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www.aiaa.org/SciTech

Modeling and Simulation Technologies
Call for Papers

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Abstract Submission Guidelines

Prospective authors are asked to submit their work electronically through the AIAA SciTech website prior to the published deadline (www.aiaa.org/SciTech). Authors may submit either an extended abstract of 1,000 words or a draft of the paper. Draft papers must include a 100- to 200-word abstract.

The manuscript, whether an extended abstract or draft paper, must include a discussion on the background and motivation for the work, as well as an explanation of the paper's main contributions to the particular area(s) of interest, including examples of results. The inclusion of the paper in the conference will depend solely on the quality and detail of the submitted manuscript.

The scope of the Modeling and Simulation (M&S) Technologies discipline encompasses M&S of aerospace vehicles in a system or system of systems context (e.g., flight simulators, airspace simulations, space operations simulations, systems analysis). See Topics of Interest below for more details. A paper that solely covers M&S methods for a single engineering discipline like structures or applied aerodynamics should be submitted to that discipline. If a paper with a single-discipline M&S topic is

submitted to this call, then it will be moved to the appropriate discipline or rejected if the discipline is not represented at SciTech.

Each submission will be reviewed by at least three members of the Modeling and Simulation Technical Committee. Authors submitting extended abstracts are encouraged to include as many details about their work as possible to help reviewers make informed evaluations.

At each conference, members of the Modeling and Simulation Technical Committee sit in the audience and judge all presentations as the first step of their selection of a best paper at the conference. The papers associated with the best presentations in each session will be evaluated further. The best overall paper will be awarded at the conference the following year and winners receive a cash award.

Topics of Interest

Authors are invited to submit technical papers which address topics either directly in or in support of modeling and simulation of aerospace vehicles, particularly related to flight simulator technologies, including:

1. **Design, Development, Testing, and Validation of Human-in-the-Loop Simulations**
   Papers are sought on the design, development, testing, and validation of human-in-the-loop simulations. Papers are encouraged that discuss novel tools, techniques, and methodologies that decrease the development time or increase the capabilities of human-in-the-loop or real-time simulations, and the quality of models. Papers that address testing and validation methodologies for flight simulators, or discuss regulatory issues and experiences are of particular interest.

2. **Human Factors, Perception, and Cueing**
   Papers are sought in the broad area of human factors, perception, and cueing systems. Of particular interest are the human perception of the essential cues in flight and the reproduction of these cues in a simulator. A related topic is the application of existing knowledge on perception and cueing for understanding and measuring simulation fidelity. Papers on human factors related to the pilot-vehicle interface, novel methods to model human performance and behavior, new pilot training evaluation techniques, and novel data processing and visualization techniques applied to (human-in-the-loop) simulations are of special interest.

3. **Simulation of Air Traffic Management**
   Papers are sought that describe the use of simulations in air traffic management concept development, testing, and analysis. Topics of interest include, but are not limited to, simulation studies that investigate air traffic management automation concepts and decision support tools, airspace and airport traffic modeling methods, and model

validation and verification experiences and methods.

4. **Simulation of Uninhabited Aerial Systems**
   Papers are sought on simulations of uninhabited aerial systems. The variety and number of vehicles in this area are ever increasing, as are the missions they perform. This variety offers a number of new challenges to the field of simulation. Papers are sought on novel simulation techniques and technologies for uninhabited aerial system development, operator training, the development of operational concepts, etc.

5. **Model and Simulation Integration**
   Papers are sought that discuss model and simulation integration. Of particular interest are papers discussing the integration of commercial off-the-shelf tools into existing simulation development and execution processes. Application of networked/distributed simulations and the development of standards that facilitate interaction of diverse simulation environments are encouraged.

6. **X-in-the-Loop Simulation and LVC (Live, Virtual, and Constructive)**
   Papers are sought on the development and use of model-in-the-loop, software-in-the-loop, processor-in-the-loop and hardware-in-the-loop simulations. Topics of interest span from model or software in the loop simulation development to system integration laboratories for hardware-in-the-loop testing of modern fly-by-wire systems, integration and testing of modern avionics and synthetic vision systems, and autonomous flight systems integration and testing. Additionally, combining constructive simulations, virtual simulators, and live vehicles & environments (LVC) permits the blending of engineering, test, training, and operations activities to achieve shortened life cycles, address increasing complexity and scale in system of systems (e.g., the National Airspace System), and improve training outcomes. Topics of interest include but are not limited to LVC architectures, immersing constructive and virtual elements in a live operating environment (shadow mode), immersing live elements in a virtual environment, simultaneous execution of digital twin(s) with live operation, and integration of simulation with ground or flight test.

7. **Modeling and Simulation of Air and Space Vehicle Dynamics, Systems, and Environments**
   Papers are sought that describe the modeling and real-time simulation of vehicle dynamics and vehicle systems, and the environments in which they operate. This includes, but is not limited to, fixed wing aircraft, rotorcraft, uninhabited aerial systems (UAS), urban air mobility (UAM) vehicles, and spacecraft. Non-real-time simulations will also be considered providing the work is in support of real-time simulation. Furthermore, multi-disciplinary modeling and simulation that spans across domains is increasingly popular. Papers are sought in the area of novel modeling and simulation approaches across domains such as structural dynamics, flight mechanics, and

aerodynamics. There is a strong preference for papers which demonstrate integration with real-time, real-time capable or human-in-the-loop vehicle simulations.

8. **Modeling and Simulation for Aerospace Cybersecurity**
   Network-based architectures are ubiquitous in aviation and space systems, including aerospace vehicles and their command and control systems. Securing these systems from unfriendly actors is a significant and growing concern. Papers are sought on modeling and simulation methods and environments that assess robustness of the networked systems to threats and provide methods of protection. Furthermore, papers are sought on the application of modeling and simulation for cybersecurity of aerospace systems. Topics of interest include, but are not limited to, modeling of cyber threats as fault scenarios in flight simulators, and the use of simulators to evaluate prevention, rejection, detection, and mitigation of cyberattacks. A related topic is the cybersecurity of the modeling and simulation environment itself, including information assurance, data protection, and the simulator as a potential attack vector into the system under test.

9. **Modeling and Simulation for Certification and Qualification**
   Modeling and simulation have become essential tools in the qualification and certification processes of new commercial aircraft and the emerging market for commercial crewed spacecraft. In addition, the introduction of autonomous aircraft in civil airspace, such as uninhabited aerial systems (UAS) and urban air mobility (UAM) vehicles, require novel certification approaches based on modeling and simulation. Papers are sought that describe the use of modeling and simulation for the purposes of certification and qualification of new aircraft. Topics of interest include, but are not limited to, expanding the use of simulation for handling quality certification of new and derivative aircraft designs, the use of simulation for the certification of autonomous aircraft, and the design of flight tests to validate these simulations.

10. **Simulator Hardware and Facilities**
    Papers are sought involving all aspects in the design, development, and use of motion systems, visual systems, and other simulator hardware, as well as image generation. Papers that discuss novel motion configurations and hardware as well as the application of motion for research and training are highly encouraged. Papers on motion and visual system technologies that improve simulation fidelity and effectiveness are also highly encouraged. In addition, papers are sought on the development of new simulator facilities.

11. **Simulation-Based Software Development and Verification**
    Papers are sought that demonstrate the use of simulation for the design, development, and testing of aerospace software systems. This topic also includes simulation-based

validation and verification of software solutions.

12. **Adapting New Technology to Modeling and Simulation Infrastructure for Aerospace**
Papers are sought describing the adaptation or assessment of new technologies to modeling and simulation infrastructure for aerospace. New technologies may include but are not limited to: extended reality, cloud technology, new messaging middleware, game engines, social network platforms (including chat, video conferencing, and 3D virtual worlds), hybrid computing architectures (e.g., CPU-GPU), and artificial intelligence & machine learning.

13. **Modeling and Simulation for Autonomous Guidance, Navigation and Control (joint GNC/MST)**
The GNC and MST Technical Committees invite papers in modeling and simulations topics in guidance, navigation and control. In particular, papers that address hardware-in-the-loop simulation for GNC algorithm verification, human-in-the-loop modeling and simulation for autonomous systems GNC are encouraged. Advancements in edge computing technologies and human machine interfacing for GNC of autonomous systems are also sought.

Note that submission to this joint track requires adherence to the GNC requirement of a full draft manuscript, which must include sufficient detail to allow informed evaluation by the assigned reviewers. Extended abstracts will be returned without review. Full draft manuscripts must not exceed a total length of 25 pages, formatted in accordance with the AIAA SciTech manuscript template.
Examples of specific topics for this area include the following:

- **Certification/assurance of Flight Control Software:** Hardware in the loop simulations, use of the digital twin for GNC algorithm development and certification.
- **Modeling and Simulation for Autonomy:** Edge computing for autonomous GNC applications, human-machine interfacing for autonomy, human-in-the-loop modeling and simulation for autonomous GNC, agent-based modeling and simulation for autonomous systems GNC.
- **Simulation Techniques for V&V of GN&C Algorithms**: High fidelity modeling and simulation for GNC algorithm testing and verification, testing of learning-based GNC software, hybrid simulation techniques for GNC V&V.

14. **Other Modeling and Simulation Topics**
Not every novel application or advancement of modeling and simulation for aerospace vehicles may be covered in the prior subtopics. Authors may use this subtopic if their work doesn't fit well with other subtopics listed.

Call for Papers

The “AIAA Adaptive Structures“, “Structural Dynamics“ and “Modeling and Simulation“ Technical Committees are sponsoring a Special Session on:

Mr. Martin Brenner Memorial Session

AIAA SciTech 2024

January 8-12, 2024
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This memorial session will celebrate Mr. Martin Brenner contributions to the area of aeroservoelasticity. Over the last thirty plus years, Marty worked many projects including the X-29, F-18 HARV, NASP, X-53, Aerostructures Test Wing and X-56, becoming known as an expert in aeroservoelasticity and performing pioneering research in “fly by feel” (measuring the aerodynamics forces directly on vehicle surfaces) for control of flexible structures. He retired from NASA in 2017.

Marty has pioneered advances in aeroservoelasticity, authoring around 120 papers, three book chapters, and an entire book on “Robust Aeroservoelastic Stability Analysis”. He also holds a patent for a novel flutter prediction methodology, called “Flutterometer”. Throughout his career, Marty had been an advisor and mentor to countless DFRF/DFRC/AFRC engineers. The special session will honor Marty’s contribution to the multidisciplinary field of aeroservoelasticity.

Make sure to select the “Mr Martin Brenner Memorial Session” topic option under “Adaptive Structures“, “Structural Dynamics” or ”Modeling and Simulation” during submission.

For more information, please contact the session organizers:

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