

Research project offer

Location : ISAE SUPAERO, Toulouse, France

Department : Department of Complex Systems Engineering (DISC)

Research group : Decisional Systems

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OFFER DESCRIPTION

Title : MBSE approach for Nanosatellites: CREME application

Proposed duration and period : 6 months (TBD, e.g., March-August 2022)

Context
(max 10 lines)

In the earliest stages of a nano-satellite development there are many aspects to take into consideration. A Model-Based Systems Engineering (MBSE) approach can greatly facilitate this phase, amongst others through traceability of requirements, functions, subsystems, components, etc.

Trade-off analysis is then used so to select the best possible design. Currently, automatic trade-offs are not possible, due to all the different software that are used to compute each subsystem parameters: STK, IDM-CIC, Python, Matlab, Simulink ...

However, a MBSE framework may provide a step forward in providing possibilities to automate such trade-off analysis and avoiding manual data management between computations. A true full-scope MBSE approach for satellite design can constitute a great advantage for traceability throughout the lifecycle of the satellite.

Key-words: MBSE, Preliminary design, Nanosatellite, Mission Analysis.

Objectives and work
(max 20 lines)

Within the framework of this internship, the goal is to work on automating (parts of) the trade-off analyses. The developed approaches will be applied on a real CubeSat currently developed to measure radiation levels in the Van Allen Belts: CREME (Cubesat for Radiation Environment Monitoring Experiment).

During the internship, the intern is expected to:

- Provide a systematic approach for nanosatellite design, from needs and desires to verification and validation
- Model different nanosatellite subsystems
- Analyze which trade-offs can be performed between subsystems and develop their automation
- Continue already existing work on database visualization tools (N2 diagram, design graphs, design structure matrixes...)
- Work on a concrete example (based on CREME data).
- If time permits, perform a full system analysis



Possibility to continue with a PhD (Yes/No) : TBD	
REQUIRED APPLICANT PROFILE AND SKILLS	
Study level (tick possible choices)	<ul style="list-style-type: none"> √ Undergraduate students (3rd or 4th year) √ Master students (1st or 2nd year) √ PhD students
Required profile and skills	<p>Basic knowledge on systems engineering and MBSE First experience with MBSE tools (e.g. CAMEO, Papyrus, TTool,...) Good programming skills (Java, Python, Javascript/Angular would be an advantage) Basic satellite design process knowledge. Experience with CubeSats would be a real plus and interest in the space domain is a must!</p>
Other useful information	<p>The candidate must be enrolled at a university in order to apply for this internship. Application: if interested, contact us by mail using the subject "[Internship] MBSE approach for NanoSats".</p>