

AIAA Atmospheric Flight Mechanics (AFM)

Call for Papers

AIAA Science and Technology Forum and Exhibition (SciTech)
23-27 January 2023
Gaylord National Harbor, National Harbor, MD
www.aiaa.org/scitech/

The Atmospheric Flight Mechanics (AFM) sessions provide opportunities for presentation and discussion by members from industry, government, and academia about all technical areas related to atmospheric flight. Topics include but are not limited to vehicle dynamics, aerodynamics, handling and flying qualities, system identification, flight testing, launch vehicles, urban air mobility concepts, reentry and aeroassist vehicles, and novel vehicle configurations. Traditional technical sessions consist of formal presentations followed by informal discussions, which are intended to create a technical dialogue and cultivate professional relationships.

Selection for the traditional technical sessions will be based on full-length draft manuscripts of proposed technical papers. Proposals and submissions for possible invited sessions, workshops, and non-traditional sessions are also welcomed and encouraged. Papers that are primarily authored by students are also eligible for the AFM Student Paper Competition.

For additional details on submission guidelines, student paper competition, session information, and technical areas, see below. More information regarding the conference, activities of the AFM technical committee, presentation guidelines, and other topics is also available from the AFM website, www.aiaaafm.com.

Please direct any questions and comments to the conference organizers:

Technical Discipline Chair

Ye Lu
Kent State University
ylu16@kent.edu

Technical Discipline Co-Chair

Soumyo Dutta
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Draft Manuscript Submission Guidelines

Draft Manuscript Deadline: 01 June 2022

Final Paper Deadline: 05 December 2022

Submission: www.aiaa.org/scitech

Paper selection will be based on full-length draft manuscripts of the proposed technical papers. Draft manuscripts must use the current [AIAA conference paper template](#) (either in MS Word or LaTeX), which begins with a 100- to 200-word abstract, followed by an introduction that provides a brief assessment of prior work by others and an explanation of the main contributions of the paper. The body of the draft manuscript must include sufficient detail on the methodology and results to allow for an informed evaluation of the paper. Draft manuscripts must be unclassified, and authors are responsible for securing prior approval for public release. Submissions not meeting the above criteria will not be accepted.

Special Sessions

Invited Sessions, Workshops, and Non-Traditional Sessions

(Email) Proposal Deadline: 30 April 2022

Approval/Denial of Special Sessions: 16 May 2022

Invited sessions, workshops, and non-traditional sessions are solicited in any of the technical areas listed below, as well as in other related and new or emerging areas. Proposed sessions should have a cohesive focus on a particular topic. The guest organizer is responsible for contacting and confirming all speakers in advance, as well as obtaining approval for the session from the AFM technical discipline chairs before the submission deadline. Proposals should be emailed to the discipline chairs and must include a session title, a summary abstract of the session topic, and a list of anticipated authors/speakers. Upon approval, session authors must submit 200- to 300- word abstracts through the conference website by the regular submission deadline (01 June 2022). Papers may be moved to or from traditional sessions as scheduling dictates.

Invited sessions are assembled by a guest organizer around a specific topic of interest. These sessions take on a traditional session format, which includes a technical presentation and discussion.

Workshops may be conducted on a more informal basis to promote discussion during the session. Workshop presentations may be given without written manuscripts if deemed appropriate by the guest organizer in consultation with the technical discipline chairs. For presentation-only workshops, no abstracts are required.

The AFM technical discipline chairs are also open to submissions for non-traditional sessions. Formats for these sessions include but are not limited to debates, tutorials on relevant topics, roundtable discussions, and others.

AFM Student Paper Competition

The AFM Technical Committee, with the support of Calspan Corporation, is sponsoring the AFM Student Paper Competition. Eligible written papers and oral presentations will be judged by members of the AFM Technical Committee. The competition is within the AFM conference and not part of the larger SciTech Forum and Exhibition. The winner of the competition will be notified after the conference and receive both a certificate and a \$500 award.



To be eligible for the competition, the entrant must be the primary author of the submitted paper and the work must have been performed while the author was a student. As such, recent graduates may still be eligible. Entrants will present their papers in the AFM technical sessions, where judges will also be in attendance. To enter the competition, the "Student Paper Competition" option must be selected instead of "Technical Manuscript" when submitting a manuscript via the conference website. Note that when entering the Student Paper Competition, the paper is still published and scheduled within the technical sessions, as normal. Papers are due by the regular final manuscript deadline (05 December 2022).

The scoring for the award will be equally based on the written paper and oral presentation. Judging of the written paper is based on the criteria:

1. Relevance of the topic to atmospheric flight mechanics
2. Organization and clarity
3. Appreciation of relevant technical issues and sources of error
4. Meaningful conclusions of the research.

Judging of the oral presentation is based on the criteria:

1. Background and problem definition statement
2. Explanation of technical approach
3. Explanation of research results

Entrants will be contacted via email after the conference to announce the winner and provide anonymous feedback on the oral presentation and written paper from the judges. For inquiries regarding the Atmospheric Flight Mechanics Student Paper Competition, please contact the competition chairs:

Student Paper Competition Co-Chair

Andrea Da Ronch
University of Southampton
a.da-ronch@soton.ac.uk

Student Paper Competition Co-Chair

Yunjun Xu
University of Central Florida
yunjun.xu@ucf.edu

Technical Areas

The Atmospheric Flight Mechanics Committee solicits papers related to atmospheric flight mechanics across all disciplines (including flight performance, flight and ground test, flying and handling qualities, system identification, etc.), across all flight regimes and missions (including formation flying, gliding and powered flight, planetary aeroassist, etc.), and across all vehicle types and configurations (including conventional aircraft, rotorcraft, multirotor vehicles, urban air mobility concepts, vertical and short take-off aircraft, unmanned aerial vehicles, electric aircraft, biomimetic vehicles, hypersonic and aeroassist vehicles, launch vehicles, missiles, projectiles, aerodynamic decelerators, etc.). Papers are also encouraged that discuss education in atmospheric flight mechanics, multidisciplinary efforts, and projects with international collaboration. The areas of interest above will be organized into the following broad topic areas:

- **Aerodynamic Prediction Methods** — Aspects of modeling aerodynamics as related to atmospheric flight mechanics. Subtopics include first-principles theory, computational fluid dynamics, panel methods, wind tunnel experiments, stability and control derivative predictions, unsteady aerodynamics, aerodynamics at high angles of attack and/or sideslip, global/nonlinear aerodynamic models, effectiveness of aerodynamic control effectors, model reduction techniques, and others.
- **Aeroservoelasticity** — Topics relating to the interactions between the aircraft structural dynamics and the aerodynamic loads, which pertain to atmospheric flight mechanics. Subtopics include modeling, unsteady models, rational function approximations, computational models, quasi-steady stability derivatives, flutter predictions and tests, simulation studies, wind tunnel or flight tests, vehicle optimization, ground vibration tests, finite element modeling, novel sensors for feedback or identification, aspects for control of aeroelastic vehicles, and others.
- **Aircraft Dynamics, Performance, Stability, and Control** — Interaction between aerodynamics and aircraft motion across the flight spectrum, as related to atmospheric flight mechanics. Subtopics may include effects of aircraft configuration, air data systems, store separation, determination of stability and control derivatives and analysis, departure prevention and spin characteristics, response and control of disturbances, trajectory optimization, linear and nonlinear modeling, effects of icing, and hazardous weather, turbulence modeling, and others.
- **Handling Qualities and Flying Qualities** — Topics related to the handling qualities and flying qualities of aircraft. Subtopics include aircraft-pilot coupling phenomena, controllers with associated aerodynamic and feel characteristics, displays with associated lag characteristics/placement/adequacy, and pilot-vehicle interface in general. Because pilot opinion is the final determination of flying qualities, papers are sought on the design of specific simulation and flight test maneuvers for flying-qualities evaluation. Other topics include development and validation of criteria, design tools and procedures to satisfy criteria, techniques to analyze and verify compliance on highly augmented and highly maneuverable aircraft, flying qualities of unmanned aircraft, flying qualities of STOVL aircraft transitioning between flight regimes, and others.

- **Hypersonic and Spacecraft Flight Mechanics** — Aspects of atmospheric flight mechanics related to hypersonic aircraft and spacecraft. Subtopics include hypersonic flight mechanics, changes in aerodynamic models with Mach number, trajectory optimizations and simulation, reentry dynamics, scheduling and control allocation of aerodynamic control effectors, and others.
- **Launch Vehicle, Missile, and Projectile Flight Mechanics** — Topics of atmospheric flight mechanics related to launch vehicles, missiles, and projectiles. Subtopics include dynamics of entry and aerocapture, computational aerothermodynamics, aeroassisted orbit transfer, tethered satellite applications, maneuvering of reentry vehicles, low-density atmospheric flight mechanics, stabilized missiles and projectiles, application of computational methodologies to the prediction of aerodynamic characteristics, launch dynamics, estimation of dynamic stability and control derivatives, trajectory optimization and simulation, analysis of flight test data, and others.
- **System Identification and Flight Test** — Extracting models and information from empirical data, such as from flight test, wind tunnel runs, numerical experiments, etc. Subtopics include time-dependent effects, novel sensors or information for identification, parameter estimation, machine learning and neural networks, nonlinear models or stitching of local linear models, optimized inputs, model structure determination, novel maneuver or experiment design, effects of feedback, real-time identification and efficient test techniques, fault detection, data analysis, flight path reconstruction, results obtained for interesting vehicle configurations, and others.
- **Unique Aircraft Configurations** — Atmospheric flight mechanics as related to aircraft with novel and nonconventional configurations. Subtopics may include multicopter vehicles, quadrotors, urban air mobility concepts, unmanned air vehicles, biomimetic or bio-inspired aircraft, flapping-wing aircraft, perching maneuvers, monocoverters, cyclocoverters, boxed- or closed-wing concepts, distribution propulsion configurations, tilt-rotor or STOVL aircraft, and others.
- **Special Session: X-62 VISTA** — This is an invited session. The X-62 VISTA is an in-flight simulator capable of supporting autonomy flight testing. This session highlights the completely redesigned flight simulation system on VISTA and the unique flight testing required to return the X-62 VISTA to operational status. Highlights from some of the initial autonomy testing conducted on VISTA will also be presented. For any questions, please contact the Guest Organizer, M. Christopher Cotting.
 - Guest Organizer**
 - M. Christopher Cotting
 - USAF Test Pilot School
 - Malcolm.Cotting@us.af.mil
- **Special Session: University Consortium for Applied Hypersonics (UCAH)** — This is a joint session co-hosted by AFM and Applied Aerodynamics TC. Papers that are relevant to AFM and UCAH topics below are being solicited. UCAH topics include the following: (1) Materials Structure and Thermal Protection Systems (2) Guidance

Navigation and Control (3) Air Breathing Propulsion (4) Applied Aerodynamics (5) Phenomenology (6) Energetics (solid fuel / ordnance etc.) (7) Ground / Flight Test (8) Modeling and Simulation. For any questions about this special session, please contact Daniel Marren at:

Daniel.E.Marren.ctr@mail.mil

Dan@MarrenAssociatesLLC.com

- **Other AFM Topics of Interest** — Other topics related to the broad category of atmospheric flight mechanics that do not fall under the other technical areas.
- **Special Sessions** — Invited sessions, workshops, and non-traditional sessions as described above