



## Airplane ice accretion simulation with FlowVision CFD multiphase IceVision module

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### Abstract:

#### Introduction

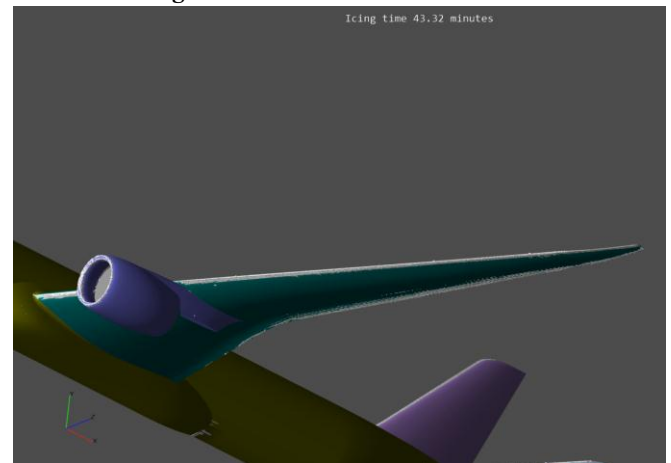
The certification procedure of transport airplanes flights under icing conditions requires the aerodynamic tests of (1) airplanes models in wind tunnels and (2) real airplanes flight test. The airplane ice accretion simulation aims to dimension and to shape the ice forming on the airplane surfaces based on the multiphase approach developed for ice accretion created on the airplane surfaces. The method is implemented in CFD software FlowVision, as the IceVision module, already in use by numerous companies and universities. The IceVision specificity, when compared to commonly used software tools simulating ice accretion, is based on the ice shape change calculated with the VOF technology for simulating the air and ice two-phases. This algorithm implies continuous ice growth considering simultaneously the external two-phase airflow, ice heating and contact surface motion applying automatic local remeshing. The implemented mathematical model is capable to simulate the formation of rime (dry) and glaze (wet) ice.

#### Conclusion

The IceVision module is validated on several ice accretion tests: (1) on cylinder in dry and wet conditions, (2) on airfoil NACA0012 in dry regime and (3) on 3-dimensional surface of the transport aircraft. For the first and second test, the numerical results are validated against experimental data and the comparison is done with other icing codes. For the third test, the performed analysis shows in details the formed ice shapes on the aircraft control surfaces.

Keywords: icing, supercooled water droplets, aircraft surface, collection efficiency, VOF

#### Relevant Image:



#### Biography:

Dean Vučinić, has joined Vesalius College (VeCo) in 2017, which is affiliated to the Vrije Universiteit Brussel (VUB). He has been affiliated to VUB since 1988. Before joining VeCo, he was guest professor and senior research scientist at the VUB Faculty of Engineering Sciences (IR), as member of its 2 departments: Mechanical Engineering (MECH) and Electronics & Informatics (ETRO). He is also the visiting associate professor at the Faculty of Electrical Engineering, Computer Science and Information Technology (FERIT), University of Osijek, Croatia, at the department of Software Engineering.