

# PhD PROPOSAL

Title of the proposed research:

## Vibration testing of structures and their impact on different fatigue life criteria strategy

*Identification d'un critère de durée de vie par essais accélérés : équivalence entre les approches vibratoire et fatigue classique*

-Aim of the investigation:

The aim of this research project is to identify and develop one or more criteria according with the correlation between vibration and fatigue solicitations in order to define accelerated tests.

-Abstract

Fatigue effects due to ambient vibrations of long duration are the main cause of structural failures. Structural manufacturers are very much concerned with vibration testing of structure prototypes in order to determine if they can support the vibration environment expected during their lifetime without being damaged. Up to now, qualification tests are performed according to different standards. These standards do not have the same severity so that the choice of one standard rather than another is not obvious. The objective of this research project is to propose a new methodology to quantify the severity of different vibration environments. To this end, different severity criteria will be first defined. Based on these criteria, the severity of vibration excitation and standards will be estimated and compared.

-Proposed plan of work:

The study in this research will implement the following:

- Review of the literature and expression of the key idea
- Definition of the experimental set-up and design of experiment
- Definition of analytical models of damage from accelerometer data in comparison with stress data
- Definition of one or more criteria of fatigue life vs vibration exposition
- Comparison between the results and validation

## References

*Fatigue life evaluation of mechanical components using vibration fatigue analysis technique*, Seong-In Moon, Il-Je Cho and David Yoon

*Fatigue of structures in mechanical vibratory environment. From mission profiling to fatigue life prediction*. M. Bennebach, H. Rognon, O. Bardou

*Vibrational Fatigue and Structural Dynamics for Harmonic and Random Loads*, Martin Česnik and Janko Slavič

*Fatigue Damage Related Descriptor for Random Vibration Test Environments*, Henderson, G. R. and Piersol, A.

*Relationship between Stress and Velocity in Resonant Vibration*, Crandall, S.H.

*A stress invariant based spectral method to estimate fatigue life under multiaxial random loading*, A. Cristofori, D. Benasciutti, and R. Tovo

*Frequency-domain fatigue analysis of wide-band stationary gaussian processes using a trimodal spectral formulation*. Z. Ghao and T. Moan

*A method for accurate estimation of the fatigue damage induced by bimodal processes*. Y. M. Low