

## **Research Fellowship in Structures and Mechanisms**

### **Directorate of Technical and Quality Management**

#### **ESTEC, Noordwijk, The Netherlands**

#### **ESA/RF-ESTEC(2015)021**

##### **Overview of the Division's mission**

The Structures and Mechanisms Division (TEC-MS) is the centre of competence of the Agency in all areas related to spacecraft and launcher structures, mechanisms and pyrotechnics, encompassing spacecraft and launcher lightweight structures, stable structures, advanced mechanical materials applications, structural dynamics, damage tolerance, deployable structures/booms, active structures, hold-down and release devices, electrical motors for space mechanisms, launcher and re-entry hot and cold structures, landing attenuation systems, seals, valves, parachute release systems, separation systems, reaction wheels, bearings and tribology aspects. It provides support to projects, preparatory and technology programmes.

##### **Overview of the field of research proposed**

Within this frame, the Mechanism Section (TEC-MSM) is the focal point for matters relating to the design, engineering and verification of space mechanisms. This entails in particular responsibility for:

- overall mechanisms definition, design and engineering;
- mechanisms performance evaluation and analysis;
- mechanisms technologies (relative to tribology, actuators, sensors, pyrotechnics, mechanical components, including micromechanical devices);
- mechanisms drive and control laws;
- mechanisms operation simulation.

The Research Fellow will participate in the concept definition, analysis and development of mechanisms for use in space projects. In assistance to ESA engineers working in this domain, the holder of this position will be given a specific task which may include:

1. assistance in the implementation and monitoring of R&D contracts;
2. critical review of design / analysis / test activity and simulation / characterization / validation up to simulation correlation of high accuracy mechanism systems, with particular emphasis to frequency domain performances representation and advanced signal analysis techniques;
3. mechanism simulation, using software packages like MATLAB/Simulink;
4. feasibility assessments of new mechanisms design concepts;
5. critical review and analysis of design solutions for mechanisms and participation in project review processes;
6. participation in the writing of technical specifications and statements of work for related research and development activities.

### **Proposed Specific Task:**

In the context of ongoing research and development in the Mechanisms Section, it is anticipated that the Research Fellow will work on the following specific task:

Among many other technical areas, the Mechanisms Section is the focal point in ESA for all ball bearing technologies, including associated analysis tools and methodologies, and ESA has supported the development of the state-of-the-art ball bearing analysis tool CABARET, for use by the European space mechanisms industries.

CABARET comprises a number of modules, including features for quasi-static load/stress/deflection analysis, friction torque estimation and thermal expansion analysis.

- Within the frame of a major update of the CABARET software, the Research Fellow shall review the modelling and analysis core of the relevant software modules on the basis of the source code, the associated technical documentation as well as additional related literature.

- In close coordination with the ESA supervisor, the Research Fellow shall plan and work on an updating and extension of the modelling and analysis core, using recent results in relevant research domains where applicable. In particular, features related to space-standard liquid lubrication and ball bearing cages/retainers (custom designs, motion dynamics, etc.) shall be extended.

- For all tasks related to the software development, the Research Fellow shall cooperate with the European Space Tribology Laboratory (ESTL), the developer of the current CABARET software.

- Furthermore, the user interface and application logic of the CABARET software shall undergo a major revision, especially regarding a guided approach for new/unexperienced users and an up-to-date presentation of analysis results via adequate plotting and printing facilities. For this purpose, knowledge and programming skills in a modern software development environment will be a major asset.

### **Who can apply**

The programme is open to suitably qualified women and men. Preference will be given to applications submitted by candidates within five years of receiving their PhD.

The Research Fellow Programme is open to nationals of the following states: Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, and the UK, or Canada as a Cooperating State, Bulgaria, Estonia, Hungary, Latvia, Slovakia and Slovenia as European Cooperating States (ECS).

### **Required qualifications**

Applicants must have recently completed their PhD studies in Mechanical- or Aerospace Engineering, and must have significant experience with the design and testing of mechanisms.

Applicants should have good analytical and communication skills and should be able to work in a multi-cultural environment in an autonomous manner.

Applicants must be fluent in English and/or French, the working languages of the Agency. A good proficiency in English is required.

### **How to Apply**

Please fill in the [online](#) application form attaching to it, **in one document only**, your CV, your motivation letter and your research proposal.

Candidates must also arrange for up to **three letters of reference** to be sent by e-mail, before the deadline, to **temp.htr@esa.int**. The letters must be sent by the referees themselves. The candidate's name must be mentioned in the subject of the email.

Applications satisfying the general conditions for eligibility, to be submitted **by 6 May 2015**, will be evaluated and successful applicants will be invited for an interview.

Interested candidates are highly encouraged to visit the ESA website: [www.esa.int](http://www.esa.int).