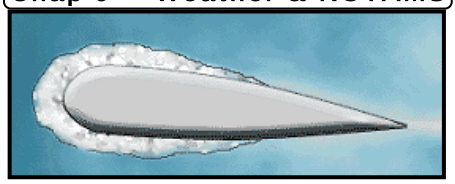
LEGAL REQUIREMENTS for FLYING IN ICE

General rules — Deice units must be provided for the **wings**, **tail**, **propellers** or **engine inlets**, **pitot/static** sources; an **alternate source of air** for reciprocating engines; and a **thermal** or **chemical** means of providing vision through the **windshield**. External **lighting** must also be provided to enable adequate monitoring during icing conditions encountered at night. The FAA must approve the equipment and any operational limitation such as, **"flight into known icing conditions is prohibited"** must be **formally removed from** the **AFM** or **POH** (if the statement was previously included). It is important to note that **aircraft certified** for **flight in known ice** are approved for flight in **light** or **moderate conditions only**, and even then the systems cannot cope with severe or continuous icing.

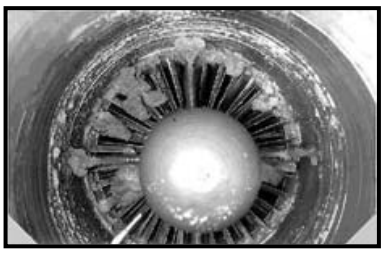
ICE: [Part 23, Part 25, 91.9, 91.13, 91.527, 121.341, 121.629, 125.221, 135.227, 135.345, AIM 7-1-18 thru 7-1-22, AC 20-73, AC 23.1419-1, AC 135-9, AFM or POH, FAA-H-8083-15A, FAA-H-8083-25A]

1. Found in **VISIBLE MOISTURE** between **+5º** & **-20ºC** or colder — but usually between **+2º** & **-10ºC**.
2. Any mention of icing conditions during a weather briefing, even if only a "slight possibility" is considered **"KNOWN ICING"** by the FAA and the NTSB. The briefer should check **AIRMETs** — issued at the first indication of **moderate** ice; and **SIGMETs** — issued for **severe** icing. Flight in known icing is definitely forbidden unless the aircraft is certificated for these conditions. You might want to mention to the briefer that you plan to remain below the freezing level or clear of clouds, just for the record. If the aircraft is not certified for flight in known icing, your job then becomes flying where the ice ain't.
   If you crash, or seriously disrupt the ATC system because of an encounter with ice — chances are — you *will* receive a very unpleasant phone call from an FAA Safety Inspector.
3. 91.527 and 135.227 **do not require** the aircraft to be **"*certified* for flight into known icing"** in order to ***depart*** into "known or forecast light or moderate icing", as long as the aircraft has some kind of **"functioning** deicing or **anti-icing** equipment **protecting** each rotor blade, **propeller**, **windshield**, **wing**, stabilizing or **control surface**, and each **airspeed**, **altimeter**, **rate of climb**, or **flight attitude instrument** system**"**. However, if the aircraft also carries a placard or limitation in the AFM that states, **"flight into known icing conditions is prohibited"**, the aircraft could not be launched into icing conditions because it would be subject to compliance with placards and limitations (91.9).
4. Nevertheless — **A**dvisory **C**ircular **135-9** (pertaining to **Part 135**) says — **"**…aircraft **could be operated in** forecast or known light or moderate **icing** under VFR or IFR rules **if** it was **equipped as required** in Section **135.227** and this equipment was functioning, ***unless*** the aircraft was **prohibited by** operating **limitations** from operating in icing conditions.**"**
   AC 135-9 also says:
   a. **"Aircraft equipped** with **functioning equipment** meeting Section 135.227(b) and ***NOT* placarded** restricting operations in icing conditions [many aircraft manufactured prior to 1973] **may fly** under IFR or VFR rules **in known** or forecast light or moderate **icing** and **continue flight** in ***actual* icing** conditions.**"**
   b. **"Aircraft equipped** with **functioning equipment** meeting Part 135.227(b) **and a *PLACARD PROHIBITING*** operation in icing conditions **may depart** on a flight **when** light or moderate **icing is forecast** or reported to exist for the intended route to be flown. However, **continued flight** in **actual icing** conditions **is *NOT* permitted** since such flight does not comply with the placard or the operating limitation in the aircraft flight manual.**"**
5. **Rule #1** — **take off "CLEAN"** without ***ANY* ice**, **snow**, or **frost** on the aircraft. (91.527, 135.227, 121.629)
6. Find out what the **freezing level** is, stay **3000** feet **below** it or **8000** feet **above** it, or **above the clouds**.
7. At the **1st sign of ice** — **do something about it** — when doing battle with ice, especially in rapidly building severe ice, by far the safest tactic is to ***GENTLY* turn around** and **RUN AWAY!**
8. **Boots** & **prop heat** will **buy a little time**, but **if ice is bad enough** it **can bring down any aircraft**. Don't think that boots will allow you to fly for extended periods of time in moderate to severe icing. BFGoodrich **ICEX** boot treatment DOES help. It creates a slick surface and minimizes ice adhesion.
9. **Alcohol windshields** are anti-ice not de-ice; however alcohol *will* remove some (most) ice. NOTE: Save the windshield alcohol for the landing approach and don't forget to turn it ***OFF*** at least 20 seconds before touchdown. It's virtually impossible to see through alcohol streaming over a windshield.
10. When **prop heat** is **not available**, operate the **propellers** at **MAXIMUM RPM**. High RPM helps to prevent ice from forming down the blades and the greatly increased centrifugal force tends to sling it off.



11. **Ice bridging** most certainly **can occur** regardless of what the FAA currently preaches. They recommend you should inflate boots at the first sign of ice. Profit from experience. **Wait** until at least a **little** ice **accumulates** prior to boot inflation. **More ice will** then tend to **shed** due to increased drag on the somewhat larger exposed area of the cracked edges.

12. As a rule of thumb — **CLIMBING** is ***usually*** the preferred ***FIRST* option** — you'll either **break out on top** or climb into **air too cold for icing**. This must be done at the **first sign of ice**, while the aircraft is **still capable of climbing**. Of course there are no guarantees, without knowing what the conditions are at the higher altitudes, you may be going from bad to worse. But the higher you fly, the more stored energy you'll have should you need to "drift down" due to ice accumulation. **DESCENDING** is usually the preferred ***SECOND* option** (get to warmer temperatures below the clouds and the ice if possible). As another rule of thumb, research has shown that 90% of icing encounters are limited to a **3000-foot** vertical area. The other 10% of the time, ***ANYTHING* is possible**. Call ATC. Get pilot reports.
13. **Cloud tops** in winter rarely extend above 30,000 feet.
14. **Penetrate** the **icing altitudes as quickly as possible** going up or down. If you're at an ice-free altitude closing in on your destination, try to stay there until the very last minute, then make a rapid descent.
15. **Don't allow ATC to fly your airplane**. TELL THEM what you need to do. TELL THEM you are in a dangerous icing situation and you *MUST* climb/descend or turn around RIGHT NOW. If the situation really gets serious — TELL THEM you need **"PRIORITY"**, then use your emergency authority (91.3) to do what you have to do RIGHT NOW. Do *NOT* let the aircraft completely ice up and fall out of the sky while waiting for a request to be granted. Keep in mind however, if you declare an icing emergency in an aircraft not properly equipped, an ugly enough incident may come to the attention of the local FSDO. A small price to pay if you're still alive!
16. Some of the **heaviest icing** can be found in the **tops of clouds**. An altitude that puts you in and out of the cloud tops is not the best place to be.
17. Some of the **WORST ICING** can be found over or **downwind** of **mountainous terrain** (enormous lifting factor) and over or **downwind** of the **Great Lakes region** (copious amounts of moisture).
18. As ice accumulates, it **destroys lift** and **adds** massive amounts of **weight** and **drag**. **Cruise speed drops** and **stall speed increases**. When those speeds meet, you are **forced to descend**. If there is warm air below, there is no problem. If there is an airport below, there is *usually* no problem. If there are **BIG ROCKS** below, there ***WILL be*** a **BIG PROBLEM**.
19. Remember, **fuel consumption** increases dramatically as more and more power is needed to keep the struggling aircraft flying.
20. When approaching to land carrying a load of ice, find a **LONG runway** preferably **with an ILS**. **KEEP** the **POWER & SPEED UP**, the **TURNS GENTLE**, and **DON'T CHANGE** the **FLAP SETTING**. You **don't NEED flaps**. Flaps can cause a very exciting **"TAIL STALL"** (the negative lift of the tailplane is eliminated and the aircraft pitches nose down). A **sharp turn** can cause a sudden **accelerated stall** that will not be recoverable at low altitude.
21. **KEEP the POWER UP**. **KEEP the SPEED UP**. **EVEN a SMALL POWER or SPEED REDUCTION during APPROACH** or **EVEN in the FLARE**, could cause an **INSTANT STALL** that will bend a lot of metal. **Better to slide off the end at 10 kts** than to **corkscrew into** the **ground** a **½ mile short** at well **over a 100 kts**.



AWOS vs ASOS

adds.aviationweather.gov; or **nws.noaa.gov**

AWOS: (AIM 4-3-26, 7-1-1, 7-1-12, 7-1-17, 7-1-30, 7-1-31, AC 150/5220-16C)

1. **A**utomated **W**eather **O**bserving **S**ystem. A suite of weather sensors of many different configurations that were either procured by the FAA or purchased by individuals, groups or airports that are required to meet FAA standards. **AWSS** — **A**utomatic **W**eather **S**ensor **S**ystem is functionally the same as ASOS.
2. A state or airport can purchase an AWOS with assistance from the FAA's Airport Improvement Program.
3. Provides minute-by-minute weather to pilots at airports that have no other approved weather reporting.
4. AWOS types:
   - **AWOS-A** — Only reports the altimeter setting.
   - **AWOS-1** (I) — Altimeter, wind, temperature, dew point, and density altitude.
   - **AWOS-2** (II) — Information provided by AWOS-1 plus **VISIBILITY**.
   - **AWOS-3** (III) — Information provided by AWOS-2 plus **CLOUD/CEILING** data.
   - **AWOS-3 P** (III-P) — Adds a **P**recipitation type identification sensor.
   - **AWOS-3 T** (III-T) — Adds **T**hunderstorm/lightning reporting capability.
   - **AWOS-3 P/T** (III P/T) — **P**recipitation and **T**hunderstorm/lightning reporting.
   - **AWOS-4** (IV) — contains all the AWOS-3 system sensors, plus precipitation occurrence, type and accumulation, **freezing rain**, thunderstorm, and **runway surface condition** sensors.
5. AWOS can also generate automated remarks about density altitude, variable winds, and ceilings.
6. **A01** indicates a station **WITHOUT** a precipitation identification sensor (i.e., cannot determine the difference between liquid or frozen/freezing precipitation).
7. **A02** indicates a station **WITH** a precipitation identification sensor.
8. AWOS information can be obtained on the proper frequency in-flight; the web addresses listed above; and normally by **telephone** (see **A**irport **F**acility **D**irectory; **"AC-U-KWIK"**, etc.).
9. An AWOS commissioned prior to July 1996 is not *required* to use the METAR format. That means it might report temperature in degrees Fahrenheit amongst other differences.

AWOS observations are considered the **"official weather"** unless **"challenged as incorrect"**. If the AWOS is reporting IFR conditions (e.g. isolated fog around the sensor), but the pilot's eyesight is reporting obvious VFR, the **Part 91 pilot's observation overrules** the **AWOS**. **Part 121 & 135** rules are **more restrictive**, they require those pilots to consider the **AWOS** information as **correct no matter how bogus** it may seem.

ASOS: (AIM 4-3-26, 7-1-1, 7-1-12, 7-1-17, 7-1-30, 7-1-31)

1. **A**utomated **S**urface **O**bservation **S**ystem. **More sophisticated than AWOS** and is designed to provide the necessary information to generate weather forecasts. ASOS is comprised of a standard suite of weather sensors (with several exceptions) all procured from one contractor.
2. Continuous minute-by-minute observations necessary to generate a routine weather report (METAR).
3. Similar to AWOS but **more sophisticated** and is designed to provide the essential information (**METAR**) to generate weather **forecasts** (**TAF**).
4. ASOS can determine type and intensity of precipitation (rain, snow, freezing rain), thunderstorms and obstructions to visibility such as fog and haze.
5. ASOS can also measure wind shifts, peak gusts, rapid pressure changes, and the amount of accumulated precipitation.
6. ASOS shines a laser ceiliometer into the sky to observe cloud layers. It takes a measurement every 30 seconds over a 30-minute period, then double-weighs measurements during the last 10 minutes so the computer can decide if the cloud layers are scattered, broken or overcast.
7. The ASOS visibility sensor is normally located near the touchdown zone of the primary instrument runway.
8. The word **"AUTO"** included in the broadcast signifies that an observer is not logged onto the ASOS for backup or augmentation.
10. ASOS information can be obtained on the proper frequency in-flight and normally by **telephone** on the ground (**A**irport **F**acility **D**irectory, **AC-U-KWIK**, etc.).

ASOS and AWOS:

1. The flag word **"TEST"** is added to the voice transmission of an ASOS/AWOS when it is being tested before commissioning. The quality of the observations may not be up to FAA standards. Therefore, the data should not be used operationally until the "TEST" flag word is removed.
2. Ceiling information is "time averaged" over a 30-minute period and visibility over a 10-minute period.
3. The upper limit of cloud height and visibility reported by ASOS/AWOS is 12,000 feet and 10 miles.
4. Most common reason ASOS/AWOS cannot be received by telephone is due to maintenance or repair.