Modeling and Simulation Technologies
Call for Papers
https://www.aiaa.org/aviation/cfp

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Abstract Submission Guidelines

Prospective authors are asked to submit their work electronically through the AIAA Aviation website prior to the published deadline (www.aiaa.org/aviation). Authors may submit either an extended abstract of 1,000 words, or a draft of the paper itself, if available. 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.

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.

Topic Areas of Interest

Authors are invited to submit technical papers which address topics either directly in or in support of modeling and simulation, 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, human-machine interface, and novel data processing and visualization techniques applied to (human-in-the-loop) simulations are of special interest.

3. **Human-in-the-Loop Simulation of Air Traffic Management**
Papers are sought that describe the use of human-in-the-loop (HITL) simulations in air traffic management concept development, testing, and analysis. Topics of interest include, but are not limited to, HITL 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. **Modeling and Simulation of Air Traffic Management (ATM)**
Papers are sought that explore the use of simulation and modeling of 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. Of special interest is the concept validation of Trajectory Based Operations (TBO), Time-Based Flow Management (TBFM), terminal operations, and Traffic Management Initiatives (TMIs), etc.

5. **Modeling and Simulation of New Entrant Integration into the National Airspace System**
Papers are sought where various modeling and/or simulation techniques have been used to help further the understanding of new entrant integration into the national airspace system (NAS). This topic includes new entrants at high altitudes, such as super supersonic aircraft, as

well as new entrants at lower altitudes such as Urban Air Mobility (UAM) vehicles and small uninhabited aerial systems (UAS). The use of modeling and simulation for new entrant integration is key to understanding its implications on the NAS.

6. Modeling and Simulation of UAS Traffic Management (UTM)

Papers are sought that describe the use of flight simulations in UAS Traffic Management concept development, testing, and analysis. Topics of interest include, but are not limited to, simulation studies that investigate UTM concepts including the interplay of autonomous vehicles and UTM, airspace and traffic modeling methods for UTM operations, and model validation and verification experiences and methods.

7. Modeling, Simulation, Machine Learning, and Optimization for Air Traffic Performance

Papers are sought on the use of Machine Learning, Agent-based modeling and Artificial Intelligence in support of real-time simulation and/or decision support of national airspace system (NAS) performance. Topics of interest include, but are not limited to, machine learning for real-time constraint prediction; modeling and simulation of multi-stakeholder interactions, negotiations, and cooperation; artificial intelligence for control of TMIs; terminal area management; etc.

8. Human-in-the-Loop Simulation of Uninhabited Aerial Systems

Papers are sought on human-in-the-loop 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.

9. 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.

10. Model-Based Design, X-in-the-Loop Simulation, and LVC (Live, Virtual, and Constructive) Simulation

Model-based development is an emerging approach to engineering that positions models as the core assets of systems development. Papers are sought that describe novel approaches and new tools in model-based development in the aerospace field. Furthermore, 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. Finally, combining constructive simulations, virtual simulators, and live vehicles & environments (LVC) permits the

blending of engineering, test, training, and operations activities to achieve shortened lifecycles, 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.

11. **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.

12. **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.

13. **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.

14. <u>Simulator Hardware and Facilities</u>

Papers are sought involving all aspects in the design, development, and use of motion systems, visual systems, active inceptors, novel cueing technologies, 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.