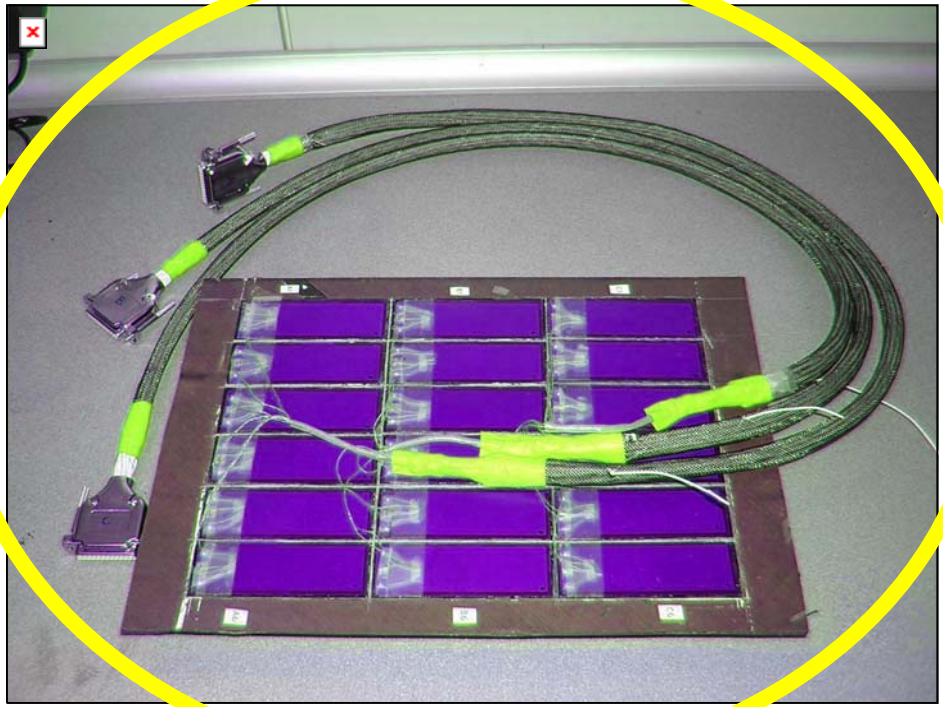
VIBRATION CONTROL

APPLICATIONS





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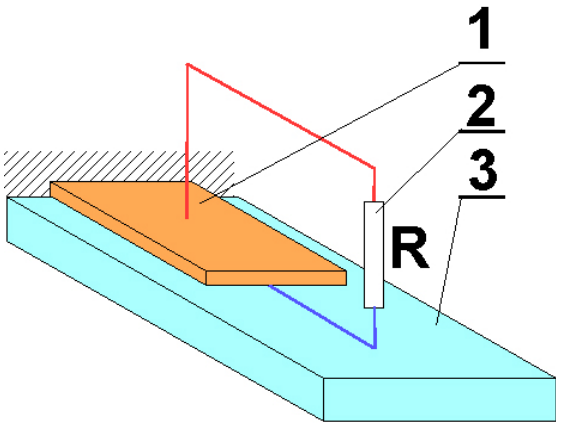
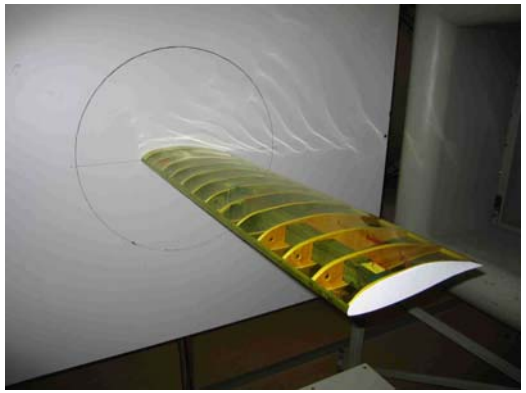
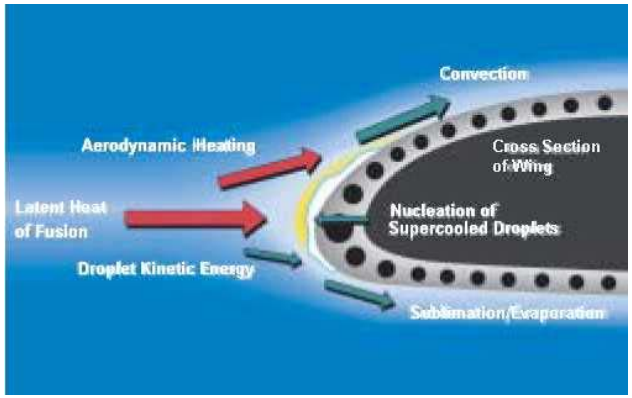
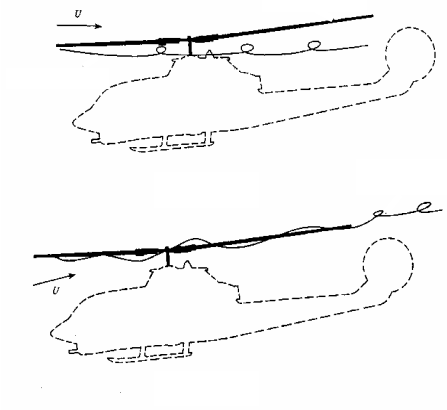
VIBRATION CONTROL

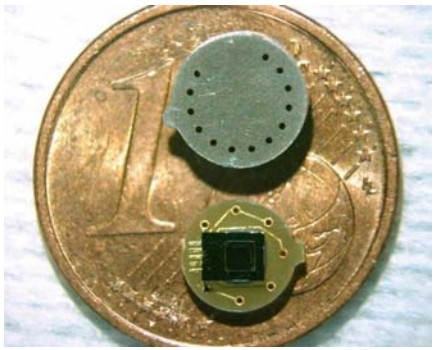
APPLICATIONS











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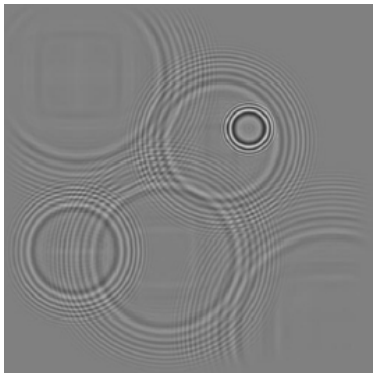
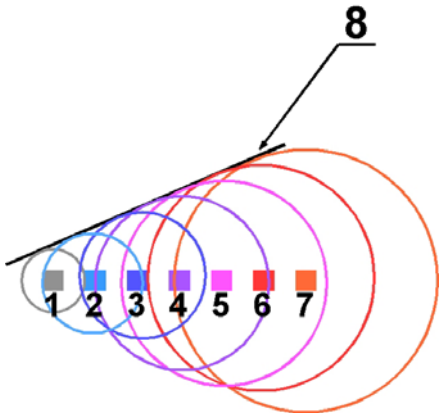
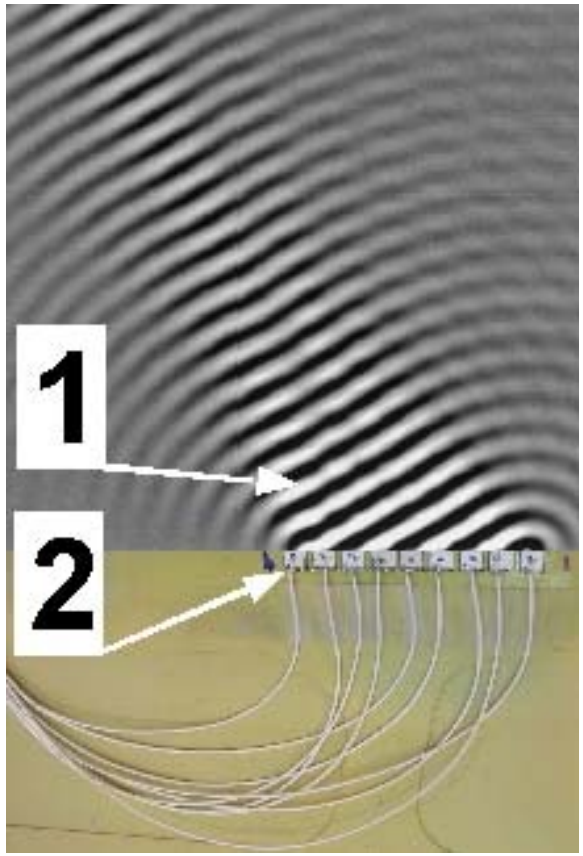
DAMAGE DETECTION

PHASED ARRAY: APPROACH

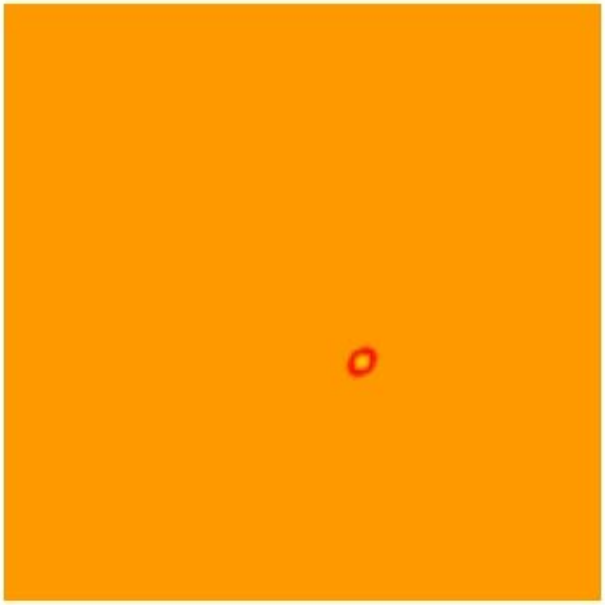




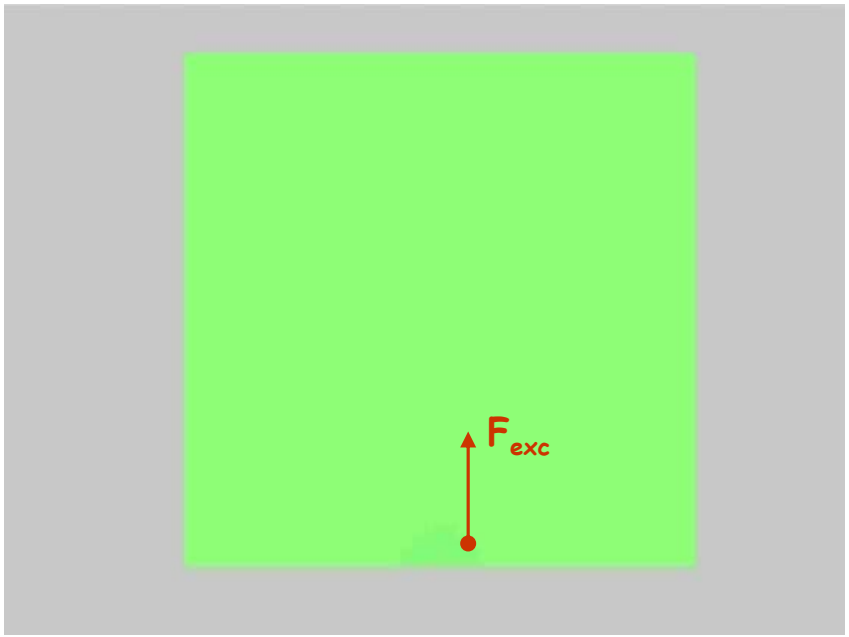


DAMAGE DETECTION

MODELING



Graphite/epoxy
composite plate $[45]_1$, vol=0.3



Isotropic panel with a crack
and horizontal stiffener

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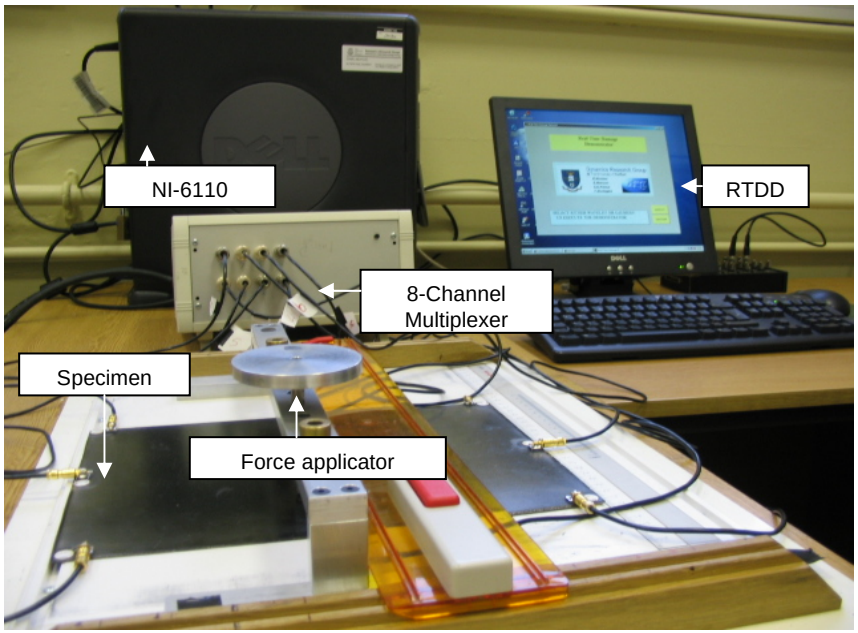
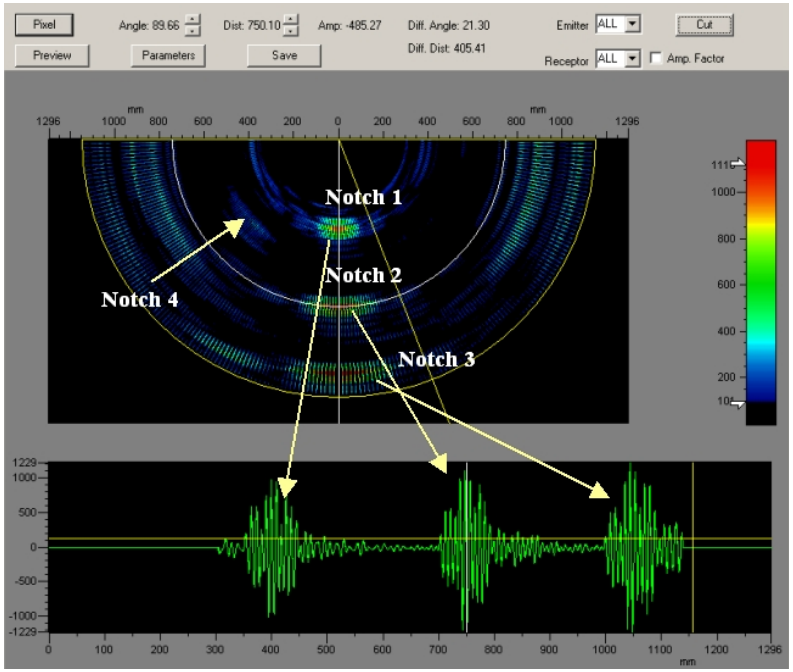
DAMAGE DETECTION

ALGORITHMS & VISUALZATION





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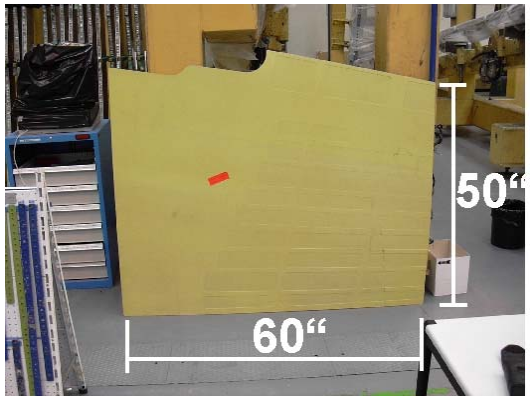
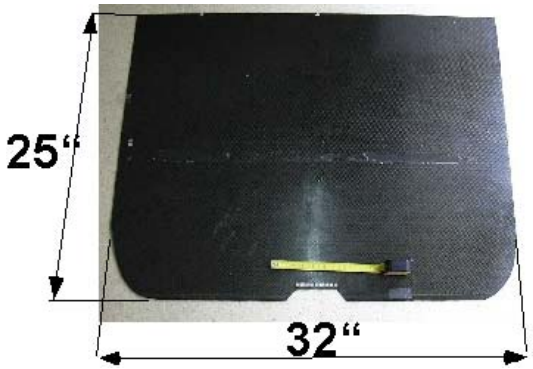
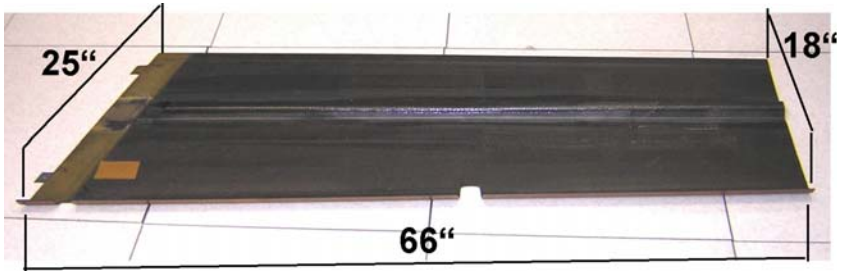
DAMAGE DETECTION

APPLICATIONS







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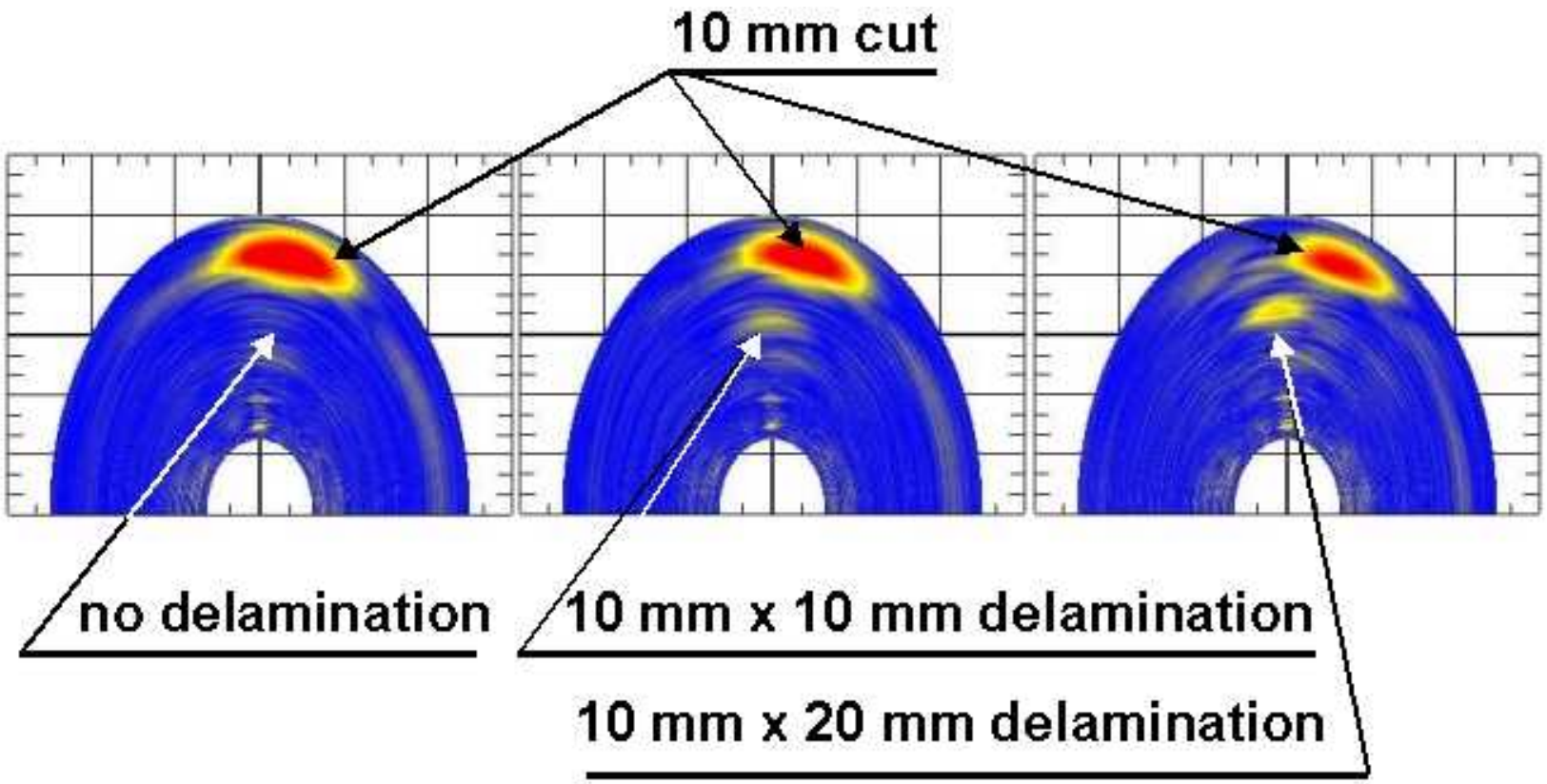
DAMAGE DETECTION

SAMPLE RESULTS



CONCLUSIONS

- **ARTIMA project will result in**
  - **Development of reliable, real-time, built-in damage detection systems**
  - **Development of reliable and effective vibrations control systems**
- **These will significantly improve the reliability of future and existing aircraft**

ARTIMA