

UAV/RPAS

Development of operating performance in icing conditions

beyond the obvious

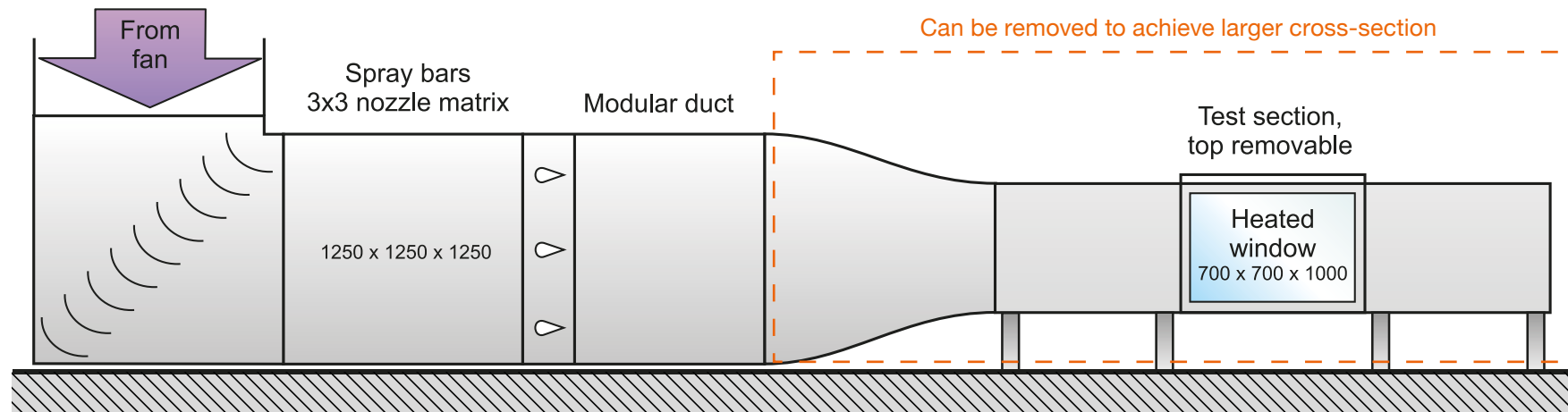
UAV / RPAS Performance in Icing Conditions

VTT Icing Wind Tunnel (IWT) facility serves the testing and verification needs of UAV / RPAS manufacturers and operators. We provide a unique infrastructure for testing, optimization; and validation & certification. Wide variety of validated operating conditions including in-cloud icing and freezing rain can be selected according to customer needs. The tunnel is located inside a temperature-controlled climatic chamber, which allows easy handling of test specimen.

UAVS with MTOW up to approximately 2 kg may fly free in the chamber room, or alternatively be attached to a test stand. Larger drones are secured to a test stand during the tests.

Examples of tests

- Icing of isolated rotor on dynamometer
- Complete drone or subsystems
- Air intake assembly
- Customer specific assembly
- Icing performance of coatings
- 2D airfoil ice accretion
- Anti- & De-icing systems
- Battery / system performance in cold or wet conditions

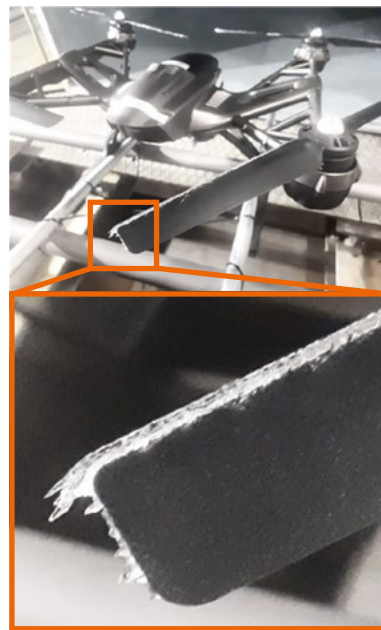


Property	Range in the facility	VTT's Reference conditions	
		In-cloud icing, stationary components	In-cloud icing, wind turbine rotor blades
Temperature [°C]	-25...+30	-5	-5
Wind speed [m/s] 1	0...50	7	40
Water content, LWC [g/m ³]	0,1...1,0	0,2	0,2
Droplet size, MVD [μm] 2	12...30	16...17	16...17
Turbulence intensity, TI [%] longitudinal component		1,3	0,6
Rain intensity [mm/h]	1...6	MIL-STD-810G	

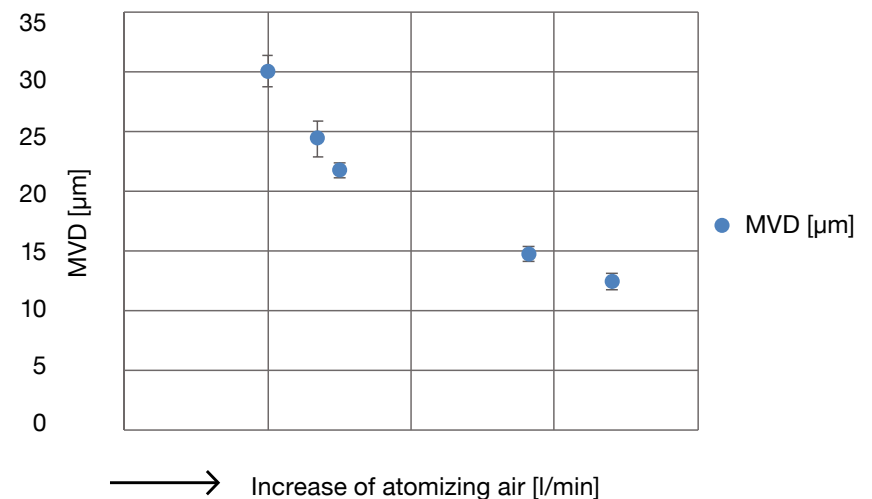
Droplet size (MVD) has been validated 05-08/2018 by Finnish Meteorological Institute (FMI), University of Oulu and Technical University of Denmark (DTU). Operational conditions in the icing wind tunnel are calibrated with the method which is described in the ISO 12494 international standard "Atmospheric icing of structures".

- 1) Wind speed up to 20 m/s can be achieved continuously. Wind speed between 20 – 50 m/s can be achieved for shorter periods and has to be assessed case by case.
- 2) Icing wind tunnel can be operated in typical or severe icing conditions and droplet size level can be tuned according to customer requirements.

UAV rotor ice accretion.



Validated droplet size regime in the icing wind tunnel test section



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