

CFI Bootcamp

Flight Instructor Training

Emergencies

Icing for VFR and IFR Pilots

What you Need to Know

Today's Bootcamp+ Network Programming

What's on for Today's Show?

Live Show – 1st Hour

Open Mic – 2nd Hour onward

Monitor the Chat - Links/Info

Wings Credit for This Presentation



Today's Bootcamp+ Network Programming



What's on for Today's Show?

PH Rebroadcast – Weds 8 pm ET
Power Hour Podcasts – Full Shows
The Last of the Bundles
Step-by-Step Workshop –
Sept 24th (8-10 pm Eastern Time)

What We Will Cover

- Why is ice dangerous to aviation and to you?
- What happens to the airplane when it is in icing conditions?
- Placards and limitations
- When can ice form?

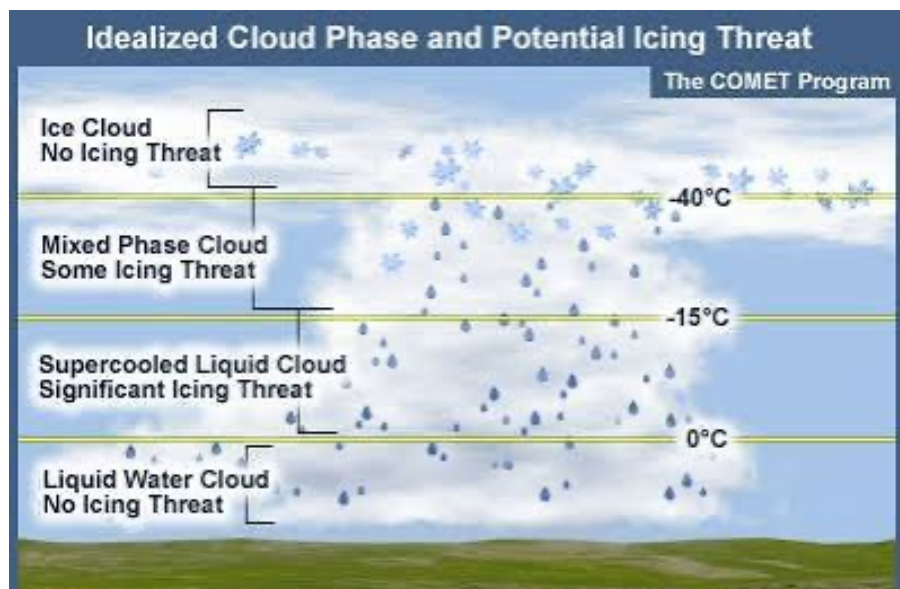
What We Will Cover

- Types of Ice and where it comes from
- If it's below freezing, can I still fly and not pick up ice?
- How to remove ice and snow from your airplane
- De icing fluids



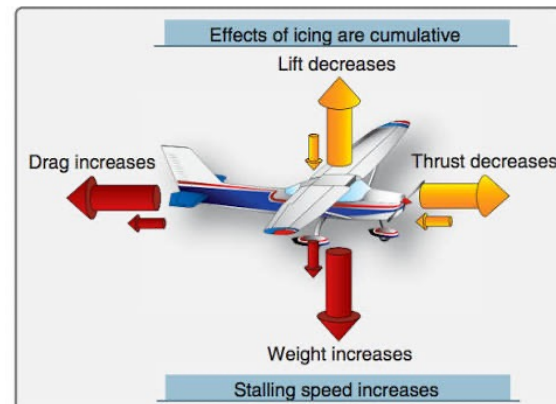
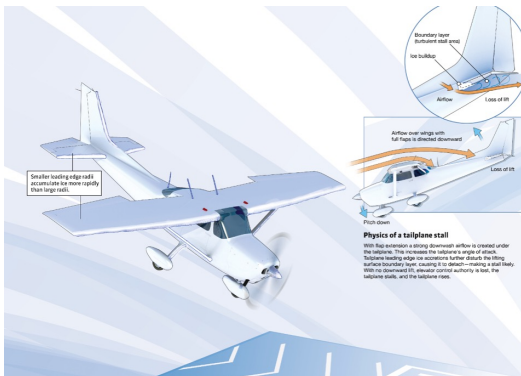
Why is Ice Dangerous to Aviation and to You?

- Adds significant weight to the airplane, even with a thin layer
- Disrupts laminar flow – Causes the stall speed to increase + less lift can be produced for the same speed with no ice
- Control surfaces may not be able to be moved
- You may not be able to see to land



What Happens During Icing Conditions

- Ice may form all at once, or gradually
- The airplane will become more difficult to control
- The icing will change the aerodynamics of the wing and horizontal stabilizer
- A tail stall may occur



Placards and Limitations

- POH and on the Panel – Flight into Known Icing Prohibited
- Emergency checklist has a section on Encounters with Icing
- Some airplanes can fly into known icing conditions and so can you

CESSNA
MODEL 172P

SECTION 2
LIMITATIONS

KINDS OF OPERATION LIMITS

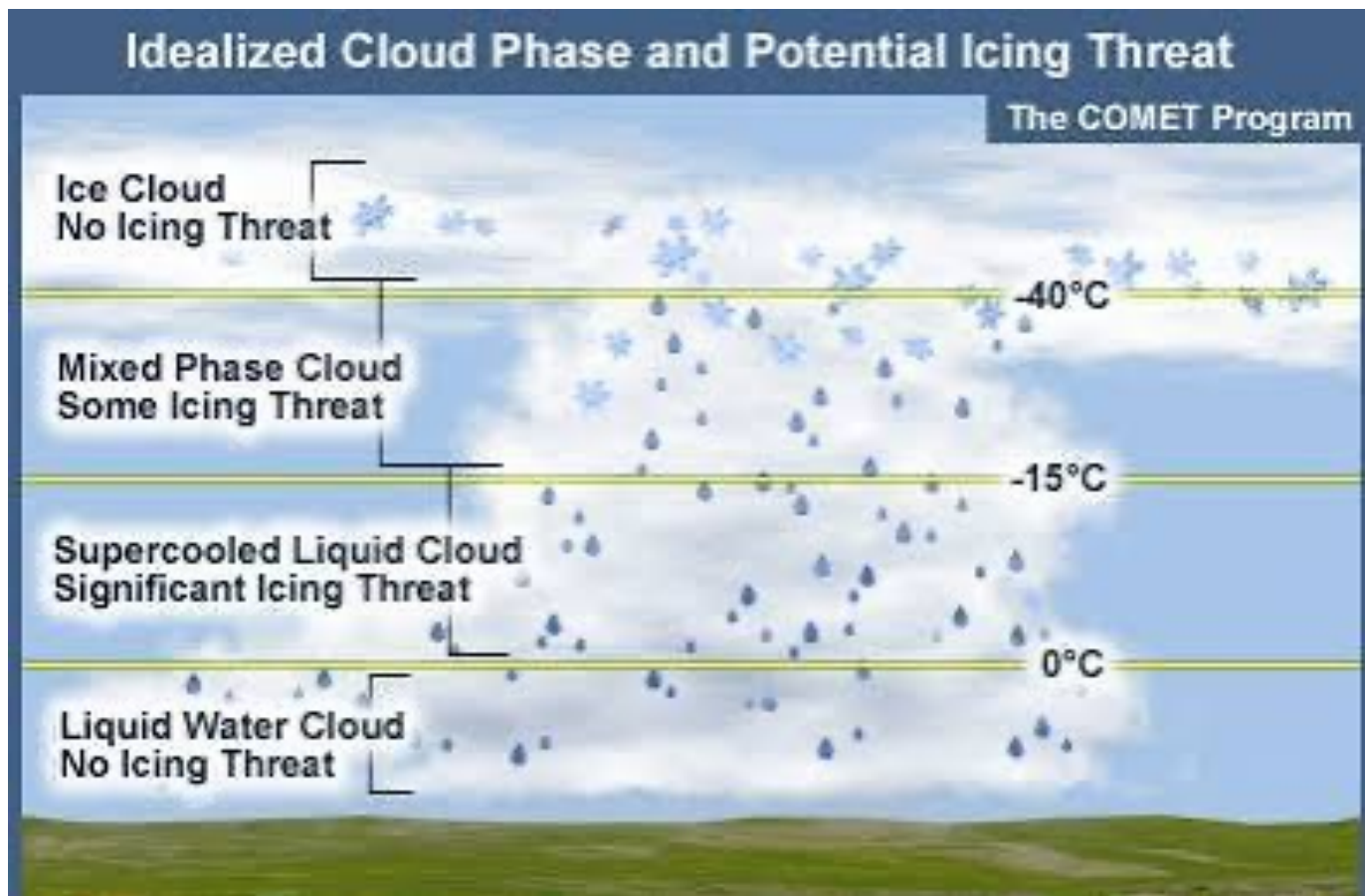
The airplane is equipped for day VFR and may be equipped for night VFR and/or IFR operations. FAR Part 91 establishes the minimum required instrumentation and equipment for these operations. The reference to types of flight operations on the operating limitations placard reflects equipment installed at the time of Airworthiness Certificate issuance.

Flight into known icing conditions is prohibited.

When Can Ice Form?

- Temperature must be freezing or below and there must be visible moisture except...
- The air over the top of the wing travels faster to create a low pressure area – this also lowers the temperature
- In this case, the ambient temperature may be a few degrees above freezing and ice may form
- Descending from high altitudes where the wing is cold soaked may cause Hoar Frost to form as the airplane descends into moisture even if the ambient temperature is above freezing

When Can Ice Form?



Types of Ice

- Rime Ice – Trapped air causes a milky and rough appearance – Stratus clouds
- Clear Ice – Supercooled water droplets freeze and spread on contact – Cumulus clouds - Can also be Freezing Rain
- Mixed Ice – Combined Rime and Clear Ice in the same location
- [All you need to know about Icing Video](#)



[NASA Icing Training for Pilots](#)

Clean Airplanes

- All snow and ice must be removed prior to flight
- [Video about removing Snow/Ice](#)
- Heated hangar or rags soaked in alcohol – snow brush
- No scraping with any hard objects



De-Icing Fluids

- Used in Two Stages
 - Deicing to remove snow and ice
 - A protective coating of material that prevents ice from forming



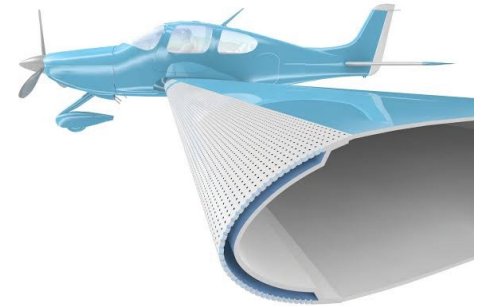
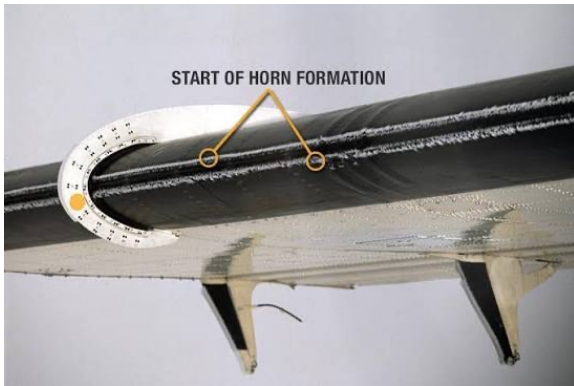
De-Icing Fluids

Type	Purpose	Composition / Behavior	Typical Use	Approx. Holdover Time*
Type I	Deicing (removes existing ice/frost/snow)	Unthickened, low-viscosity, heated glycol/water mix; flows off quickly, little residual protection	Light coating before Type II/III/IV, or standalone in mild conditions; suited to composite surfaces	~1–22 minutes (temp/precip dependent)
Type II	Anti-icing (deices, then leaves a protective film)	Thickened, pseudoplastic fluid; stays on at rest but shears off during takeoff roll at higher rotation speeds	Larger/faster aircraft (rotation speed >100 kt); often applied over Type I	~20 min minimum (WSET); varies with conditions
Type III	Anti-icing, “in-between” fluid	Thickened like Type II/IV but shears off at lower speeds	Aircraft with rotation speed under 100 kt — covers most GA and turboprop aircraft	Similar range to Type I/II, fluid/condition dependent
Type IV	Anti-icing (longest protection)	Most heavily thickened; designed for extended holdover in ongoing precipitation	Airliners, business jets, and operations expecting a longer gap before takeoff (heavy snow, busy ramps)	~9–160 minutes (temp/precip dependent)

**Exact holdover times must be taken from the current-season FAA Holdover Time Guidelines table for the specific fluid brand, concentration, OAT, and precipitation type — ranges above are illustrative only and not to be used operationally.*

General Aviation De-Icing Systems

- Boots
- Heated area of the windscreen so the pilot can see – no ice
- Hot Props
- Alcohol based nozzles and shoes
- TKS – Weeping wings – Cirrus SR22 (known icing)



Resource Document for Icing

[Airplane Icing Summary PDF](#)

Airplane Icing

What Every Pilot Needs to Understand

Why Icing Matters

Ice changes the shape of an airfoil, destroys lift and adds drag — even a thin layer of frost with the texture of coarse sandpaper can increase stall speed and reduce stall margin significantly. Icing doesn't just accumulate on wings; it affects control surfaces, propellers, altimetric systems, windshields, and engine induction systems. It is one of the few hazards that can be effectively invisible until it's already degrading performance.

Types of Icing

1. Structural Icing

Ice that forms on the exterior of the airframe (wings, tail, antennas, struts) in flight, typically when flying through visible moisture (clouds, rain, drizzle) at or below freezing.

- **Clear (glaze) ice** — Forms in large supercooled water droplets (freezing rain/drizzle) that spread before freezing. Hard, dense, transparent, and difficult to see. Slows movement and disrupts airflow badly. Most dangerous type.
- **Rime ice** — Forms in smaller supercooled droplets (stratus clouds). Freezes rapidly on contact, trapping air — appears rough, white, opaque. Lighter and more brittle than clear ice, but still degrades aerodynamics.
- **Mixed ice** — A combination of clear and rime, often with embedded snow or ice particles; rough and irregular.

2. Induction Icing

- **Carburetor ice** — Can form even in above-freezing OAT (classic risk zone: 20–70°F with visible moisture) due to the temperature drop from fuel vaporization and the venturi effect. Recognized by a rough-running engine and RPM/manifold pressure drop, addressed with carb heat.
- **Ingested ice** — Ice forms on air intakes, alternate air doors, or induction screens, restricting airflow to the engine (more relevant to fuel-injected and turboprop engines).

3. Instrument/System Icing

- **Pitot-static icing** — Blocks pitot tube or static ports, drives altimeters or floors, skews altitude indications. Pitot heat is the primary defense.
- **Windscreen icing** — Reduces visibility; some aircraft have heated windscreens or plates.
- **Propeller icing** — Reduces thrust efficiency and can cause vibration if shed asymmetrically.

4. Ground Icing (Frost)

Frost forms on a cold-soaked airframe from humid air, typically overnight on a clear, calm night (radiational cooling) or when a cold aircraft is exposed to warm, moist air. Even light frost must be removed before flight — it's not just cosmetic; it disrupts boundary layer airflow the same way in-flight ice does.

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Special Announcement

- Initial CFI Airplane 7-Day Courses
- Sept 14 – 20 (8am – 3pm PDT – In person Palo Alto, CA, or Zoom
- Oct 12– 18 (11am – 6pm EDT – In person Opa-Locka, FL or Zoom
- **[Register Here](#)**
- [Course Syllabus – Hour by Hour Here](#)



Special Announcement!

Reminders!



CFI Study Group
on Facebook



Society of Aviation and
Flight Educators



National Association of
Flight Instructors

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