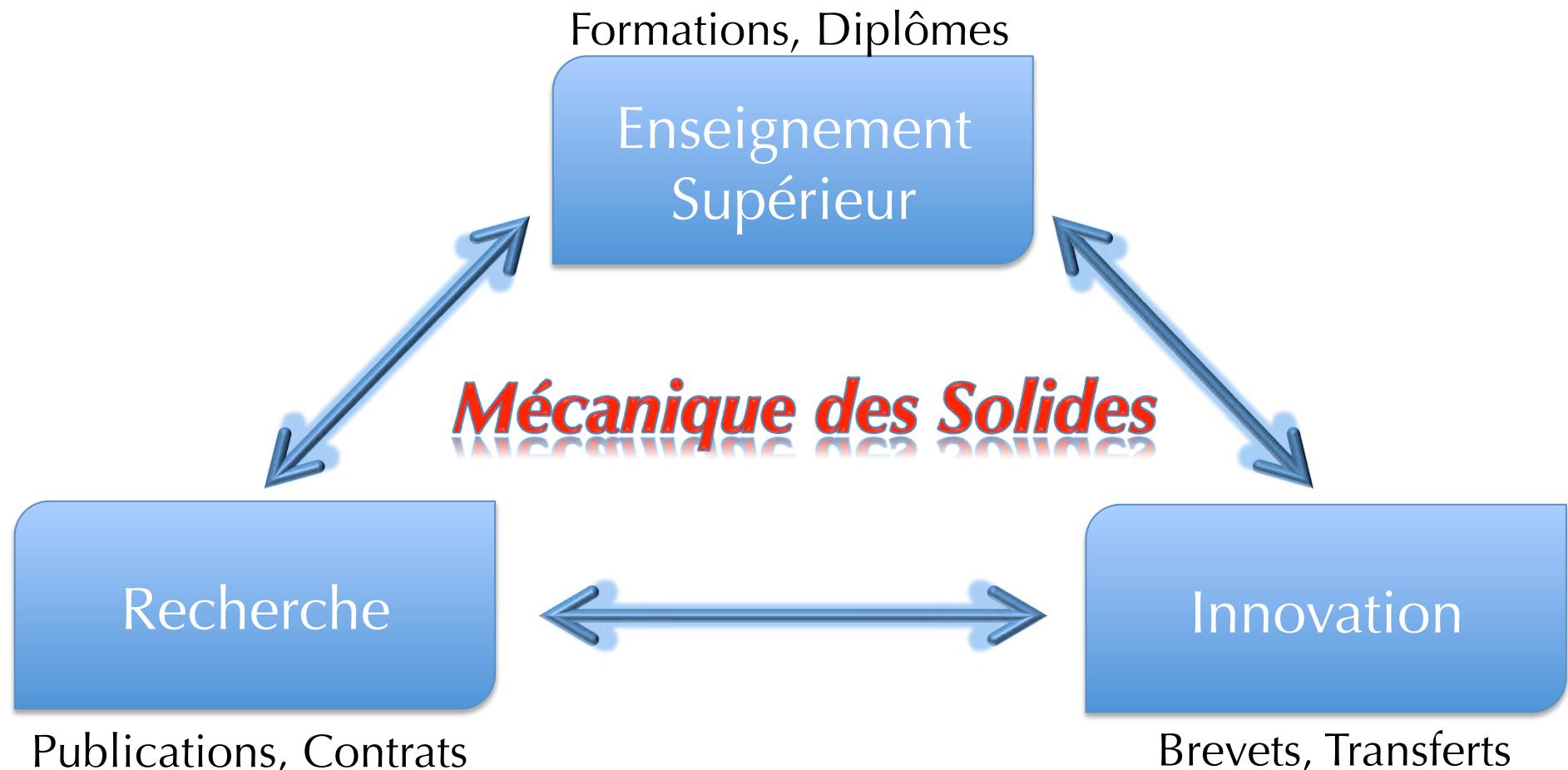




Bienvenue à L'ISAE-SUPAERO / DRRP / DMSM

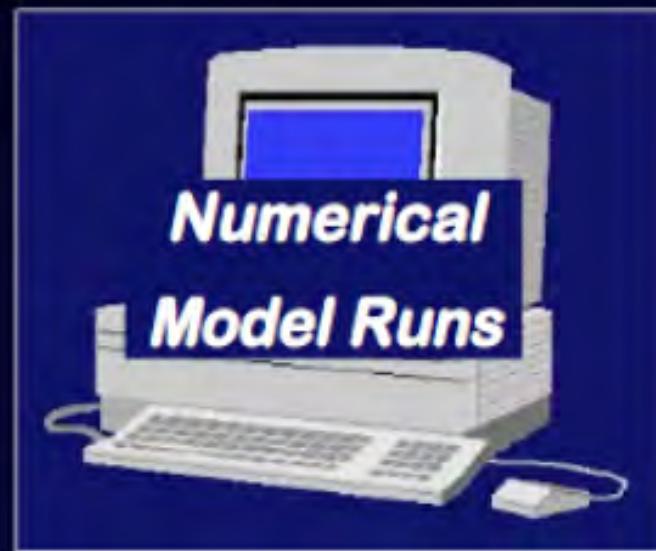
Département Mécanique des Structures & Matériaux
de l'ISAE-SUPAERO

1^{er} septembre 2015





Certification of Complex Systems



Axes *Scientifiques du DMSM*

- *Matériaux Structuraux Innovants*

Durabilité et tolérance au dommage
des matériaux composites & métalliques

- *Durabilité & Dynamique des Structures*

Modélisation & qualification statique et dynamique
vibratoire & transitoire des éléments minces aérospatiaux

Un axe émergent :

Interactions Fluides-Structures & dynamique bioinspirée

L'Organisation matricielle du DMSM

<i>Animation Opérationnelle Missions</i>	<u>FORMATION</u>	DFI DFM
	<u>RECHERCHE</u>	DDS MSI
	<u>INNOVATION</u>	

Structuration Fonctionnelle Organique

Mécanique des solides
vers la qualification des structures
- Durabilité & Dynamique des Structures
- Matériaux Structuraux Innovants

64 Personnes = *35 Permanents (dont 15 CS, dont 9 Pr)*
+ 29 Chercheurs Juniors & Invités (dont 25 Doctorants)

L'Équipe ISAE-SUPAERO / DRRP / DMSM

35 Permanents DMSM

Chef du DMSM : Yves GOURINAT

Cadres Scientifiques

Christophe BOUVET

Jacques HUET

Frédéric LACHAUD

Patrice LONGÈRE

Catherine MABRU

Guilhem MICHON

Joseph MORLIER

Michel SALAÜN

Miguel CHARLOTTE

Rémy CHIERAGATTI

Christine ESPINOSA

Anis HOR

Laurent MICHEL

Samuel RIVALLANT

Assistante : Marie-Odile MONSU

Équipe Technique

Michel LABARRÈRE

Joël XUÉREB

Thierry MARTIN

Jean-Benoît ALIBERT

Frédéric BONTEMPS

Marc CHARTROU

Olivier CHERRIER

Marc CHEVALLIER

Véronique GODIVIER

Daniel GAGNEUX

Thierry FAURÉ

Olivier LACAZE

Alain BOUINOT

Michaël CHANDELIER

Philippe CORRIA

Thierry DUIGOU

Xavier FOULQUIER

Charlie GILARD

Bernard RIVIÈRE

29 Chercheurs Juniors & Invités DMSM

Doctorants ISAE - ED MEGeP (12)

- Guillaume ANDROUIN
- Loïc BERNARD
- Nicolas DUBARY
- Guillaume LELIAS
- Juan LOUKOTA
- Joao Flavio PAFUME COELHO
- Giuseppe PENNISI
- Cesar Moises SANCHEZ CAMARGO
- Joël SERRA
- Floriane SOULAS
- Arnaud WILHELM
- Johannes WOLF

Doctorants ISAE - ED-AA (8)

- Luc AMAR
- Elisa BOSCO
- Mohamed Amine BOUHLEL
- Pierre-Louis CHIAMBARETTO
- Ankit CHIPLUNKAR
- Olivier LEFRANÇOIS
- Peter SCHMOLLGRUBER
- Floran TOSTAIN

Post-Docs ISAE (1)

- Hugo TRICOU

Doctorants encadrés ISAE (5)

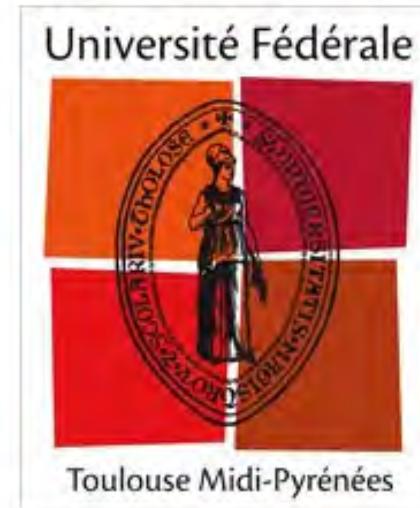
- Mahdi AL-RAFFI (UT3-MEGeP)
- Mickaël DUVAL (UT3-MEGeP)
- Ludwig PASENAU (UT2-AA)
- J-Marie de POULPIQUET (UT1-AA)
- Cyril SOLA (INSA Tlse-MEGeP)

Stagiaires ISAE (3)

- Eric FEUILLOLEY
- Miguel RESECO BATÓ
- Zihan ZHEN



L'Institut Clément ADER (1/2)



- 2007 L'IGMT (2000) devient la structure fédérative FED 4103
- 2009 Laboratoire labellisé EA814-ICA « Institut Clément Ader »
Évaluation AERES « A »
- 2015 ICA, FRE CNRS 3687**

Laboratoire de Mécanique des Solides de Midi-Pyrénées

Tutelles : ISAE-SUPAERO, INSA Toulouse, UTIII Paul Sabatier, EMAC, CNRS

EDs de rattachement : ED468-MEGeP, ED467-AA, ED309-Systèmes

112 doctorants, 118 personnels en mission recherche (30 Pr et 58 Dr)

Sites : Toulouse (ECA), Albi (Mimausa), Tarbes (LGP)

DMSM TEST FACILITIES

- **Static / Fatigue Tests**
Structures & Coupons Specimens
- **Vibration Tests**
Modal Analysis, Laser Vibrometry
- **Impact Tests**
Impact Tower, Rapid Impactor
Hopkinson Bars
- **Environment Material Tests**
Thermo-Hydrometric Rooms
Thermal Imaging
- **Instrumentation - NDT**
Extensometry, Contactless Measurement
High Speed Imaging, US, X, SEM



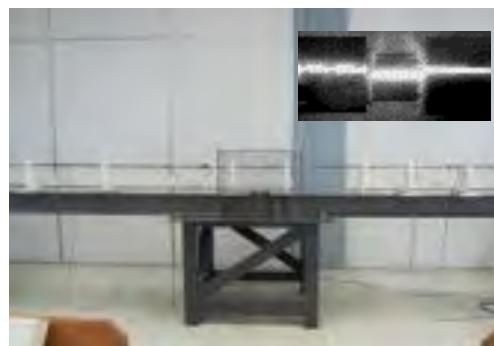
Tension / Compression Test



Laser Vibrometer



Pneumatic Rapid Impactor



Hopkinson Bars



Impact Tower

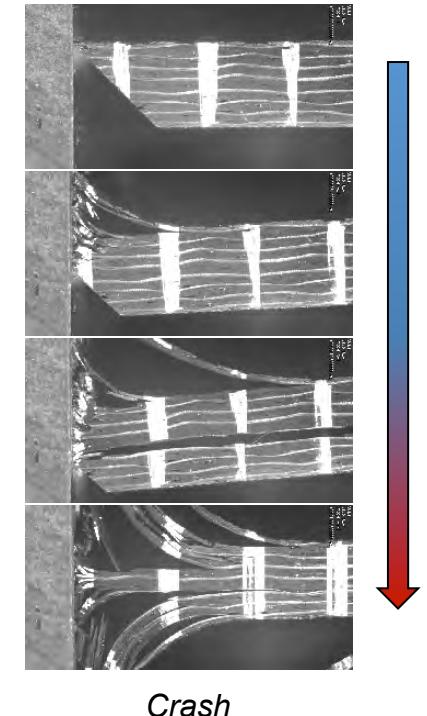
Damage to composite materials in aerospace structures

Research Topics

- Processes and Materials
 - drilling of laminated composites, control of porosity content,
 - characterization of damage, crack propagation,
 - environmental effects on durability
- Structural details and sizing of structures
 - numerical modelling of mechanical behavior of very critical structural zones.
 - composite structure optimization by heuristic methods
- Impact behavior and damage tolerance
 - identification of energy absorption mechanisms, damage processes and residual strength.
 - Impact behavior for low to intermediate speeds (micro-mechanics approach for short-fiber, mesoscopic approach for laminated composites).

Main partners

- Airbus France, EADS IW, ONERA, Thales Alenia Space, CNES, SKF, LATECOERE...



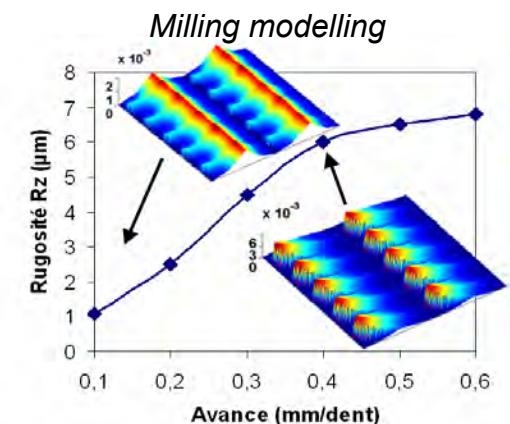
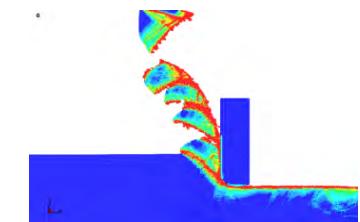
Fatigue of metal materials and structures

Research Topics

- Fatigue of structural bolted joints
 - design and optimization of aeronautical assemblies according to their static and fatigue resistance
 - behavior of bonded-bolted hybrid joints
- Fatigue and environment
 - thermomechanical fatigue (innovative coupled fatigue test bench, numerical modeling).
 - complex dimensioning of structures subjected to combined environments.
- Fatigue and manufacturing processes
 - relations between ranges of machining and resistance to fatigue. Effect of machining and surface quality (roughness, residual stresses, microstructure).
 - Modelling manufacturing processes to predict surface quality of a machined part based on cutting parameters and thus optimize structural parts quality and lifetime.
 - joint influence of machining and an anti-corrosion process on fatigue resistance

Main partners

- Airbus, Aircelle, Astrium, CNES, CIRIMAT

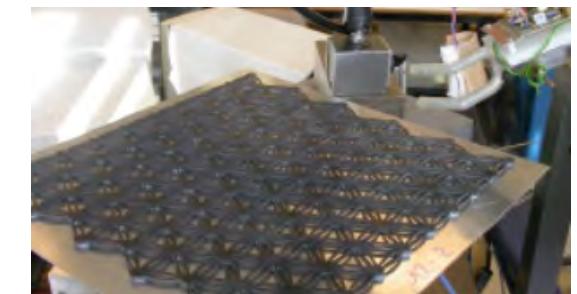


Dynamics of Structures

Vibrations, Dissipation and Structural Control

Research Topics

- forecasting methods for the vibrational behavior of structures, especially for helicopters and launch vehicles.
- development and experimental validation of specific models at different scales
- theoretical and experimental studies on intrinsic non-linear dynamics
- designing and qualifying new passive and active systems for dynamic control
- active control of stability during gyroscopic flutter on tilt rotorcraft
- optimization of alveolar surfacing materials for passive control of vibrations
- large bandwidth resonators for dynamic control
- apply these techniques to structural health monitoring and diagnostics (& more...)
- structural dynamic diagnostics for thin composite structures
- optimization of a planetary probe's drilling tool
- Modelling of the dynamic equilibration sensor of the inner ear



Passive damping

Main partners

- Airbus Helicopters, ESA, CNES, Univ. of Surrey, MIT, French MoD

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Passive damping

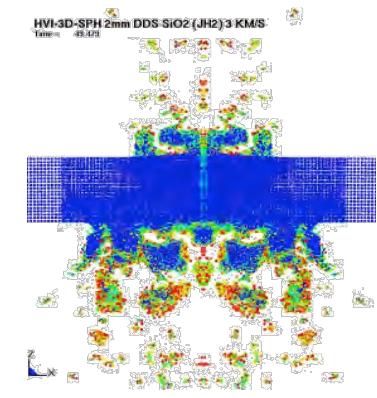
Main partners

- Airbus Helicopters, ESA, CNES, Univ. of Surrey, MIT, French MoD

Advanced numerical methods for mechanics

Research Topics

- Transient and nonlinear dynamic behavior of structures and materials
 - Development of computational methods, numerical tools and robust behavioral models for materials and structures subjected to dynamic loads generating high displacements and/or strains or strain rates.
 - high speed machining of aeronautical materials (w/Metallic Materials team)
 - Modelling of 3D crack and rupture initiation and propagation during impacts
 - Modelling of hypervelocity impact (HVI) on thin monolithic silicate solar cells
 - damage modeling and structural integrity of aeronautical parts during and after low velocity impacts and complex composite damage
- Advanced numerical methods and design assistance methods
 - multi-criteria and multi-scale methods for choice of technological solutions in aeronautics & space structures design or architecture.
 - comprehensive optimization methods ; reliability and probabilistic approach
 - use of recent numerical methods (XFEM, SPH)



hypervelocity impact

Main partners

- CEA, CNES, ESA, Airbus Helicopters, Snecma, Airbus, ONERA, Thales Alenia Space