

Ph.D. position at A&M ParisTech, Paris, France

“Structural Health Monitoring of Aeronautic Structures: from the laboratory to full-scale field tests”

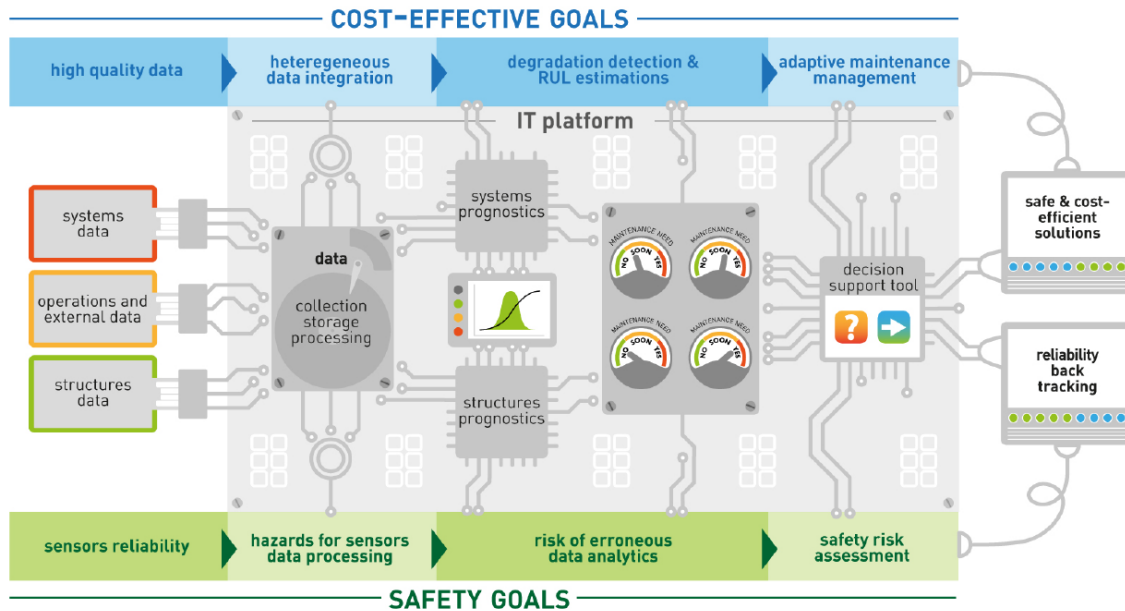
Location: PIMM laboratory, ENSAM, 155 Boulevard de l’Hopital, 75013 Paris, France.

Advisors: N. Mechbal (Associate professor, HDR) & M. Rébillat (Associate professor) in the Dynamic, Structure, and Control (DYSCO) group

Funding: This 36 months Ph.D. position is founded by the H2020 collaborative European project “ReMAP – Real-time Condition-based Maintenance for Adaptive Aircraft Maintenance Planning”.

Starting date: between October 2018 and January 2019

Research project: ReMAP aims at establishing an innovative framework that can be used toward the reliable implementation and certification of condition-based maintenance (CBM) on aircraft systems and structures, replacing fixed interval inspections by real-time adaptive maintenance management. ReMAP targets four goals: (1) the elaboration of nominal and non-nominal flight conditions **aircraft systems and structures health diagnostics and prognostics**; (2) the **definition of adaptive maintenance management algorithms**, able to effectively adjust to real-time aircraft health and condition knowledge updates; (3) the **formulation of an integrated safety risk assessment** to support a safe implementation of condition-based health management maintenance planning; and (4) **definition of guidelines and standards** for a successful implementation and certification of applications.



PIMM laboratory: The proposed Post-Doctoral position will take place within the Dynamic-Structure-Control (DYSCO) group of the Process and Engineering in Mechanics and Materials (PIMM) laboratory. The PIMM laboratory is the largest research laboratory of Arts & Métiers ParisTech with around 150 people. Its activities can be resumed in the following sentence “From materials to smart-structures” The laboratory provides a world unique environment with many available facilities (scale one A380 nacelle parts equipped with piezoelectric element, high energy LASER shock equipment to generate real-like delamination defects, physico-chemical material characterization facilities, ...). This makes the PIMM laboratory a very attractive environment for multidisciplinary research activities related to structural health monitoring.



With respect to the ReMAP project, PIMM is responsible for the coordination of activities dealing with the **active structural health monitoring (SHM) of structures by means of piezoelectric sensors**. This includes involvement in a work package dedicated to sensors (number and position, excitation signal design and data acquisition specifications) and an active participation in a work package dedicated to SHM (development and validation of algorithms for damage detection, localization, and quantification). The group has already a renowned experience in these areas as reflected from its participation in previous projects and publications. The selected Ph.D. student is expected to contribute to one or several of the above-mentioned points.

Profile: Candidates are expected to have obtained, or to obtain soon, a master's degree in Signal Processing, Statistical Analysis, or Machine Learning with strong links with the field of Mechanical Engineering. Candidates holding a master's degree in Mechanical Engineering with a strong Signal processing, Multivariate Statistical Analysis or Machine learning component will also be considered. A solid background and demonstrable interest for experimental activities is mandatory. Additionally, very good research, communication and programming skills, proficiency in English, and a strong motivation towards working in a collaborative international environment are required. Travels in Europe are to be expected.

Application: Interested candidates who meet the qualifications are encouraged to apply by sending their applications to marc.rebillat@ensam.eu and nazih.mechbal@ensam.eu. Applications should include

- (1) a **motivation letter** (max. 2 pages) describing why the applicant is applying to this position and how the position fits into his or her career plans,
- (2) a **full CV** showing how the applicant's profile fits the requirements,
- (3) an electronic copy of the **Master's thesis** (if already available),
- (4) a list of **three referees** that can be contacted.

Relevant publications of the group:

- M. Rébillat, R. Hajrya et N. Mechbal, «**Nonlinear structural damage detection based on cascade of Hammerstein models**», *Mechanical Systems and Signal Processing*, vol. 48, pp. 247-259, 2014.
- Mechbal N., Uribe J.S. & Rébillat M., «**A Probabilistic Multi-class Classifier for Structural Health Monitoring**», *Mechanical Systems and Signal Processing*, Elsevier, 2015, 60-61, pp.106-123.
- Fendzi C., Mechbal N., Rébillat M., Guskov M. & Coffignal G., «**A General Bayesian Framework for Ellipse-based and Hyperbola-based Damage Localisation in Anisotropic Composite Plates**», *Journal of Intelligent Material Systems and Structures*, 2015, pp.32
- Fendzi C., Rébillat M., Mechbal N., Guskov M. & Coffignal G., «**A data-driven temperature compensation approach for Structural Health Monitoring using Lamb waves**», *Structural Health Monitoring*, 2016, 15 (5), pp.525-540.
- M. Ghrib, L. Berthe, N. Mechbal, M. Rébillat, M. Guskov, R. Ecault et N. Bedreddine, «**Generation of controlled delaminations in composites using symmetrical laser shock configuration**», *Composite Structures*, vol. 171, pp. 286-297, 2017.
- M. Rebillat, O. Hmad, F. Kadri et N. Mechbal, «**Peaks Over Threshold--based detector design for structural health monitoring: Application to aerospace structures**», *Structural Health Monitoring*, 2018.