



La Société Savante de l'Aéronautique et de l'Espace (3AF)

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3AF - Commission Aérodynamique

## Guest editorial

### **Aerodynamics at off-design conditions 54th 3AF International conference on applied aerodynamics (AERO2019)**

The 3AF-International Conference on Applied Aerodynamics is organized each year by the French Aeronautics and Astronautics Society (3AF) in a different venue in France known for its activities in the field of aeronautics and/or space technology. The conference is an excellent opportunity for scientific exchanges within the aerospace community where aerodynamicists from industry, research institutions and academia meet. Scientists and engineers from other fields involving fluid mechanics are also welcome.

Every year the conference addresses a different topic trending in the field of aerodynamics. It is organized on the basis of five half-day of technical presentations, each introduced by a keynote conference given by a highly recognized expert in the field covered during the session. The conference is concluded by a technical visit in connection with the conference subject.

In 2019, the conference was hosted by the Conservatoire National des Arts et Métiers (CNAM) in Paris. This 54th 3AF International Conference on Applied Aerodynamics focuses on complex flow behavior at off-design conditions, which may or may not be planned. This includes conditions on the edge of the flight envelope: high speed/altitude/AoA as well as take-off and landing conditions. The design of aircraft and rotorcraft is bound to take into account those cases, where the system endures high constraints. Similarly, terrestrial vehicles are designed to withstand tunnel and overtaking effects, and spacecraft to withstand atmospheric entry. Unexpected conditions may also appear, when the flight envelope is overreached for instance. Weather and environmental conditions may be unpredictable and particularly harsh: gusts and crosswinds may make take-off and landing harder or even prevent them; icing conditions are a source of incidents or accidents, as well as sand and bird ingestion, foreign objects, sand, volcanic ash. All these conditions are source of risks and imply complex phenomena which are challenging for CFD, experimental and theoretical studies. A deeper knowledge of such extreme conditions is thus crucial to avoid undesirable or catastrophic events, despite the complexity of the flow phenomena which presents serious challenges to the traditional experimental, theoretical and numerical analysis.

Among the many aspects of the problem, the following items were considered: low- and high-speed buffet, operation at high angle of incidence and stall, ground effect, unsteady and transient



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conditions, flight at high altitude/high speed, take-off and landing, space launcher at lift-off conditions, gust and crosswind/wind effects on building, ice accretion and droplet impact.

This special issue of the *International Journal of Numerical Methods for Heat and Fluid Flow* presents a selection of articles based on the most instructive contributions to the conference AERO2019.

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