

# Job Title: Internal Research Fellow

Requisition ID 11945 - Posted 21/12/2020



## EUROPEAN SPACE AGENCY

Research Fellowship Opportunity in the Directorate of Technology, Engineering and Quality.

ESA is an equal opportunity employer, committed to achieving diversity within the workforce and creating an inclusive working environment. For this purpose, we welcome applications from all qualified candidates irrespective of gender, sexual orientation, ethnicity, beliefs, age, disability or other characteristics. Applications from women are encouraged.

### Post

#### Internal Research Fellow

This post is classified F2.

### Location

ESTEC, Noordwijk, The Netherlands

### Our team and mission

---

Internal Research Fellow (PostDoc) in Model-Based Systems Engineering in the Systems Engineering Division, Systems Department, Directorate of Technology, Engineering and Quality.

The Systems Engineering Division is responsible for:

- providing system engineering and performance analysis support to all phases;
- managing and executing system studies and activities conducted by D/TEC, in particular to investigate new system concepts and architectures to answer future mission and user needs;
- research and development of End-to-End and system engineering methods;
- managing internal pre-Phase A mission and system design studies or trade-offs executed using the CDF and with the participation of ad hoc interdisciplinary teams from ESA;
- providing cost estimates and cost engineering analysis, data bases and tools in support to programmes and projects as well as internal mission and system design studies executed in the CDF, technology developments and future space systems;
- implementing the in-orbit demonstration strategy managed by D/TEC including in-orbit demonstration missions, cube-satellites and technology flight opportunities;
- developing cost engineering methodologies and improving overall Agency capability in cost analysis;
- development of system engineering standards in the framework of ECSS and ESA Standardisation Boards.

ESA is introducing Model-Based System Engineering in the project lifecycle. Trial projects are on-going in several space mission projects in early phase and in parallel Research and Development activities have been initiated in order to consolidate the method, the process and define and develop a common set of tools adapted for space system engineering.

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

### Field(s) of activities/research/learning areas

---

Space system engineering, Model Based System Engineering and computer science.

You will conduct research in the area of Model Based for System Engineering.

Model-based engineering is an approach for the development of systems characterised by the use of models, for example visual modelling artefacts that serve as archetypes of the system under development, but mainly data digitalisation enabling tool support for transformation or verification, in order to improve the efficiency and productivity of the system development life cycle. Model-based systems engineering is the particular use of the set of aspects of model-based engineering specifically associated with systems engineering applied in a formal way to support lifecycle activities by providing the reference for engineering data.

"Model-based systems engineering (MBSE) is the formalised application of modelling to support system requirements, design, analysis, verification and validation activities beginning in the conceptual design phase and continuing throughout development and later life cycle phases." INCOSE SE Vision 2020 (INCOSE-TP-2004-004-02, Sep 2007)

MBSE is therefore the enabling set of technologies (i.e. methods, tools, languages) that makes it possible to author the product artefacts in such a way that digital continuity is ensured all along the life cycle, across the disciplines, and through the supply chain. The artefacts produced enable a proper elicitation of relationships among the entities of the systems and the entities of the project of the system. System complexity is at the root of our needs. Initially manageable by a single or a small team of system engineers, the complexity of some of our space systems begins to exceed what can be thoroughly encompassed by a human team. ESA has identified the following

needs for system engineers: formal representations beyond textual descriptions, a controlled exchange of data supported by automated mechanisms, a structured knowledge of their system, an authoritative source of truth (consistent by construction), from which appropriate viewpoints may be extracted to communicate about the system, a dashboard with system engineering information to create consistent baselines of the system and to be able to initialise a system with a reusable set of consistent data, to grasp all relationships among all entities of the system.

The solution proposed to fulfil these needs relies on (i) semantic interoperability of the tools based on the definition of a global conceptual data model (ontology) and (ii) the definition of the reference architecture of a “system factory”, i.e. the software infrastructure that supports systems engineering.

---

## Proposed activity/research

The availability of this solution at industrial and agency level would make it possible to actually deploy MBSE in space projects. The purpose of the Research Fellowship is to perform research on MBSE and its application to space, propose and experience/implement solutions to the theoretical and practical issues raised in this deployment. This includes in particular:

- Analysing the System Factory functional reference architecture available at ESA now.
- Analysing the technologies available today for the function of “data hub”, i.e. the communication functions that allow data to be exchanged between tools, while respecting data ownership and data replication in the factory, including configuration control. Data hub technologies include in particular the result of some ESA activities (like the product CIP, the activity Paperless from ESOC, etc) and external technologies such as the TeePee from IRT Toulouse or openflexo.
- Analysing the requirements allocated to this datahub function, and mapping them on tools that are more the responsibility of system engineering (e.g. SE-oriented configuration management), and tools that are pure IT infrastructure (e.g. firewalls).
- Potentially interfacing with ESA corporate IT to coordinate the datahub technology of choice with the ESA corporate IT tools.
- Analysing security-related issues. This is at pure informatics network exchange level, but also at the level of the visibility which is offered within a stakeholder model to another stakeholder (access control list, type of exposed data, etc.)
- Solving the issues related to semantic interoperability, i.e. the way to use the global conceptual data model (ontology) in order to drive the data communication within the system factory (in the “data hub”): combining ontologies, using conceptual data models to generate logical data models and physical data models, and to generate the tools that translate physical data to and from two data models which have (nearly) the same conceptual data model, potentially configuring the data hub with the ontology.

---

## Technical competencies

Knowledge relevant to the field of research

Research/publication record

Ability to conduct research autonomously

Breadth of exposure coming from past and/or current research/activities

General interest in space and space research

Ability to gather and share relevant information

---

## Behavioural competencies

Innovation & Creativity

Continuous Learning

Communication

Relationship Management

Self Motivation

Problem Solving

Cross-Cultural Sensitivity

---

## Education

You should have recently completed, or be close to completion of a PhD in a related technical or scientific discipline. Preference will be given to applications submitted by candidates within five years of receiving their PhD. In particular for this position, the following is required:

A PhD in Space System Engineering or Computer Science is required.

---

## Additional requirements

The working languages of the Agency are English and French. A good knowledge of one of these is required. Knowledge of another Member State language would be an asset.

---

## Other information

For behavioural competencies expected from ESA staff in general, please refer to the [ESA Competency Framework](#).

The Agency may require applicants to undergo selection tests.

**The closing date for applications is 25 January 2021.**

In addition to your CV and your motivation letter, please add your proposal of no more than 5 pages outlining your proposed research in the "additional documents" field of the "application information" section.

At the Agency we value diversity and we welcome people with disabilities. Whenever possible, we seek to accommodate individuals with disabilities by providing the necessary support at the workplace. The Human Resources Department can also provide assistance during the recruitment process. If you would like to discuss this further please contact us at [contact.human.resources@esa.int](mailto:contact.human.resources@esa.int).

---

Please note that applications are only considered from nationals of one of the following States: Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, and the United Kingdom. Nationals from Latvia and Slovenia, as Associate Member States, or Canada as a Cooperating State, can apply as well as those from Bulgaria, Cyprus, Lithuania and Slovakia as European Cooperating States (ECS).

Priority will first be given to candidates from under-represented Member States.

In accordance with the European Space Agency's security procedures and as part of the selection process, successful candidates will be required to undergo basic screening before appointment