

RECRUTEMENT CNRS - DR8

FICHE DE POSTE DOCTORANT

Laboratoire et service	Institut Pprime : DGMSC - Equipe : Mécanique des Interfaces Lubrifiées Du 01/12/2026 au 30/11/2029
CONTACT	Responsable Scientifique (<i>Scientific supervisor</i>) : Mihai ARGHIR Co-encadrant : Julian Le Rouzic
INTITULE DU POSTE	Doctorant - CDD 36 mois (<i>PhD contract, 36 months</i>)
LOCALISATION DU POSTE	Laboratoire d'accueil : Institut Pprime – UPR 3346
DIPLOMES	Diplôme de Master ou d'ingénieur à compléter : Génie Mécanique et Aéronautique (<i>Master degree in Mechanical or Aeronautical Engineering</i>)

TITRE – INTITULE DU POSTE

TITRE COURT :

Numerical and experimental modeling of overlapping piston ring seals in static, semi-static and dynamic operating conditions.

Informations générales

Contexte :

This thesis is being conducted within the framework of a partnership between the PPRIME Institute, UPR CNRS 3346 of the University of Poitiers and ISAE ENSMA, Safran Aircraft Engines and CETIM, and the AEROSEAL chair, whose objective is to improve knowledge of aeronautical sealing.

Overlapping piston ring seals are used in numerous aeronautical applications, both civil and military. Their primary function is to ensure an airtight and/or oiltight seal between two pressurized engine cavities. These rings can operate in different configurations:

- Static: the ring is fixed in its bore and provides a seal between two static parts (without relative movement between the two parts)
- Semi-static: the ring can move axially in its bore over a very short distance and provides a seal between two static parts
- Dynamic: the ring can move axially in its bore over a very short distance and provides a seal between two parts in relative movement (such as a "piston/bore" or "rotor/stator" system)

The estimation of leakage rates is currently carried out using an analytical approach that does not take into account the physicochemical properties of the ring, the interfacing parts, or their surface conditions.

DESCRIPTION sujet de thèse

The objectives of the thesis are:

- To understand fluid flows through inter-shaft seals
- To quantify leakages at the piston ring/bore and piston ring/rotor interfaces and at the clearance level
- To define sizing criteria
- To optimize the piston ring geometry (axial/radial dimensions; sealing clearance, surface finish, materials, etc.) for different application cases

Refined numerical modeling of the seal ring validated by dedicated experimental results will enable the implementation of strategies to improve its operating conditions.

Task Description:

- State of the art / monitoring of single- and two-phase fluid flow modeling
- Modeling of single- and two-phase flows through sealing rings in static configurations

- Modeling of single- and two-phase flows through sealing rings in semi-static configurations
- Modeling of single- and two-phase flows through sealing rings in dynamic configurations
- Exploitation of experimental test campaign results
- Master the dedicated test rig: understand operation, calibrate sensors, set up the protocol and data acquisition program, and conduct rig qualification tests.
- Perform experimental tests on the dedicated rig to validate the numerical model.
- Analyze results from experimental test campaigns: compare calculations with test data and validate the numerical model.

CONTEXTE LABORATOIRE

The PhD student will be based at the Pprime Institute / ENSMA (pprime.fr) and will participate in project progress meetings at the sites of industrial partners Safran Aircraft Engines and CETIM Nantes.

CONTRAINTES ET RISQUES

Ecole Doctorale :
Des déplacements de courte durée, en France et à l'étranger, sont à prévoir.

COMPETENCES REQUISES

The candidate must hold a Master's degree in Mechanical or Aeronautical Engineering or in Materials Science with good training in mechanical design, numerical modeling of continuous media and a programming language.

Informations complémentaires

Institut Pprime is a laboratory with restricted access: any recruitment is subject to a preliminary authorisation from Security Defense State Officer.

Fait à Chasseneuil, le 7/10/2025

NOM : ARGHIR
Prénom : Mihai

Signature :