

SAE INTERNATIONAL

**THE ART AND SCIENCE OF
COMPROMISE:
AIRCRAFT ANTI-ICING FLUID
STANDARD DEVELOPMENT**

EASA Annual Safety Conference
Jacques Leroux
15 October 2013



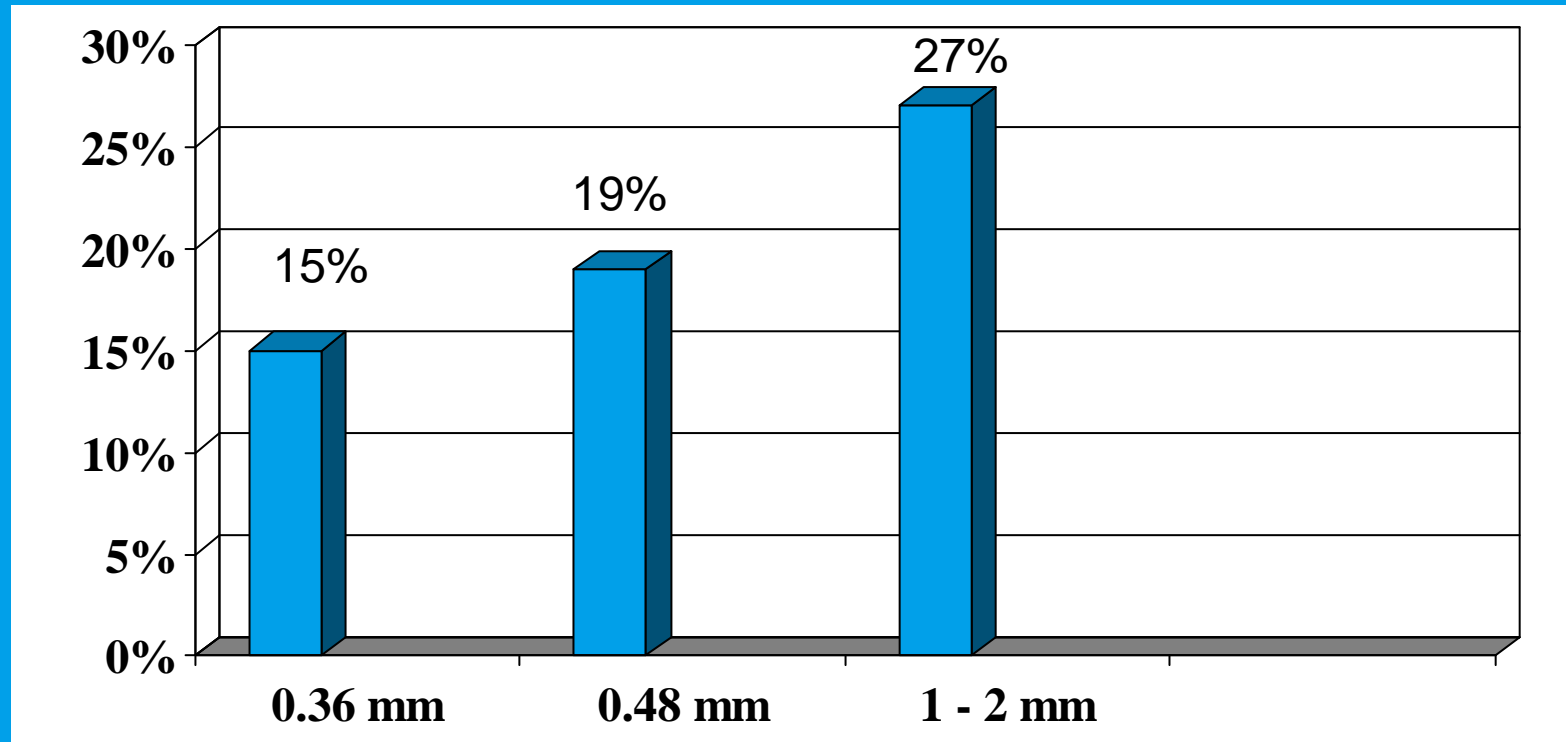
Outline

- Reason for anti-icing (thickened) fluids
- Differences between Type I, II and IV Fluids
- Development of Standards
- Qualification of fluids by manufacturers
- Recognition of standards by the FAA and Transport Canada
- How to participate in standard development?



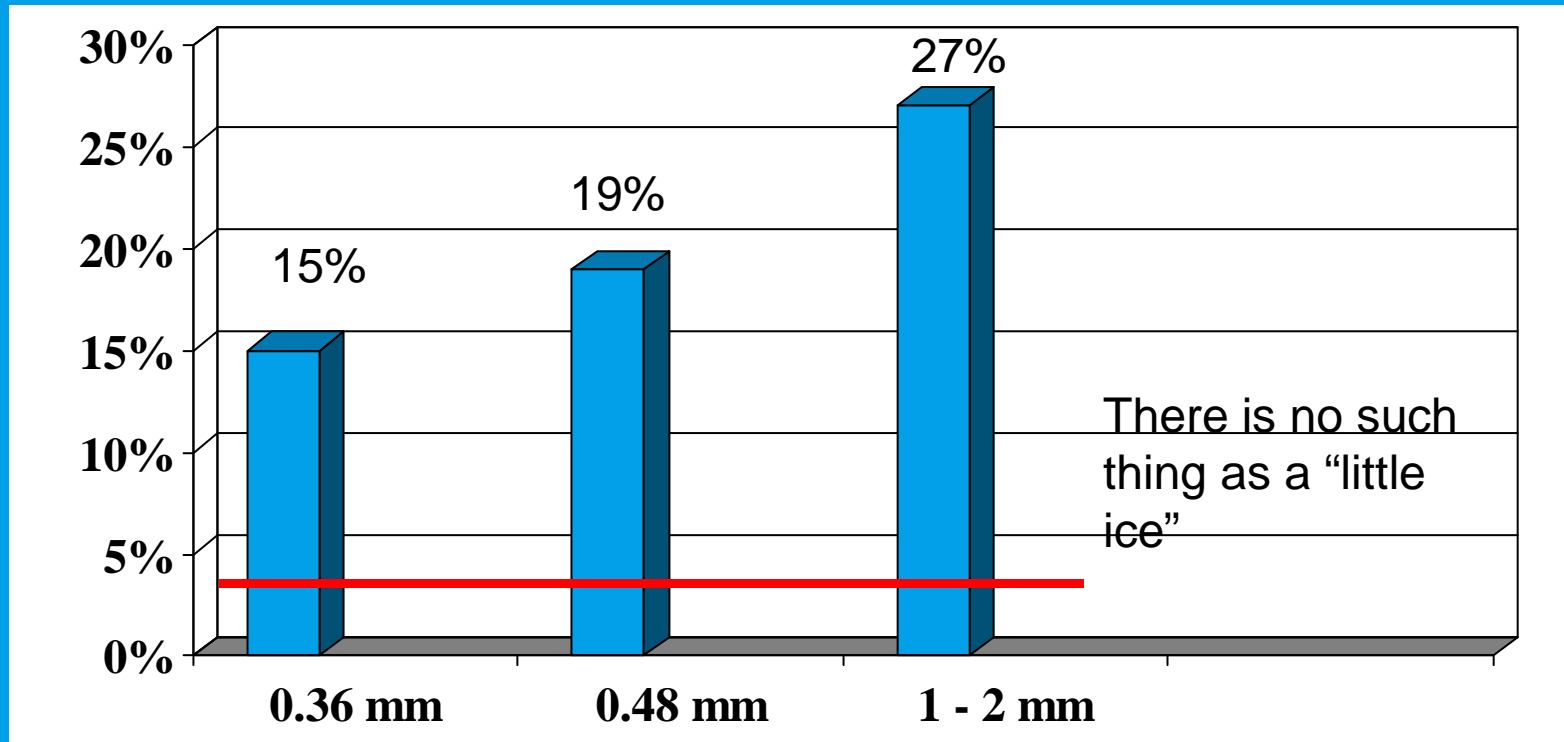
Lift Loss vs. Roughness

(aircraft dependent)



Lift Loss vs. Roughness

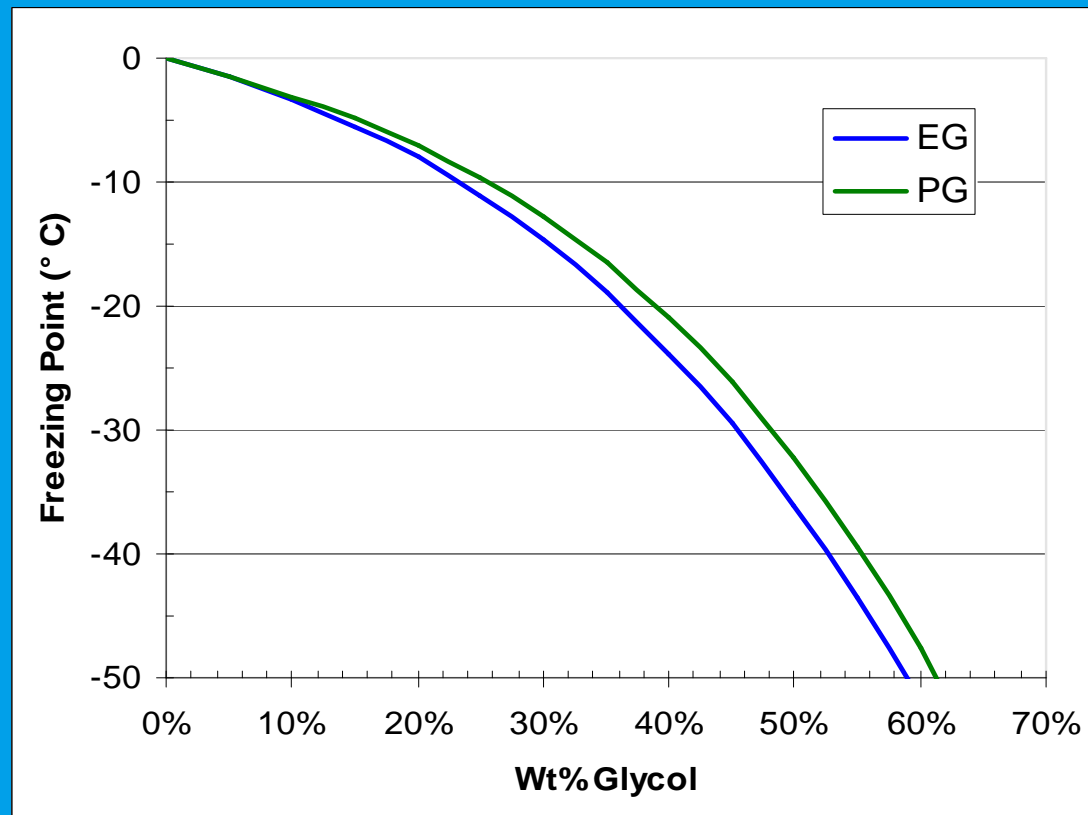
(aircraft dependent)



Examples of Roughness

- Snow
- Ice
- Frost
- Slush (water and ice)

Freezing Point vs. Percent Glycol



WHY Anti-icing?

TIME

How to Buy Time

Idea

Consequence

Thick Layer →

Longer Protection

High Viscosity →

Thick Layer

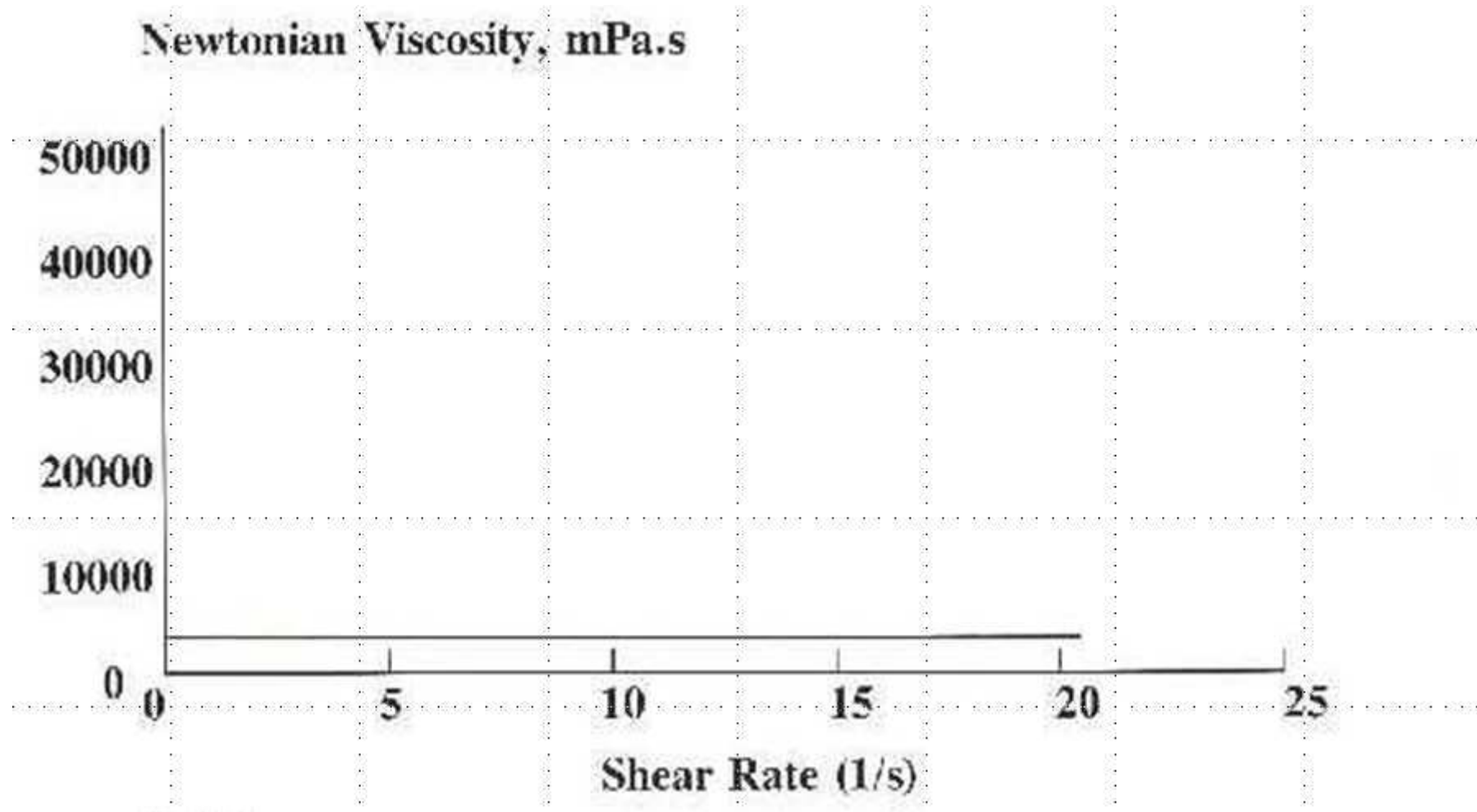
Thick Layer →

Roughness

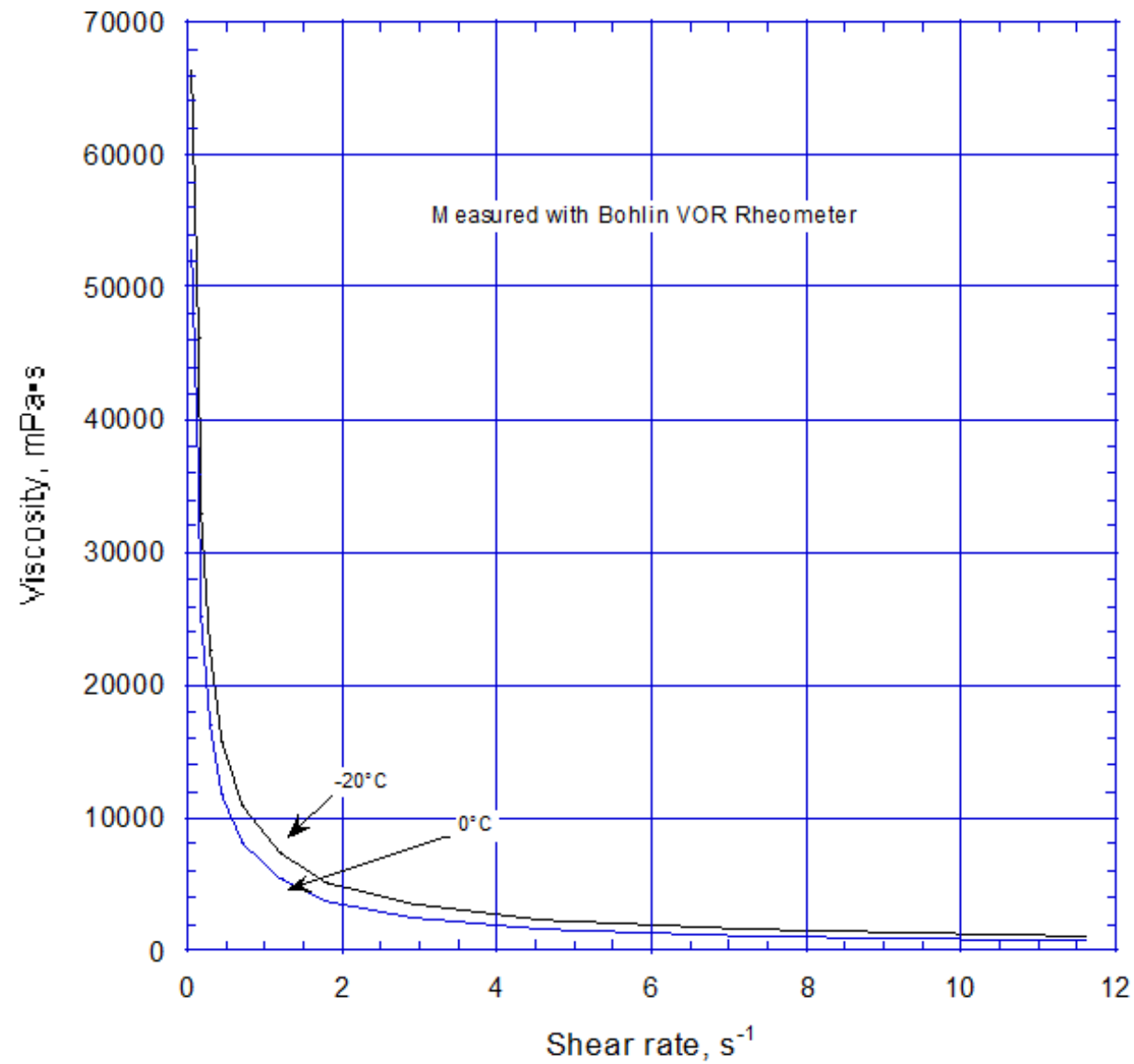
Roughness →

Lift Loss!

SAE AMS 1424 Type I Fluid Viscosity



SAE AMS 1428 Type IV Typical Viscosity



Deicing vs. Anti-icing

Deicing: The process of REMOVING snow, frost, and ice.

Anti-icing: A means of PROTECTION for a LIMITED TIME against precipitation.

Fluid Composition

Deicing

- Water
- Freezing Point
Depressant (Glycol)
- Corrosion Inhibitors
- Wetting Agents
- Dye

Anti-icing

- Water
- Freezing Point
Depressant (Glycol)
- Corrosion Inhibitors
- Wetting Agents
- Dye
- Thickeners

Fluid Specifications

Deicing

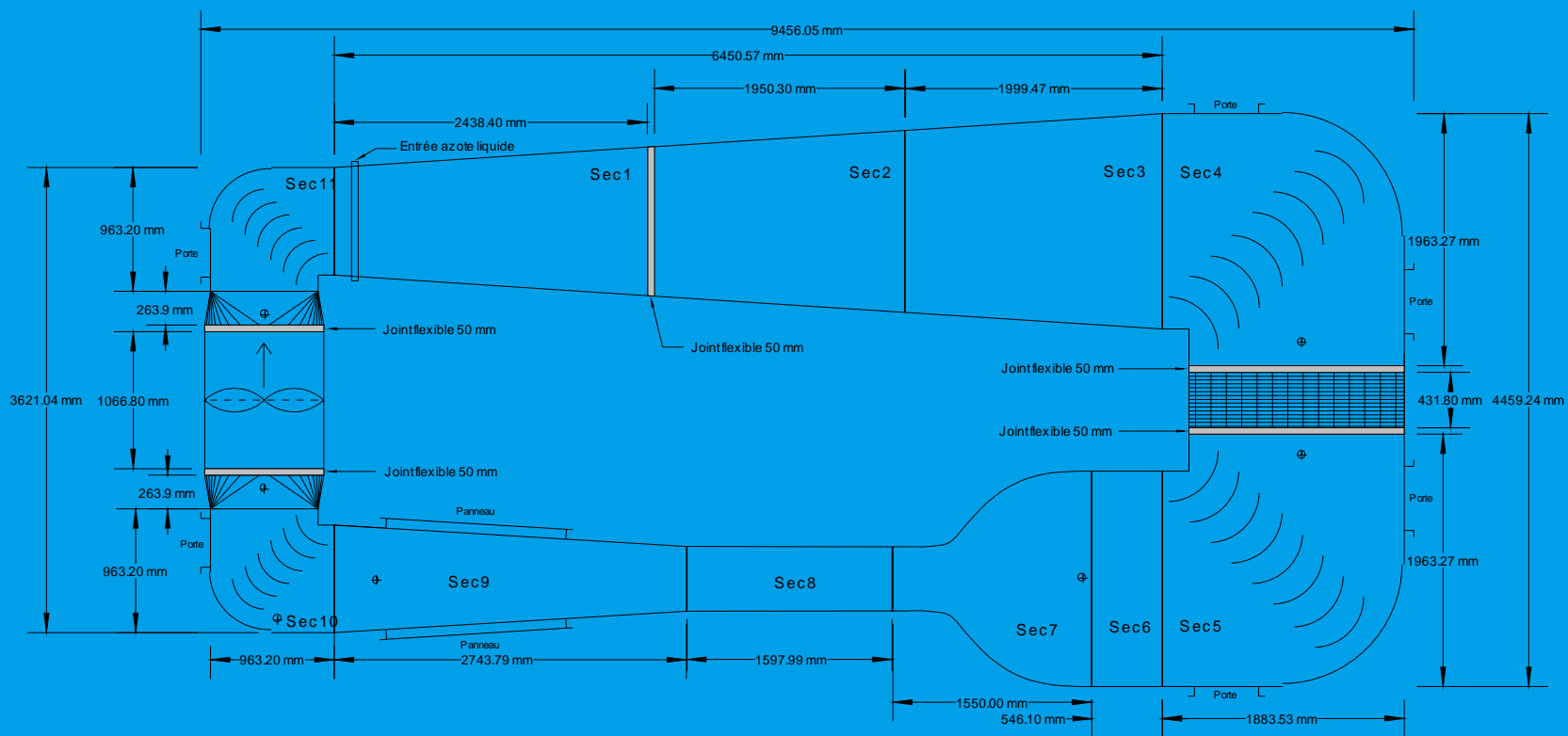
**SAE AMS 1424
Type I**

**Anti-icing (Thickened
Fluids)**

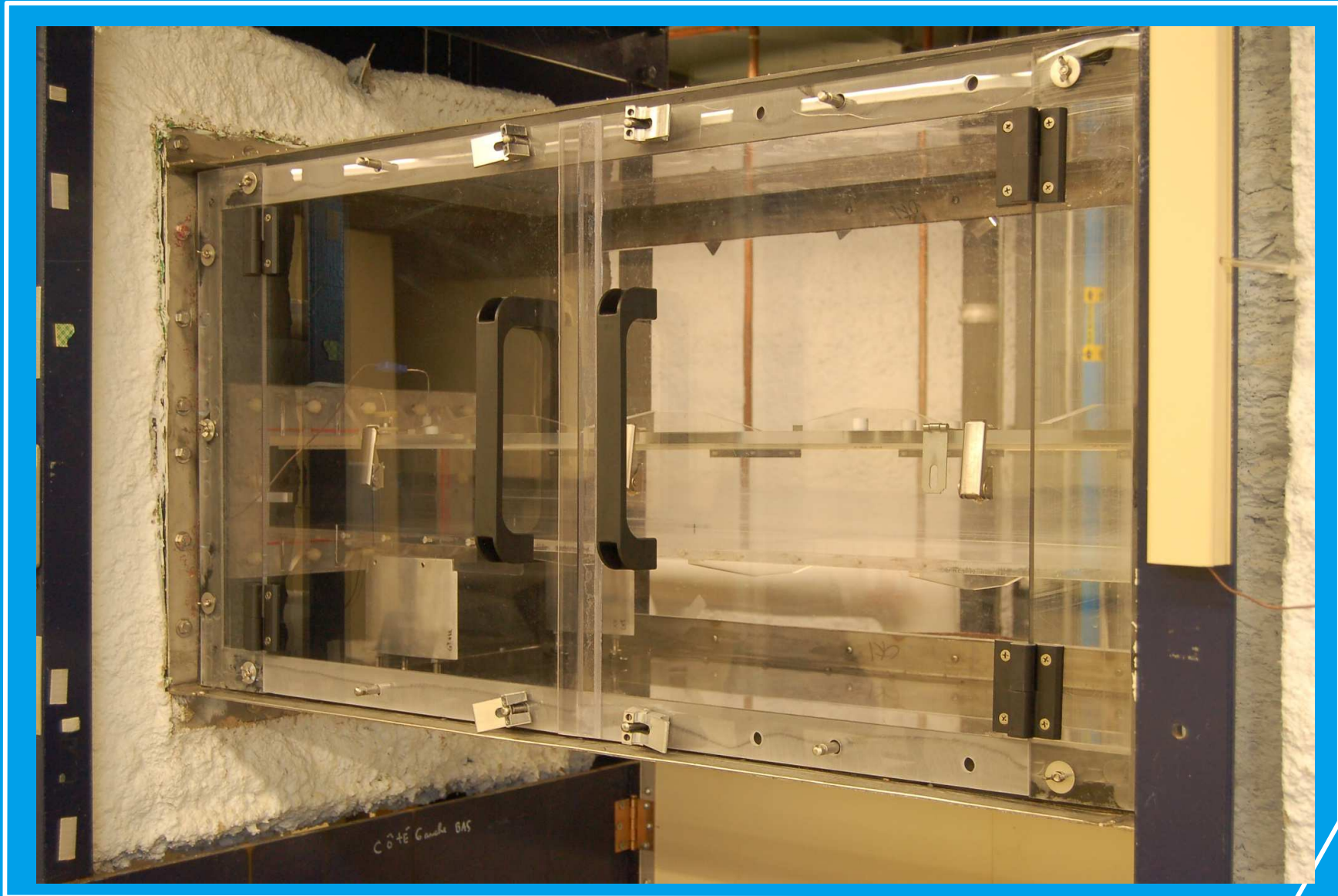
**SAE AMS 1428
Type II, III or IV**

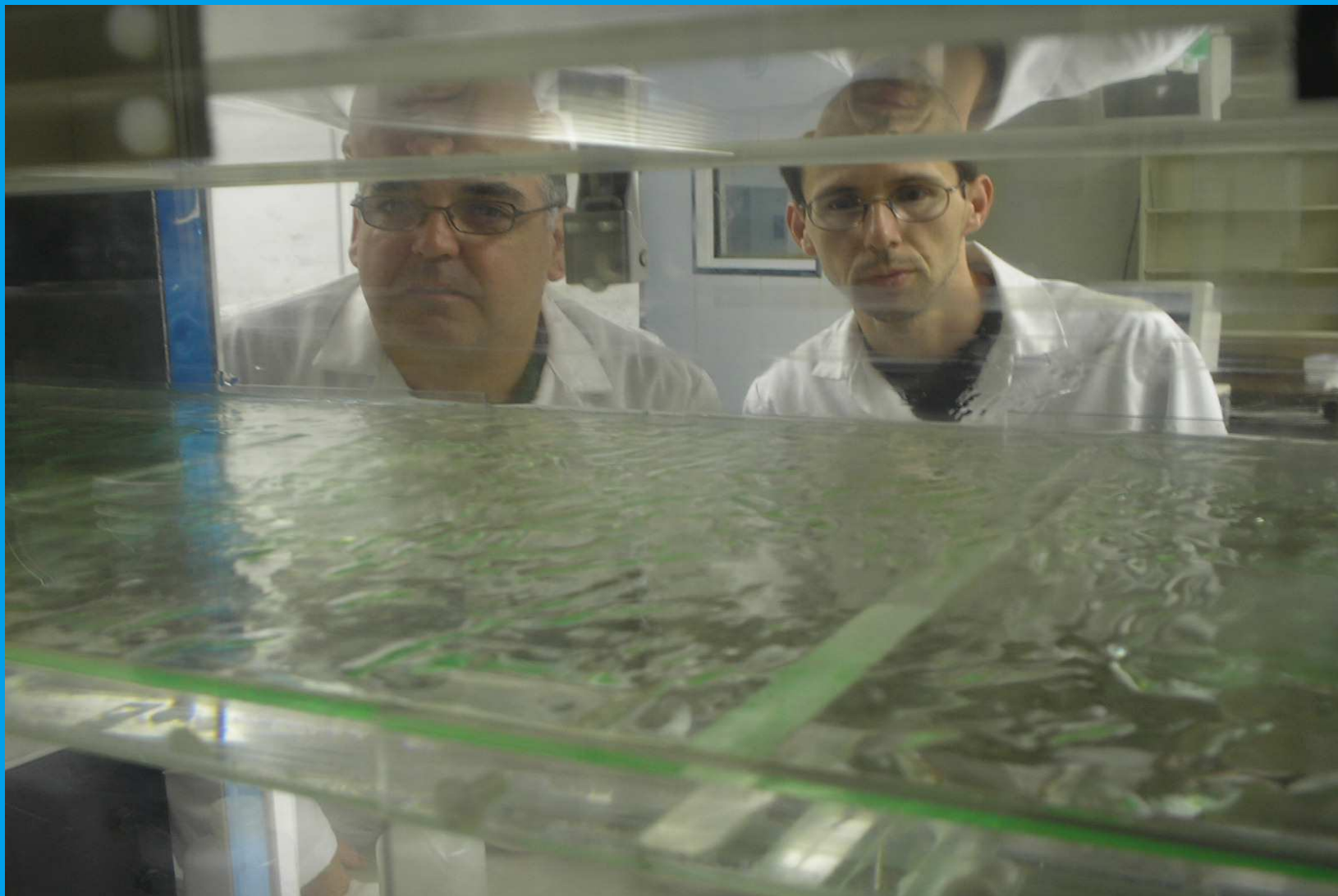
Performance Properties

- **Aerodynamics Acceptance Test**
- Water Spray Endurance Time
- High Humidity Endurance Time
- Materials Compatibility



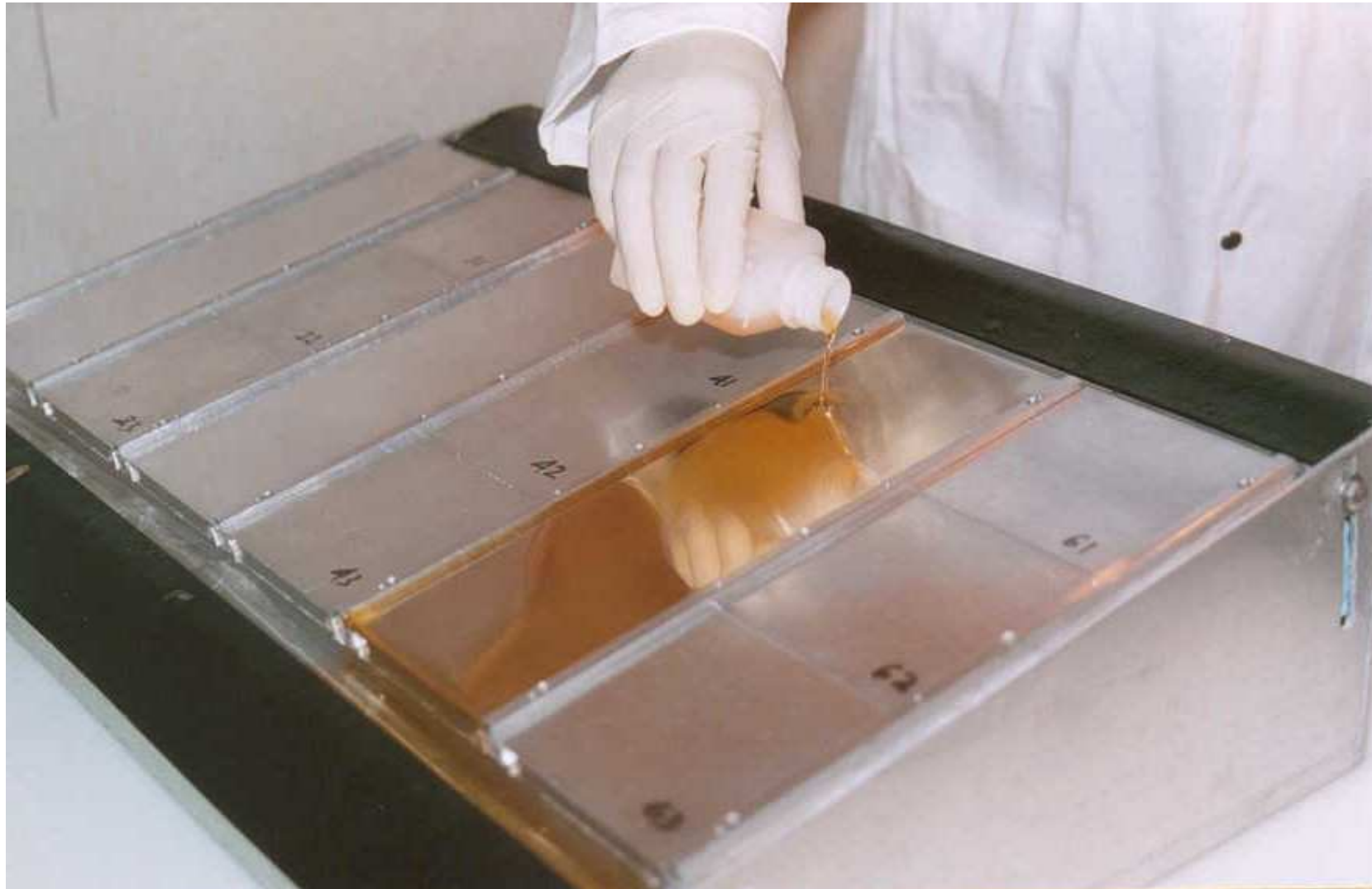






Performance Properties

- Aerodynamics Acceptance Test
- Water Spray Endurance Time**
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- Materials Compatibility





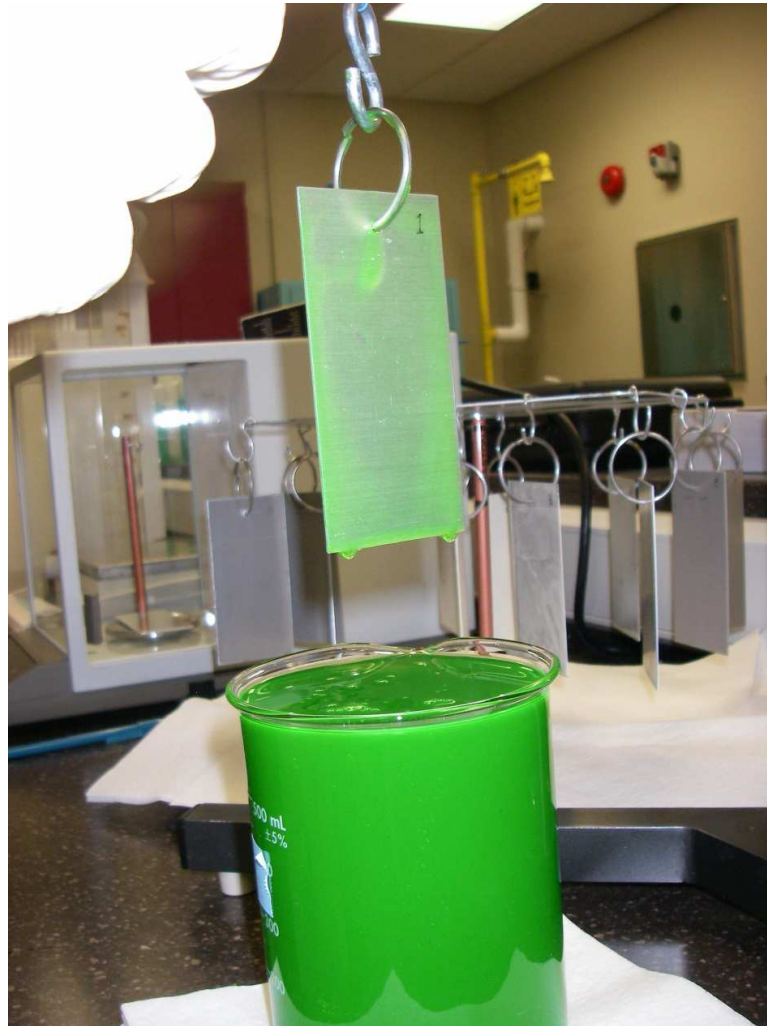
COMPARISON

	Deicing Type I	Anti-icing Type III	Anti-icing Type II	Anti-icing Type IV
Rotation Speed	High/Low	Low	High	High
WSET minutes	3	20	30	80
Color	Orange	Bright Yellow	Colorless/ Straw	Green

Fluid Qualification by Independent Laboratories

- AMIL: Water Spray Endurance Time, High Humidity Endurance Time, Successive Dry-out and Rehydration
- APS Aviation on behalf of FAA and Transport Canada: Endurance Time Testing
- SMI: Materials Compatibility

Successive Dry-out and Rehydration (AMIL)



Endurance Time Testing (APS Aviation)

NRC Climatic Engineering Facility



Outside View

Endurance Time Testing (APS Aviation)



Inside Views



Total Immersion Corrosion (SMI Inc.)



SAE Participants

- Airlines, Service Providers
- Regulators (EASA, FAA, TC, CAAC)
- Laboratories
- Associations (AEA, A4A), Individuals

Regulators

- Chair the Holdover Time Committee
- FAA and TC publish a list of fluids fulfilling SAE Aerodynamics and WSET requirements
- FAA and TC publish Holdover Time Guidelines



Thanks

- Alberto Fernandez Lopez, EASA
- SAE G-12 members
- Dow Chemical Canada ULC

