

Aircraft Safety

Preflight Briefing:

- PIC is required to ensure that passengers receive a preflight briefing in regards to normal and emergency procedures
- Passengers are responsible for paying attention to the briefing. Remember, you are an active participant in safety and your own well being
- Specifics may vary from aircraft to aircraft and the flight conditions
- Here is an example of a good briefing, as given on an airliner:

<http://www.youtube.com/watch?v=gN78LLRZnzM>

Aircraft Safety

Receiver Autonomous Integrity Monitoring (RAIM) Checks:

- Flights under IFR with Non-WAAS equipped IFR GPS units, a RAIM check **MUST** be performed
- It may be a good idea to do this for all flights, IFR or VFR
- Required if using:
 - T routes (RNAV routes below 18,000 feet msl)
 - RNAV Obstacle Departure Procedures (ODPs)
 - RNAV Departure Procedures (DPs)
 - RNAV Standard Terminal Arrival Routes (STARs)
- http://www.aopa.org/advocacy/articles/2009/090924raim.html?WT.mc_id=090925epilot&WT.mc_sect=sap

Aircraft Safety

Close call with Terrain – improper use of GPS ground data:

- <http://www.youtube.com/watch?v=8Nm8pNgqBAk>

Takeoff Performance Safety Margins

- Know your numbers
- Be prepared for anything
- Youtube video: Columbian Air Patrol C182 takeoff
<http://www.youtube.com/watch?v=ZWC2XJYgcJU>

Know Your Numbers

Aircraft Performance Charts

- How confident are you?
 - New Equipment
 - Test Pilot at the controls
- Perfect conditions (15 °C, Field at 0 FT, density altitude 0FT)

Know Your Numbers

The “simple” act of taking off or landing accounts for 50 percent of all general aviation accidents.

The 50/50 Solution

ASF recommends adding 50 percent to the POH takeoff or landing distance over a 50-foot obstacle. For example: If the distance over the obstacle requires 1,600 feet, add 800 feet (50 percent) for a *safety distance* of 2,400 feet.

The two checklists in this safety advisor are full of tips for mitigating the numerous risks associated with takeoffs and landings. As you read them, remember that the root cause of most accidents is poor judgment. Know the aircraft, the airport, and the environment...but most importantly, know when it's time for *you* to divert, go around, or stay on the ground.

Safe Pilots. Safe Skies.

www.asf.org

Two good reference articles:

- Know the Performance of Your Aircraft:

<http://www.pilotfriend.com/safe/safety/performance.htm>

- Mastering Takeoffs and Landings:

<http://www.aopa.org/asf/publications/sa18.pdf>

Know Your Numbers

Aircraft Performance Charts

MODEL 182T NAV III

PERFORMANCE

SHORT FIELD TAKEOFF DISTANCE AT 3100 POUNDS

CONDITIONS:

Flaps 20°
2400 RPM, Full Throttle and Mixture Set Prior to Brake Release
Cowl Flaps Open
Paved, Level, Dry Runway
Zero Wind
Lift Off: 49 KIAS
Speed at 50 Feet: 58 KIAS

Press Alt - Feet	0°C		10°C		20°C		30°C		40°C	
	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst	Grnd Roll Ft	Total Ft To Clear 50 Ft Obst
S.L.	715	1365	765	1460	825	1570	885	1680	945	1800
1000	775	1490	835	1600	895	1715	965	1845	1030	1980
2000	850	1635	915	1760	980	1890	1055	2035	1130	2190
3000	925	1800	995	1940	1070	2090	1150	2255	1235	2435
4000	1015	1990	1090	2150	1175	2325	1260	2515	1355	2720
5000	1110	2210	1195	2395	1290	2595	1385	2820	1485	3070
6000	1220	2470	1315	2690	1415	2930	1520	3200	1635	3510
7000	1340	2785	1445	3045	1560	3345	1675	3685	---	---
8000	1480	3175	1595	3500	1720	3880	---	---	---	---

NOTE

1. Short field technique as specified in Section 4.
2. Prior to takeoff, the mixture should be leaned to the Maximum Power Fuel Flow placard value in a full throttle, static runup.
3. Decrease distances 10% for each 9 knots headwind. For operation with tail winds up to 10 knots, increase distances by 10% for each 2 knots.
4. For operation on dry, grass runway, increase distances by 15% of the "ground roll" figure.

Figure 5-6 (Sheet 1 of 3)

Know Your Numbers

Short Field Takeoff Procedure

TAKEOFF

NORMAL TAKEOFF

1. Wing Flaps - UP - 20° (10° preferred)
2. Throttle Control - FULL (push full in)
3. Propeller Control - 2400 RPM
4. Mixture Control - RICH
(Above 5000 feet pressure altitude, lean for maximum RPM)
5. Elevator Control - LIFT NOSEWHEEL at 50 - 60 KIAS
6. Climb Airspeed - 70 KIAS (FLAPS 20°)
80 KIAS (FLAPS UP)
7. Wing Flaps - RETRACT at safe altitude



Know Your Numbers


Short Field Takeoff Procedure (amplified)

TAKEOFF

POWER CHECK

It is important to check full throttle engine operation early in the takeoff roll. Any sign of rough engine operation or sluggish engine acceleration is good cause for discontinuing the takeoff. If this occurs, you are justified in making a thorough full throttle static run-up before another takeoff is attempted. The engine should run smoothly and turn approximately 2350 - 2400 RPM.

Full throttle run-ups over loose gravel are especially harmful to propeller tips. When takeoffs must be made over a gravel surface, advance the throttle slowly. This allows the airplane to start rolling before high RPM is developed, and the gravel will be blown behind the propeller rather than pulled into it.

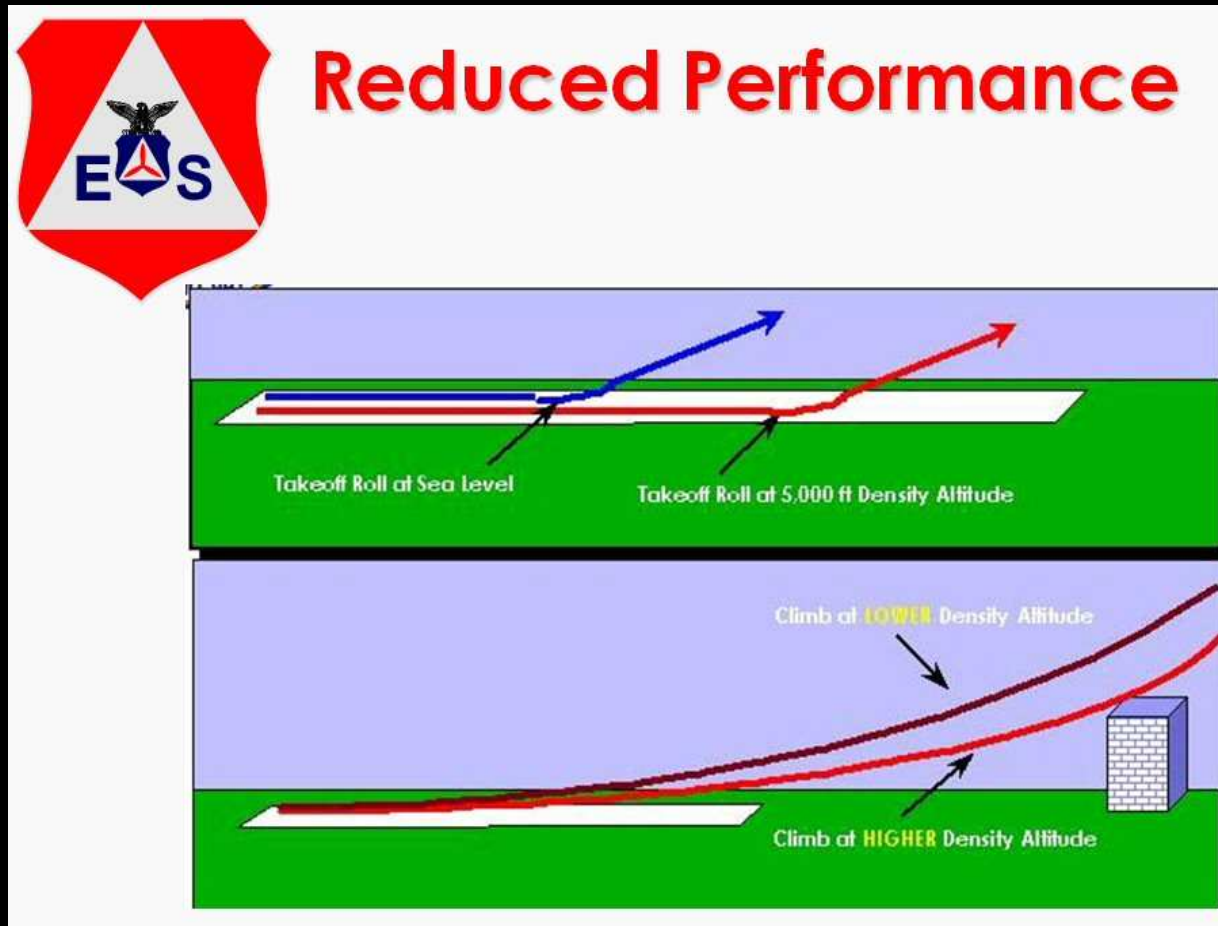


After full throttle is applied, adjust the throttle friction lock clockwise to prevent the throttle from moving back from a maximum power position. Similar friction lock adjustments should be made as required in other flight conditions to hold the throttle setting.

(Continued Next Page)

Know Your Numbers

Effect of Density Altitude on Performance (Physical Altitude MSL, Temperature $> 15^{\circ}\text{C}$ (59°F), Pressure < 29.92 in)



Be Prepared

Why perform a Takeoff Brief?

- Each takeoff is unique!
- Sets and maintains a common perception between crewmembers (CRM)
- Defines performance expectations
- Reviews actions to be taken leaving no question as to what will be done
- Sets the tone and role of crewmembers (who is in command) – always ask for input!

Be Prepared

A briefing is a tool to increase crew performance - you should:

- Always **BRIEF** the takeoff
- Be ready to **DECIDE AND ACT**
- Maintain situational **AWARENESS**
- Once action is initiated, **NEVER CHANGE YOUR MIND!**

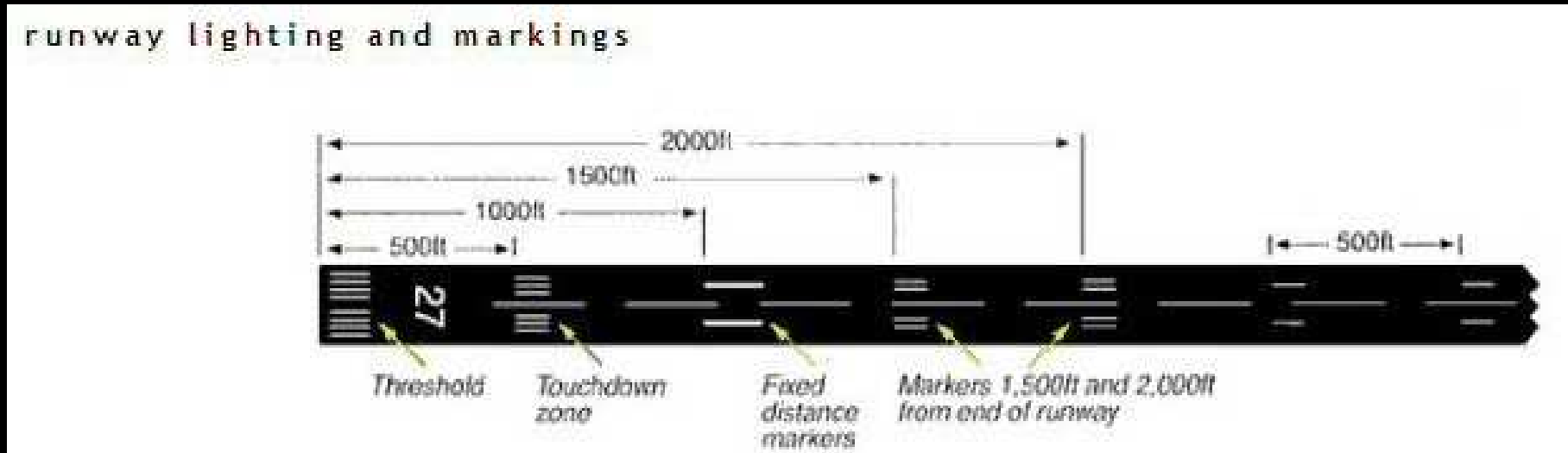
Be Prepared

How to determine takeoff performance:

- FAA recommends runway light spacing to be 200 FT apart (may be different)
- Runway threshold markings are 150 FT long
- Precision approach runways (ILS) have touchdown markings 500 FT apart
- Centerline lights are 100 FT apart at large airports

Be Prepared

Runway Threshold/Touchdown Zone Markings



Taken from:

http://www.pilotfriend.com/training/flight_training/communication/rnwy_mark

Be Prepared

When to abort a takeoff:

- **SEE** abnormal engine instrument indications
- **SEE** from visual “benchmarks” that performance is not normal
- **HEAR** unusual sounds
- **FEEL** unusual vibrations

If any are present or there is any doubt, **ABORT**
the takeoff!!!

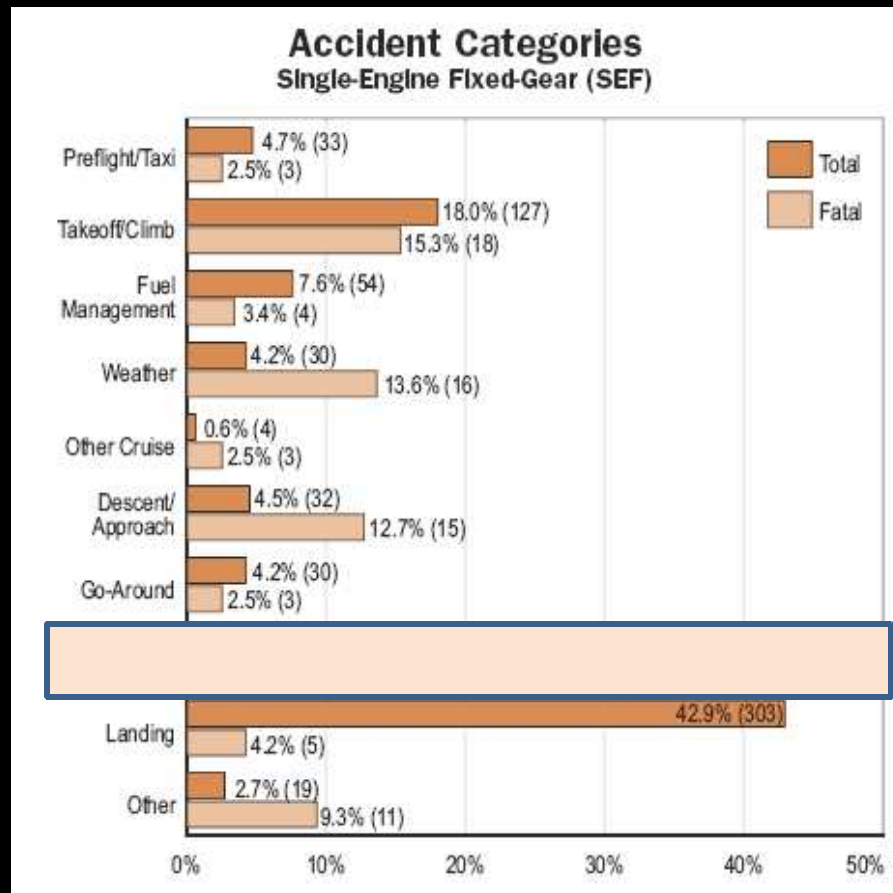
The Impossible Turn?

When should a pilot plan to attempt a 180° turn back to the airport?

- Airlines use 400 to 500 FT as their “acceleration altitude” to transition from V_2 (1.2 V_s for twin engine A/C or V_x 65 KIAS) to normal climb at 250 KIAS, flaps are retracted at V_{flap}
- Climb check is initiated at 1500 FT

The Impossible Turn?

AOPA ASF Nall Report 2007 Statistics:



Taken from:

<http://www.aopa.org/asf/publications/nall.html>

The Impossible Turn?

Human factors: Simulator study by Jett

- B. W. Jett, Proc. AIAA 20th Aerospace Sciences Meeting, AIAA-82-0406 (1982).
 - 28 pilots experience engine failure on takeoff at 500' AGL in simulator representative of a "single-engined, light utility/sport aircraft"
 - Simulator exhibits partial motion
 - Early 1980s technology probably lacks realistic graphics, terrain, obstacles to crash into, etc.
 - Experience ranges from 40 hour pilots to CFIs and 5000+ hour military pilots
- Success criterion for landing off-airport:
- <2500 fpm max descent rate
 - <500 fpm descent at touchdown
 - wings within 5 degrees of level below 100' AGL
- Success criterion for turnbacks are the above plus:
- turn >175 degrees above 100' AGL
 - maximum bank angle less than 55 degrees*
- *Remember this one

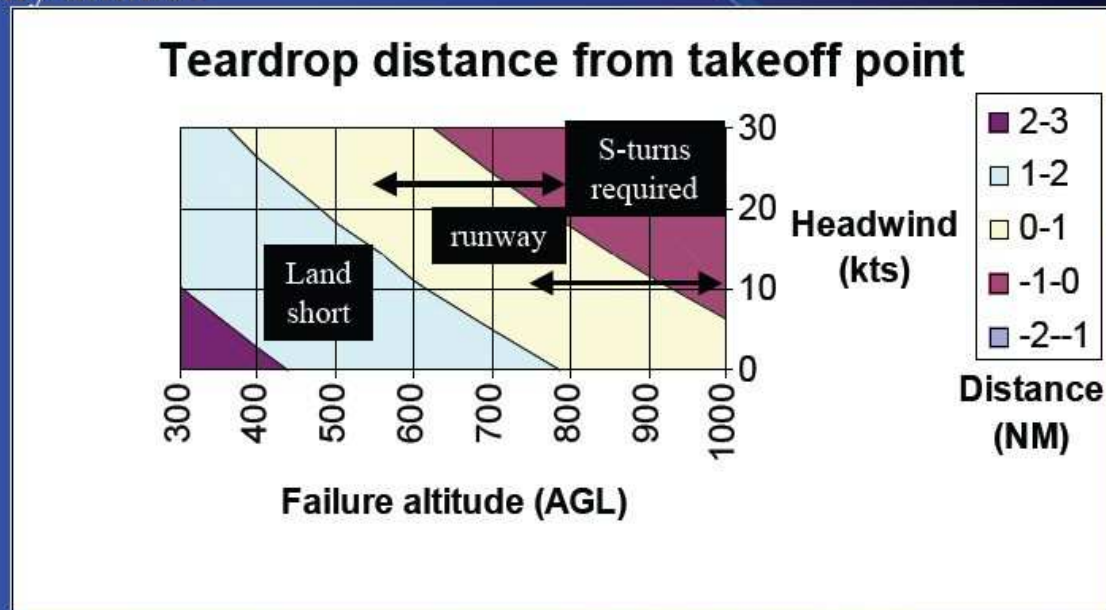
Taken from http://williams.best.vwh.net/turnback_seminar_Oct_2008.pdf

Greater than 50% of turn-backs were unsuccessful when un-rehearsed (Pg 16)

The Impossible Turn?

Extrapolated return point from C172
N73857 data, test 2: sloppy performance

- Test 2: Climb v_y , 6 sec. delay before turn, 80 kts in turn, 3700' density altitude



For this relatively sloppy case, 900' AGL is minimum turnback altitude for most runways with no wind (3700' density altitude.)

Taken from:

http://williams.best.vwh.net/turnback_seminar_Oct_2008.pdf

(Pg 30)

The Impossible Turn?

When should a pilot plan to attempt a 180° turn back to the airport?

RECOMMENDATION: **NO LESS THAN PATTERN ALTITUDE!**

- If you turn back, bank angle between 35 to 45°
- Be prepared to make S-Turns and to over-run the runway end

The Impossible Turn?

When should a pilot plan to attempt a 180° turn back to the airport?

RECOMMENDATION: **NO LESS THAN PATTERN ALTITUDE!**
(continued)

- Consider your experience level with the gliding characteristics of the aircraft and with maneuvering at low altitudes
- **NEVER ATTEMPT TURN BACK AT HIGH DENSITY ALTITUDES!**

Takeoff Performance Safety Margins

Questions? Comments?



Aircraft

Dress Appropriately For the Weather!
Know your aircraft/equipment
Know the region/weather
Always leave an OUT

Aircrew Task Guide, MO Task P-2008

Winter Preflight

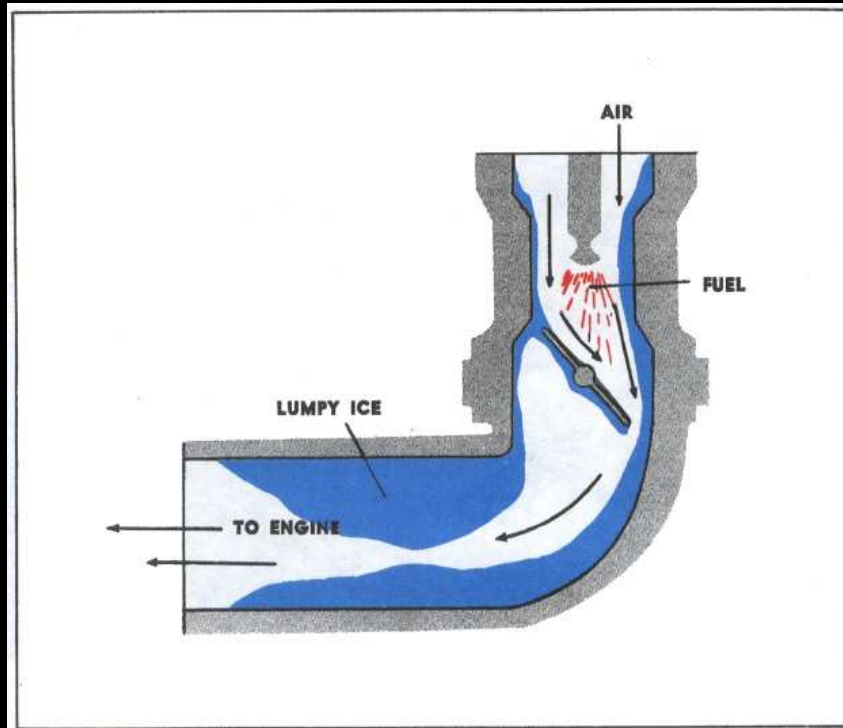
Extra Items to Check:

- Snow/Ice contamination of spaces between control surfaces (water may refreeze aloft if left on aircraft).
- Check Pitot tube/Static/Stall ports/all openings to be clear of snow/ice. Snow can become packed inside engine compartment.
- If parked outside – Preheat engine. handcar is best if

Types of Icing

- Induction (Carburetor Icing)
- Airframe Icing

Induction Icing



- **Cause:** Evaporation of fuel into air
- **Symptoms:** Loss of power (RPM) or Manifold Pressure

Induction Icing

- Is noticed as you increase power from a setting that has been held for a while – engine stumbles and may even quit.
- Adding carburetor heat will cause engine to run rough then increase in power.

Induction Icing

- Can occur between 10°F to 90°F with relative humidity greater than 20%

Airframe Icing

3 (4) Types are:

- Rime
- Clear
- Mixed
- (Frost)

Airframe Icing

Rime ice

- Milky white (Freezes Instantly)
- Occurs in Stratus Clouds

Airframe Icing

Rime ice



Airframe Icing

Clear ice

- Clear (Freezes Slowly)
- Occurs in Cumulus Clouds

Airframe Icing

Clear ice



Airframe Icing

Mixed ice

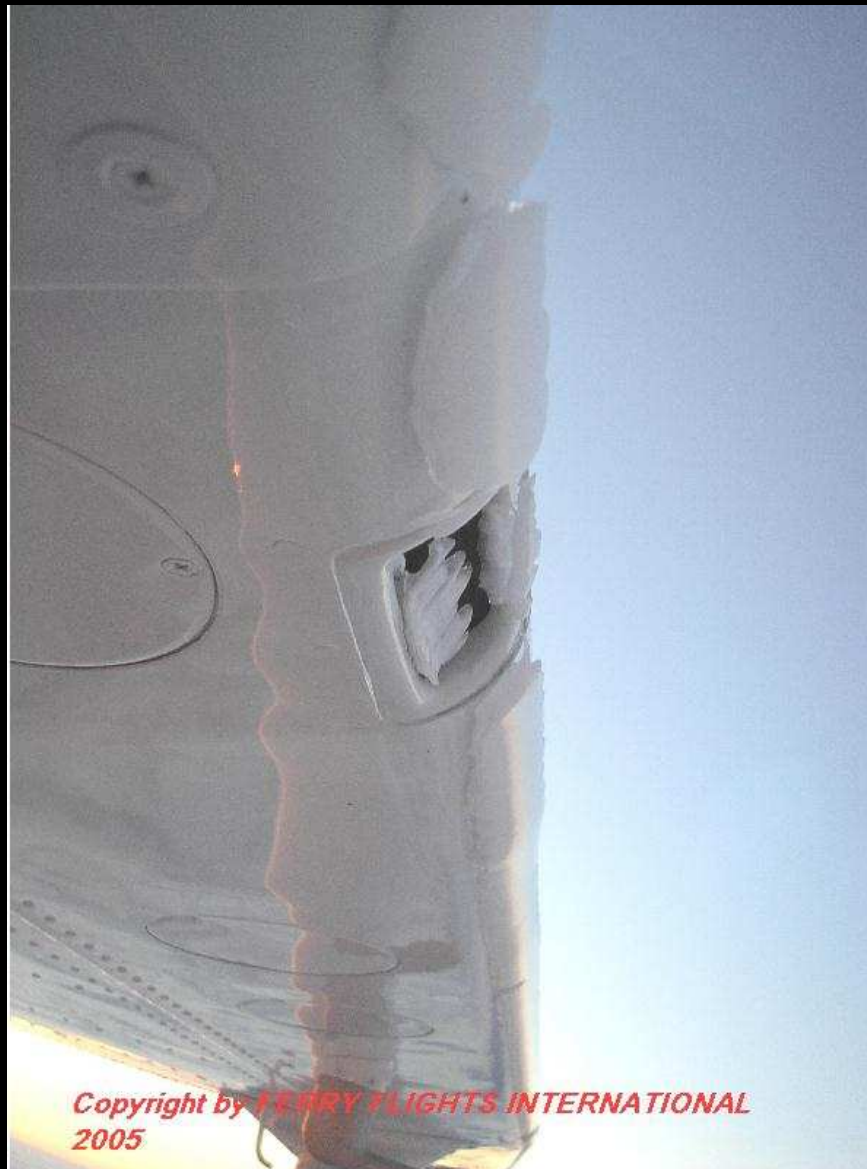
- Combination of both Clear and Rime Ice

Airframe Icing

Mixed ice



Airframe Icing



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2005*

Airframe Icing

Freezing Rain

- **Symptoms:** Freezing “Runback” on windscreen and side windows
- **Causes:** Temperature Inversion
- **Escape:** Climb if able

Airframe Icing

Airframe icing issues:

- Increased weight on aircraft which lowers performance.
- Increased drag (surface area) which slows aircraft.
- Airfoil (and propeller) contamination causing loss of surface lifting (thrust) ability.

Airframe Icing

Airframe icing issues:

- An ice deposit of as little as $\frac{1}{2}$ " on the leading edge of a wing can reduce lift by about 50%, increase drag by an equal percentage, and thus greatly increase the stall speed.
- On a typical C172, a $\frac{1}{4}$ " coating of ice can add up to 150 lbs.. $\frac{1}{2}$ " can add 300 lbs..

Airframe Icing

Estimating Icing Altitude:

- Lapse rate - As altitude increases, temperature decreases at a fairly uniform rate of 2° Celsius or 3.6° Fahrenheit for each 1000 feet.
 - Airport elevation = 1,000 feet
 - Temperature 12°C ($12/2 = 6$)

Airframe Icing

Frost

- **Cause:** Water droplets condense at night as temperature drops then freeze on surfaces when temperature is below freezing. Dew occurs when temp. above freezing.
- **Removal:** FAA stance is to remove ALL frost (hangar or de-ice).

Taxiing in Ice or Snow

Pilot should exercise extreme caution to avoid the following:

- Loss of traction on ice covered surfaces, use extreme caution on newly plowed runways and surfaces with no braking action reports.
- Impact of nose wheel/propeller with snow and or ice drifts or ridges left by snow plowing equipment.

Tail-plane Icing (NASA 1998)



Dangers of Aircraft Icing

EVALUATION

Discuss the following concerning icing

- Freezing Level
- How airframe frost and icing affects aircraft performance.
- How carburetor icing affects aircraft performance.

Dangers of Aircraft Icing

Questions? Comments?

Aircraft Safety

Tidbits from the recent AOPA Air Safety Foundation Safety Seminar “What Went Wrong?”

- Google Earth (and/or other satellite photo maps): Great for reviewing the area around unfamiliar airports
 - Can preview arrival view
 - Can preview open areas for emergency off airport landings
 - Keep in mind that these maps can be several years old, so use with care and discretion

Aircraft Safety

Tidbits from the recent AOPA Air Safety Foundation Safety Seminar “What Went Wrong?” (continued)

- Pre-Takeoff Briefing: Who, What, Where, When, How
 - Both for Normal & Emergency situations
 - Who does what, when, why, where, and how!

Aircraft Safety

Tidbits from the recent AOPA Air Safety Foundation Safety Seminar “What Went Wrong?” (continued)

- Pre-Takeoff Briefing: (continued)
 - Example: Engine Power loss
 - Who will have/take control of flying the airplane?
 - When will the aircraft be handed over to the PIC?
 - What will the initial and follow up actions be by the PIC &/or student?
 - What should other crew members do?
 - When should this briefing occur?
 - Prior to engine start plus review of engine out procedures just prior to taking the runway

Aircraft Safety

Tidbits from the recent AOPA Air Safety Foundation Safety Seminar “What Went Wrong?” (continued)

- In IFR, Circle to Land procedure is the most dangerous thing we do
 - Many flight departments restrict the use of circle to land
 - A tail wind may well be better and safer than executing a circling approach, especially at night

Aircraft Safety

Questions? Comments?

Aircraft Safety

This concludes the 2009 October Safety Stand Down Day.

Thank you for attending and for your continued support of our Safety First mission.