



AVIATION



HIGHWAY



MARINE



RAILROAD



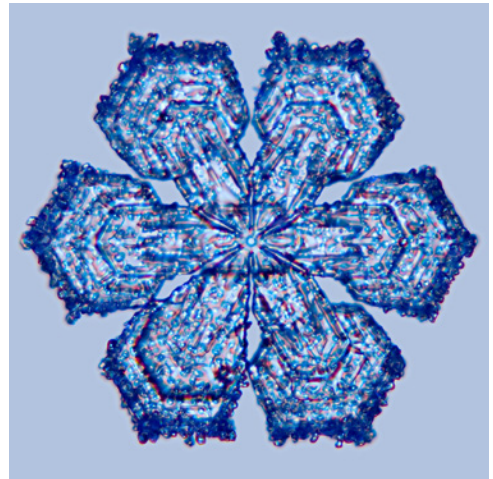
PIPELINE

# Flight in Snow

## Assess the risk of flight in wet snow conditions, especially at low altitudes

### The problem

- Flight in wet snow and associated icing conditions can lead to deadly consequences. While snow is typically thought to consist of all-frozen water, snowfall can also contain liquid particles either on the flakes or liquid particles falling amongst the snowflakes. This is what is commonly referred to as wet snow (see figure 1). The liquid portions of wet snow have the potential to freeze onto surfaces that the snow comes in contact with (for example, aircraft) and pose a significant hazard to safety of flight through structural, engine, and windshield ice accumulation.
- Although Federal Aviation Administration (FAA) Advisory Circular (AC) 91-74B states “dry snow” is unlikely to pose an icing hazard while “wet snow” could, the FAA does not define either term. It is imperative that pilots and dispatchers review all potential snow forecasts for an icing threat in addition to potential instrument meteorological conditions (IMC).
- A recent National Transportation Safety Board (NTSB) investigation revealed that pilots and operators assumed that flight in snow was safe as long as minimum ceiling and visibility requirements were met or that snow conditions were too dry or cold to pose an icing hazard. Pilots also commented that snow conditions are safe to fly in as long as you can see through it; they did not consider the effects of icing. Such assumptions can result in inadequate reviews of icing-related forecasts or tools. A comprehensive review of en route weather conditions, including the likelihood of wet snow and icing, can prevent accidents.



SOURCE: GREGORY THOMPSON, IN THE CLOUDS PHOTOGRAPHY

**Figure 1.** A snowflake containing liquid particles

## Related accidents

### The NTSB has investigated the following fatal accidents in which wet snow was present:

■ A Cirrus SR22 airplane was destroyed after the pilot reported ice accumulation and subsequently impacted terrain (figure 2). The pilot received a weather briefing the night before the accident and filed a flight plan. Weather information for the time of the accident revealed that the pilot was operating in IMC and icing with light snow, mist, and light rain observed at the surface. At the time of the accident, an active weather advisory was in effect for moderate icing, instrument flight rules/mountain obscuration, and low-level turbulence near the accident site. (CEN18FA144)

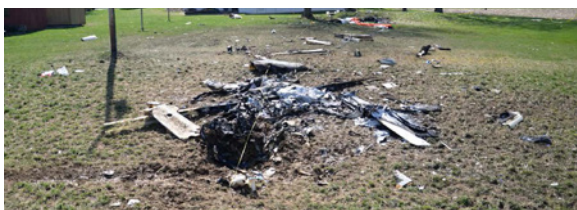


Figure 2. CEN18FA144 accident scene

■ An aerial observation flight impacted terrain after departing in snow, icing, and IMC (figure 3). Satellite, radar, and weather observations near the accident site reported low clouds and visibility with light to moderate snowfall at the time of the accident. Weather models and advisories supported the probability of structural icing in the area at the time of the accident. Despite accessing the NOAA Doppler radar loop weather imagery depicting these conditions before the accident flight, the accident pilot elected to depart in snow, which illustrates his incomplete understanding of the hazard. The NTSB determined that the probable cause was a loss of engine power due to snow or ice ingestion at an altitude that was insufficient to allow for engine re-ignition. (CEN18FA074)



Figure 3. CEN18FA074 accident scene

■ A helicopter on a visual flight rules (VFR) flight returning from a glacier dog camp encountered IMC, snow, icing, and gusting wind and impacted terrain near the departure location (figure 4). On a flight earlier that day, the pilot reported in-flight icing caused by “wet snow;” he decided to continue the mission and evaluate conditions on subsequent flights. The operator did not maintain operational control following the icing report and allowed the pilot to continue flying in the icing conditions despite it being prohibited in the rotorcraft flight manual. (ANC16FA023)



Figure 4. ANC16FA023 accident scene

■ A medical transport helicopter, on a night VFR flight to pick up a patient, inadvertently encountered inclement weather (including snow, supercooled-liquid water, and reduced visibility conditions) and impacted terrain (see figure 5). The computer-based weather information available to the pilot showed marginal VFR ceilings and visibility with snow before departure. Available weather data and reports from first responders to the accident site indicated that the flight likely encountered areas of freezing drizzle, supercooled liquid water, and snow. (CEN13FA096)



**Figure 5.** CEN13FA096 accident scene

## What can pilots, dispatchers, and operators do?

- Be aware that wet snow has the potential to freeze onto surfaces, such as the airframe, engine, or the windscreen, potentially compromising flight safety. Additional resources concerning the hazards of icing can be found at <https://aviationweather.gov/icing/fip> or by using the Forecast Icing Potential/Current Icing Potential overlays on the [Graphical Forecasts for Aviation](#) or the icing overlays on the [HEMS Weather Tool](#).
- If you find yourself faced with forecast or observed snow conditions, consider the icing threat and follow your icing mitigation or avoidance procedures.
- Stay updated with the latest SIGMET, AIRMET, and CWA information and pilot reports ([PIREPs](#)) along your flight route. Pilots are encouraged to ask air traffic control about PIREPs as well as provide reports to apprise others in the National Airspace System of current weather conditions.
- If your airplane is equipped with leading-edge deice boots, activate them as soon as icing is encountered unless the aircraft flight manual or the pilot's operating handbook specifically directs not to activate them. See NTSB Safety Alert [SA-014](#) for more information.
- Be honest with yourself about your skill limitations. Plan ahead with cancellation or diversion alternatives.
- Seek training to ensure that you are proficient and fully understand the features and limitations of the equipment in your aircraft, particularly how to use all features of the avionics, autopilot systems, and weather information resources.
- Operators
  - Make sure that risk assessments for flight into snow conditions include a review of potential for icing that can accompany snow.
  - Make sure that risk assessments contain more than just a review of ceiling and visibility conditions.
  - Check en route weather conditions as part of risk assessments.
  - Consider including information about the various snow types in training programs.
- [FAA AC 91-74B - Pilot Guide: Flight In Icing Conditions](#), states, "Be aware that freezing drizzle can coexist with snow. If you are flying into or over areas reporting snow, it is important to understand that the presence of snow does not necessarily mean that icing conditions are not present."
- [FAA AC 135-14B - Helicopter Air Ambulance Operations](#), states that current and forecast weather including icing "should be considered for the departure point, en route, and primary destination and contingency routes/diversion landing facilities."

## Interested in more information?

The reports for the accidents referenced in this safety alert are accessible by NTSB accident number from the [Aviation Accident Database](#) link, and each accident's public docket is accessible from the [Accident Dockets](#) link for the Docket Management System.

The NTSB's Aviation Information Resources web page, [www.nts.gov/air](http://www.nts.gov/air), provides convenient access to NTSB aviation safety products. This Safety Alert and others can be accessed from the [Aviation Safety Alerts](#) link at [www.nts.gov](http://www.nts.gov).

[www.twitter.com/ntsb](https://www.twitter.com/ntsb)   
[www.facebook.com/ntsbgov](https://www.facebook.com/ntsbgov)   
[www.youtube.com/user/ntsbgov](https://www.youtube.com/user/ntsbgov)   
[www.instagram.com/ntsbgov](https://www.instagram.com/ntsbgov)   
[www.flickr.com/photos/ntsb](https://www.flickr.com/photos/ntsb) 



The NTSB is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant accidents in other modes of transportation—highway, marine, railroad, and pipeline. The NTSB determines the probable cause of the accidents and issues safety recommendations aimed at preventing future accidents. For more information, visit [www.nts.gov](http://www.nts.gov).