Title: **General Aviation Winter Flying**

1. INTRODUCTION

The purpose of this document is to outline some of the hazards General Aviation flyers experience during the Winter Flying Season and to suggest some steps you can take to improve your safety.

Research by the USA NTSB on winter accidents in the general aviation sector found that a large percentage had lack of pilot experience of winter weather conditions as a major contributory factor. The AAIU have made safety recommendations for similar reasons.

The data presented in this document is collated from guidance material issued by other authorities, experienced pilots and input from national representative bodies in Ireland.

2. REFERENCES

The following documents have been used as source material and are recommended as additional reading material on this general subject:

2.1 IAA AIC Nr 11/93

2.2 USA NTSB Study Risk Factors Associated with Weather-Related General Aviation Accidents

2.3 UK CAA SafetySense Leaflet 3 – Winter Flying

2.4 UK CAA SafetySense Leaflet 7 – Aeroplane Performance

3. WINTER HAZARDS

Winter flying introduces a number of additional hazards not usually experienced during the summer season. These extra risks are outlined below with some guidance on how you can prepare yourself and ensure you minimise the risk to you.

4.1 Carburettor Icing

Carburettor icing is commonly quoted in accident investigations and can quickly lead to engine failure during flight in winter ***and summer*** in Ireland. There are three scenarios where carburettor ice may form:

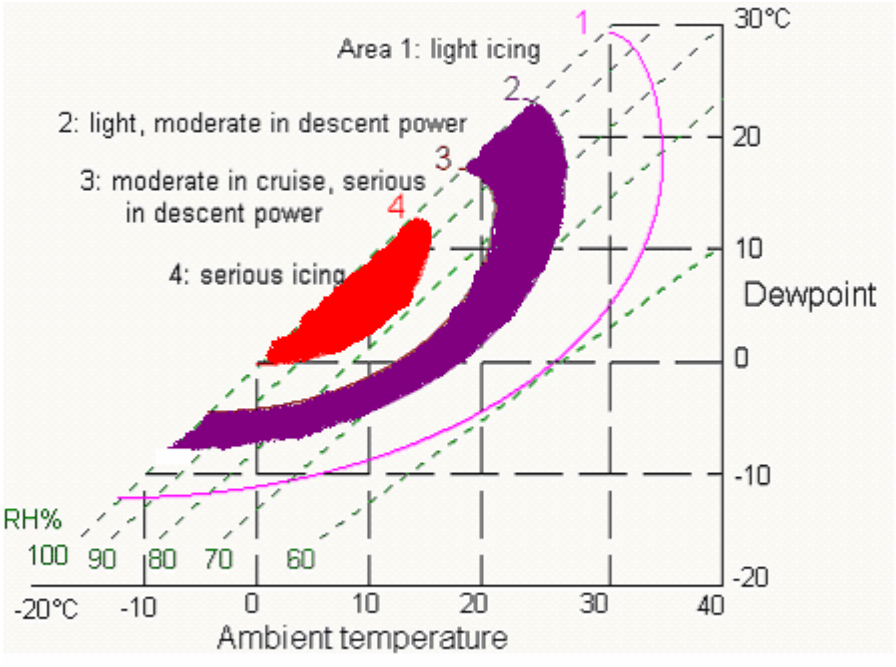
- Impact ice formed by impact of moist air at temperatures between -9°C and 0°C on airscoops, throttle plates, heat valves, etc. Usually forms when visible moisture such as rain, snow, sleet, or clouds are present. Most rapid accumulation can be anticipated at -4°C.
- Fuel ice forms at and downstream from the point that fuel is introduced when the moisture content of the air freezes as a result of the cooling caused by vaporization. It generally occurs between 4°C and 26°C, but may occur at even higher temperatures. It can occur whenever the relative humidity is more than 50%.
- Throttle ice is formed at or near a partly closed throttle valve. The water vapour in the induction air condenses and freezes due to the venturi effect cooling as the air passes the throttle valve. Since the temperature drop is usually around 3°C, the best temperatures for forming

throttle ice would be 0°C and 3°C although a combination of fuel and throttle ice could occur at higher ambient temperatures.

In general, carburettor ice will form in temperatures between 0°C and 10°C when the relative humidity is 50% or more. If visible moisture is present, it will form at temperatures between -9°C and 0°C. A carburettor air temperature (CAT) gauge is extremely helpful to keep the temperatures within the carburettor in the proper range. Partial carburettor heat is not recommended if a CAT gauge is not installed. Partial throttle (cruise or descent) is the most critical time for carburettor ice. It is recommended that carburettor heat be applied before reducing power and that partial power be used during descent to prevent icing and overcooling the engine.

To prevent icing use carburettor heat during ground check, use heat in the icing range and use heat on approach and descent. Some warning signs are loss of rpm (fixed pitch) or a drop in manifold pressure (constant speed) and/or rough running. Pilot response:

- Apply full carburettor heat immediately (may run rough initially for short time while ice melts)
- The curves encompass conditions known to be favourable for carburettor icing. The severity of this problem varies with different types, but these curves are a guide for the typical light aircraft.



4.2 Icing on all aircraft surfaces

Icing on any surface, but particularly on lift surfaces, can seriously degrade the lift characteristics of all aircraft types leading to unexpected flying characteristics and stalls at higher operating speeds. Remember there is no such thing as a little ice. With ice the aircraft weight increases, the lift reduces and also drag increases leading to higher stall speeds.

Propeller RPM can affect the type of ice formation on the wing surfaces in the propeller slipstream. Many propeller manufacturers recommend that the propeller RPM be increased in icing conditions so as to improve the performance of the propeller de-icing system and to reduce vibration resulting from uneven distribution and shedding of blade ice. In addition, it is possible that the build up of ice on the propeller blades can generate a very turbulent airflow in the wake of a propeller operating at its normal cruise RPM and, under severe icing conditions, this turbulent airflow encourages the formation of a thin rough ice layer on the airfoil in the propeller slipstream. This particular kind of ice formation results in disruption of the boundary layer and a serious deterioration of the local lift coefficient - significantly more so in fact than encountered with conventional [smooth] ice accretion.

Never fly in icing conditions for which the aircraft is not cleared. Do not be misled into thinking that because an aircraft is fitted with de-icing, or anti-icing, equipment, it is necessarily effective in all conditions. Most general aviation aeroplanes are not cleared for flight in icing conditions, although some protection may be given. (See Pilots' Operating Handbooks, Flight Manuals, etc.)

If an aircraft is parked in an area where there was blowing snow or rain, special attention should be given to openings in the aircraft where snow or water can enter, freeze solid, and obstruct operation. These openings should be free of snow, water and ice before flight. Some of these areas are as follows:

- Pitot Tubes
- Heater intakes
- Carburettor intakes
- Anti torque and elevator controls
- Main wheel and tail wheel wells, where snow can freeze around elevator and rudder controls.

4.3 Grass runways in winter

Airport conditions can change dramatically in winter. Runways and aprons can be muddy and soft and can make take-off runs much longer. Wet grass runways may throw up additional water on to the

aircraft engine and lift surfaces leading to an increased potential for icing. A heavy aircraft may 'dig in' and never reach take-off speed.

Landing runs can also be much longer, despite the increased rolling resistance. Tyre friction reduces, as does the amount of braking possible. Very short wet grass with a firm subsoil will be slippery and can give a 60% stopping distance increase. When landing on grass the pilot cannot see or always know whether the grass is wet or covered in dew.

Make sure you factor adequate safety margin as per the aircraft Flight Manual/ Flight Operation manual. Ensure there is adequate takeoff distance and landing distance for your aircraft weight and prevailing runway and weather conditions.

4.4 Engine Maintenance

Lower temperatures will lead to thicker oil with reduced lubrication during initial start-up. Also condensation can occur in the engine. If the aircraft is not flown regularly the condensation can combine with engine oil and by-products of the combustion process leading to acidic corrosion in the engine. Follow the manufacturer's recommendations for type of oil and replacement frequency.

4.5 Fuel

There may be a greater risk of water condensation in aircraft fuel tanks in winter. Drain fluid from all water drains (there can be as many as thirteen on some single-engine aircraft). Park the aircraft in level flight position, and allow the fuel settle before draining. Drain it into a clear container so that you can see any water.

Extra care should be taken during changes in temperature, particularly when it nears the freezing level. Ice may be in the tanks which may turn to water when the temperature rises, and may filter down into the carburettor causing engine failure. During freezing conditions water can freeze in lines and filters causing stoppage. If fuel does not drain freely from sumps, this would indicate a line or sump is obstructed by sediment or ice.

When refuelling, ensure the aircraft is properly earthed. The very low humidity on a crisp, cold day can be conducive to a build-up of static electricity.

4.6 Weather conditions

The weather is always an issue in Ireland but particularly in winter when opportunities to fly are even less. According to the UK CAA flying into poor weather conditions is the biggest killer in the UK. The US NTSB study also concluded that historically, about two-thirds of all general aviation (GA) accidents that occur in instrument meteorological conditions (IMC) are fatal, a rate much higher than the overall fatality rate for GA accidents.

Make sure you have the most up to date weather forecast available. Do not ignore what it says and make a carefully reasoned GO/NO–GO decision. Do not let 'Get-there/ home–itis' affect your judgement and do not worry about 'disappointing' passenger(s). Establish clearly in your mind the current en-route conditions, the forecast and the 'escape route' to good weather. Plan an alternative route if you intend to fly over high ground where cloud is likely to lower and thicken. Be continuously vigilant of icing.

Don't try to fly in weather you and your aircraft and not equipped for. Know the weather and don't take chances.

4.6 Pilot Experience

The US NTSB conducted a study of GA aircraft accidents in the USA between August 2003 and April 2004 to determine the risks factors associated with weather related GA accidents. On the subject of pilot experience the NTSB made a number of interesting findings:

Age at Private Certificate - Pilots with the lowest risk of accident involvement were those who received their private certificates at or before age 25. Pilots who received their private certificates between age 25 and 35 were found to be at 4.5 times greater risk than those in the youngest group of being involved in a weather-related accident, and those who received their certificates between 35 and 45 were at 4.8 times greater risk. Pilots who received their licences after age 45 were 3.4 times more likely than the youngest group to be involved in a weather-related accident.

Prior Accident/Incident Involvement - Pilots with a history of any type of accident or incident were found to be 3.1 times more likely to be represented in the accident group than pilots with no such history.

Instrument Rating - Not having an instrument rating was associated with significantly higher accident risk. Specifically, pilots who did not hold an instrument rating were found to be 4.8 times more likely than instrument-rated pilots to be involved in a weather-related accident.

4.7 Improve Your Chances

There are a number of simple steps you can take to improve your safety:

Flight Plan – always file a flight plan and do not close it until you have safely reached your destination. This is a key step in helping authorities identify if you may be in trouble and need assistance. There have been two fatal accidents in Ireland over the last two years where a relatively long period of time passed before the aircraft were missed. In Ireland flight plans are filed by contacting the IAA as per the details supplied in the integrated Aeronautical information package (AIP) available on the IAA website at : http://www.iaa.ie/safe_reg/iaip/Frame1.htm

Pre-Flight – make sure all equipment is functioning correctly. Heaters, de-misters should be checked before you actually need them. Items such as batteries work harder during the winter and

should be checked regularly for good charge and condition. Give them time to recharge before applying large loads.

ELT – Emergency locator transmitters are continuously improving, becoming smaller and cheaper. Consider installing a transmitter in your aircraft, either a fixed or portable unit that will guide rescue services to your location in the event of an accident.

Medical Kit – A simple medical kit, readily available in supermarkets and pharmacies, may allow immediate basic medical care be provided at an accident site.

Winter Clothing – Wear clothing that is suitable for use outside in the prevailing weather conditions. A failure of a cabin heater could leave you in a very cold environment or if you need to land don't leave yourself freezing on the ground awaiting assistance.