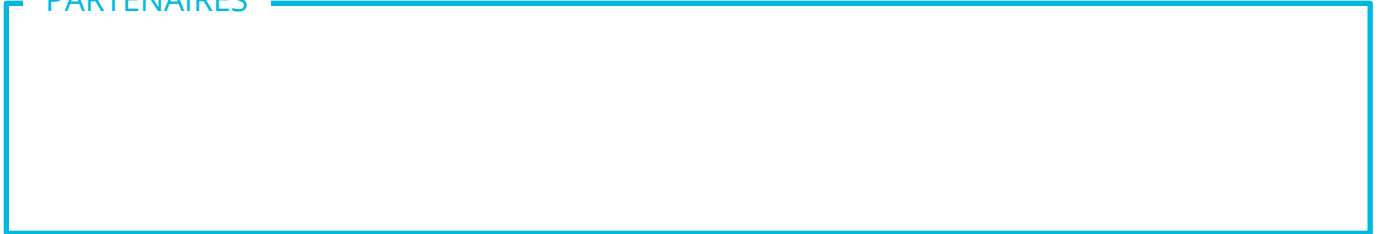




Seamless Integration of Models in a MBSE-MBSA-MDAO Co-Design Process

PARTENAIRES



Key words: systems engineering, modeling, safety analysis, optimization

Department: systems engineering, mechanics

The theme of interoperability between model-based design and analysis approaches is one of our research areas. This PhD topic is a continuation of a work conducted within the CONCORDE collaborative project between ONERA, ISAE, and ENAC. The expected results aim to consolidate advancements in the field of model synergy and open new collaborations via a planned laboratory platform.

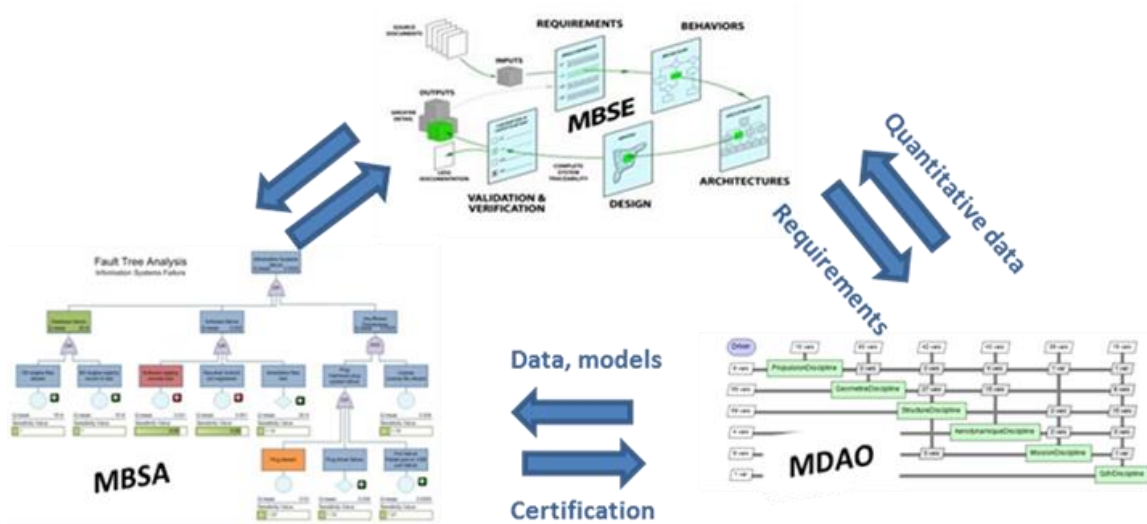
JOB DESCRIPTION:

Modern aerospace engineering faces unprecedented complexity, especially with frugality constraints and efficient system configurations. This complexity makes traditional document-centric approaches inadequate, prompting a strategic industry shift toward model-based methodologies. These approaches allow us to structure, analyze, and validate systems throughout their life cycle.

Guaranteeing the certification or qualification of aerospace systems is a major challenge. Consequently, the traceability of modeling artifacts is a structuring aspect. Models must be traced, consolidated, and verified at every stage—from design to verification and validation—to provide proofs of compliance to the concerned authorities [1].

The proposed methodology utilizes model transformation to create a robust, bidirectional link between MBSE (Model-Based Systems Engineering), MBSA (Model-Based Safety Assessment), and MDAO (Multidisciplinary Design Analysis and Optimization) [2-4]. The MBSE model serves as a pivotal

element, acting as the starting point for generating specific analysis models and the point of convergence for results.



Key contributions will include the development and validation of formal model transformation rules to ensure the system consistency and its integrity. Formalisms such as Event-B, OCL, or QVT_o may be evaluated [5].

MISSIONS:

The project is organized around three complementary research axes:

- Axis 1: Formalization of transformation and consistency rules: Establishing a formal, robust, and reproducible framework for model transformation.
- Axis 2: Management of bidirectional consistency and iterative processes: Focusing on the data feedback loop from MBSA and MDAO tools back to the central MBSE model to enable a truly iterative design process.



- Axis 3: Application and validation on a case study: Demonstrating technical feasibility and scalability on aerospace case studies such as nanosatellites, launchers, or high-altitude drones.

REQUIRED PROFILE:

Candidates must have a Master's degree (engineering school or equivalent) with solid knowledge in systems engineering, computer science, or applied mathematics. The role involves improving modeling languages and methods, as well as software tool prototyping. Proficiency in English and teamwork skills are required.

EXPERIENCE: 0 to 2 years

COMPENSATION: 2600€ / MONTH

DURATION: 36 MONTHS

RYTHM: Full time

LOCATION: TOULOUSE

RESPONSIBLE OF THE SUBJECT:

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TÉL. : XXXXXXX

APPLICATION PROCESS: Evaluations of application are based on CVs, recommendation letters, and transcripts, followed by an interview for selected candidates.

APPLICATION DEADLINE: 31/07/2026

ISAE-SUPAERO



REFERENCES:

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