



# FLIGHT IN ICING

# CONDITIONS

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# REFERENCES

- Excerpts From the Aeronautical Information Manual
  - Chapter 7: Safety of Flight
  - Section 1: Meteorology
  - 7-1-21 PIREPs Relating to Airframe Icing
- Icing research flights using the MU-2 as the test aircraft
  - Natural icing conditions
  - Tanker tests
  - Ice shape tests
- Mitsubishi YET Icing Training Video (SLD)

# Icing Certification

- “Certified Into Known Icing Conditions”
  - Icing Certification Criteria
- Appendix C (14CFR, Part 25 and 29)
  - Liquid water content
  - Mean effective drop diameter (MED)  
Supercooled
  - Cloud horizontal extent

The background of the slide is a grayscale aerial photograph of a mountainous, snow-covered landscape. The terrain is rugged with various ridges and valleys. In the lower right portion of the image, a small, white, rectangular cabin or structure is visible on a relatively flat, snow-covered patch. The overall scene is desolate and high-altitude.

**Icing info.mp4 video**



# EFFECTS OF AIRFRAME ICING

- Cumulative
- Thrust is reduced
- Drag is increased
- Lift is degraded
- Weight is increased
- Increase in stall speed and deterioration of aircraft performance
- Power available vs power required

The background of the slide is a grayscale aerial photograph of a mountainous, snowy landscape. The mountains are rugged and covered in snow, with some dark patches of rock or vegetation visible. In the lower right portion of the image, a small, white cabin or building is situated on a slope. The sky is a clear, light blue. A large white rounded rectangle is centered on the slide, containing the text.

# **Power vs Power.mp4 video**

# GROUND ICING

- Preflight all surfaces
  - Visual and feel if necessary
- Seriously affects lifting surface of the wing and tail
  - Must be removed prior to flight
- Ground de-icing is always recommended
  - Liquid de-icing
  - Hangar

# PROPELLER ICING

- Effects can be significant
  - Large droplet
  - Uplifted moisture
- Rapid loss of thrust / airspeed
- Pilot action
  - Full RPM
  - Counter loss of airspeed with pitch
  - Change altitude or direction
- Propeller icing tests



The image features a central white rounded rectangle with the text "Prop Ice.mp4 video" in a bold, black, sans-serif font. The background is a grayscale aerial photograph of a rugged, snow-covered mountain range. In the lower right portion of the background image, a small, light-colored aircraft is visible on a flat, snow-covered area. The top of the image is a solid blue gradient.

**Prop Ice.mp4 video**

# ICE CONTAMINATED TAIL STALL (ICTS)

- Does not apply to all aircraft types and/or configurations
- Results in loss of elevator control during full flaps extension with a resulting pitch down or no pitch control response
- Flaps back to previous setting

**ICTS.mp4 video**

# ICE BRIDGING

- Older aircraft
  - Low pressure systems
  - Less efficient
- Modern aircraft
  - High pressure systems
  - More efficient
- Today's aircraft and boot systems are less affected by "Ice Bridging".

# REPORTING ICING

## **Trace:**

Accumulation slightly greater than sublimation

## **Light:**

Accumulation may be a problem

## **Moderate:**

Short encounters potentially hazardous

## **Severe:**

Equipment fails to control the hazard



# TYPES OF ICING

## **Rime Ice:**

Rough, milky, opaque

## **Clear Ice:**

Glossy, clear, or translucent

## **Mixed:**

Combination of rime and clear (glaze)

# SLD

- **Supercooled Large Droplets**
  - **Freezing rain:** Diameter greater than 0.5mm (runback)
  - **Freezing drizzle:** Diameter less than 0.5mm and greater than 0.05mm
- **Upper limit to icing certification rules**
  - 0.04 (40 microns) continuous encounter
  - 0.05 (50 microns) intermittent encounter

# PILOT ACTIONS

- Inadvertent encounter
  - Activate anti-ice/de-ice systems
  - Notify ATC
  - Ask for altitude/heading/routing change
  - If SLD, disconnect autopilot and hand fly
  - Don't climb unless you know you have the power available
- If necessary —“Declare an Emergency”

# PILOT ACTIONS

- Stalls with icing
  - Reference: Private/Commercial/ATP Practical Test Standards
  - AC120-STALL
  - Reduce angle of attack, accelerate and then increase power and recover
- Warnings
  - Do not attempt to add power to fly away with minimal loss of altitude
  - If autopilot was on, do not initially add full power

# SUMMARY

- All icing conditions should be treated with respect.
- Never Ever fly in icing conditions with lack of, or inoperative icing equipment.
- Continued flight into icing conditions is unwise.
- If inadvertent icing conditions are encountered, begin immediately to devise the way out.
- Never take off with ice on any flying surface



# SUMMARY

- [mu-2aircraft.com](http://mu-2aircraft.com)
  - Training
  - YET Icing Video
- Register
  - Pilot certificate
  - N Number