

Winter Flying: Icing and IMC
A Case Study of an Icing Accident
AOPA Courses and Using the FAA Wings Program



By
Maj William J. Doyle, Jr., CFI A&I, AGI, IGI
NJWG/DOV

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Purpose

This document discusses an icing accident that took five lives as well as the life of the family pet. This accident occurred within 15 minutes of departure following an extremely rapid ice buildup. The accident case study uses NTSB findings as well as materials from the AOPA Air Safety Foundation.

This document also provides links to AOPA ASF online courses and Safety Advisors to assist pilots as well as some FAA Safety Seminars, in identifying icing hazards and avoiding them. The online courses can be taken at whatever pace the pilot chooses.

Lastly this document strongly encourages pilots to register with FAASafety.gov and participate in the FAA's Wings program. The online courses listed below all carry FAA Wings credit.

For CAP pilots these Wings credits can be set to carry over into the CAP eServices Safety Program. They can couple with annual CAPF-5, which is also eligible for Wings credit, to complete a Wings Phase and result in the completion of a Flight Review. The last section of this document treats the FAA Wings Program and how it relates to CAP in detail.

Background

On 14 NOV 2013, I was at the Flying W Airport (N14) for an FAA Safety Seminar entitled, "Breaking the ICE! Managing the Hazards of Aircraft Icing during Take-off, Cruise & Landing." This Safety Seminar was presented by Mr. Chris Dumont of the FAA's William J. Hughes Technical Center located at Atlantic City International Airport (KACY), Atlantic City, NJ.

Mr. Dumont presentation described how ice accumulates as well as the extent to which the various types of deicing and anti-icing systems deal with icing. He will be giving this presentation again at the locations listed below. It is an excellent presentation with fantastic graphic animation to illustrate accretion and the associated risk.

- 3 DEC 2013 – Toms River, NJ
- 16 DEC 2013 – Millville, NJ

One of the references for Mr. Dumont's presentation was an AOPA/Air Safety Foundation (ASF) Safety Advisor article entitled, "Aircraft Deicing and Anti-icing Equipment" that was published in October 2004. This article was funded by the FAA. There is a link to this Safety Advisor later in this document.

Around the same time as Mr. Dumont's presentation at the Flying W, the December edition of AOPA Pilot Magazine came out. It contained an article entitled, "Safety Pilot Landmark Accident: Unpredicted, Unadvised, Unaware." The article described the departure of a Socata TBM 700, its encounter with severe icing, and its high speed descent into terrain 15 minutes after takeoff.

In conjunction with the AOPA Pilot article, AOPA/ASF published a 14 minute video clip on their AOPA Live web page.

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Accident Case Study

On 20 DEC 2011, a Socata TBM 700 crashed on I-287 in Morristown, NJ. The pilot had filed an IFR flight plan from Teterboro Airport (KTEB), NJ to the Peachtree-DeKalb Airport (KPDK) in Atlanta, GA with a requested cruising altitude of FL260. The flight departed Teterboro at 9:50 AM.

- The TBM entered instrument meteorological conditions while climbing through 12,800 feet and was advised of moderate rime icing from 15,000 feet through 17,000 feet.
- While at 16,800 feet, the pilot confirmed that, “Light icing has been present for a little while and a higher altitude would be great.”
- About 15 seconds later, the pilot stated that he was getting a “little rattle” and requested a higher altitude as soon as possible.
- About 25 seconds after that, the flight was cleared to Flight Level 200, and the pilot acknowledged.
- One minute later, at 10:04 a.m., the airplane reached a peak altitude of 17,800 feet “before turning sharply to the left and entering a descent.”
- While descending through 17,400 feet, the pilot’s last radio call was “and N-Seven-Three-One-Charlie-Alpha’s declaring....”
- The TBM came down very quickly from altitude, according to several witnesses, losing a wing and taking out part of the empennage before hitting the ground.

The pilot and four passengers were fatally injured.

AOPA Overview of Icing Accident

The links below present the AOPA Air Safety Institute’s research of this accident.

- December 2013 AOPA Pilot article entitled, “Safety Pilot Landmark Accident: Unpredicted, Unadvised, Unaware.” Suggest that you read this article before watching the AOPA Live video clip below http://williamjdoylejr.net/FAAST/AOPA-SA/AOPA_Pilot_2013-12-01_Landmark_Accident_TBM700.pdf
- Delayed Reaction: AOPA Live video on 20 DEC 2011 icing and crash (5 fatalities) of Socata TBM 700 at Morristown NJ <http://www.aopa.org/AOPA-Live.aspx?watch={9CC22A1C-9960-43A5-AC03-3757498BE36C}>

NTSB Findings

The NTSB found the probable cause to be

“The airplane’s encounter with unforecasted severe icing conditions that were characterized by high ice accretion rates and **the pilot's failure to use his command authority** to depart the icing conditions in an expeditious manner, which resulted in a loss of airplane control.”

- **Factual Report ERA12FA115 – Crash of Socata TBM 700**
<http://dms.nts.gov/aviation/AccidentReports/fkgyuu5542b1rqe3wr0iuf551/T11182013120000.pdf>
- **Probable Cause ERA12FA115 – Crash of Socata TBM 700**
http://www.nts.gov/AviationQuery/brief.aspx?ev_id=20111220X20005&key=1

AOPA Safety Advisors and Online Course – Precipitation & Icing

The reference materials and courses listed below contain training material directly related to the circumstances of the accident described above.

- **Online Course – WeatherWise: Precipitation and Icing**
http://flash.aopa.org/asf/wxwise_precip/

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- **AOPA/Air Safety Foundation Safety Advisor: SA11 – Aircraft Icing**
http://williamjdoylejr.net/FAAST/AOPA-SA/sa11_Aircraft_Icing.pdf
<http://www.aopa.org/-/media/Files/AOPA/Home/Pilot%20Resources/ASI/Safety%20Advisors/sa11.pdf>
- **AOPA/Air Safety Foundation Safety Advisor: SA22 – Aircraft Deicing and Anti-icing Equipment**
http://williamjdoylejr.net/FAAST/AOPA-SA/sa22_Aircraft_Deicing_and_Anti-icing_Equipment.pdf
<http://www.aopa.org/-/media/Files/AOPA/Home/Pilot%20Resources/ASI/Safety%20Advisors/sa22.pdf>

Recommendations

Consider these recommendations before flying IFR in the winter or at any time that the temperature aloft is below freezing and you will be in visible precipitation.

- Get a thorough weather briefing. Suggested practice would be the following:
 - Create a flight plan through one of the online services.
 - Obtain an electronic weather briefing for that route of flight.
 - Call Flight Service for an update at 1-800-WX-BRIEF.
 - Pay attention to the PIREPS (Pilot Reports) in addition to the TAFs and METARs.
- Be able to recognize when icing is most likely to occur.
- Know the difference between aircraft deicing equipment and aircraft anti-icing equipment
 - Single engine general aviation airplanes typically only have anti-icing equipment:
 - Carburetor heat
 - Pitot heat
 - Alternate air
 - Understand the limitations of aircraft deicing equipment.
- Practice continuing pilot education:
 - FAA Safety Seminars
 - FAA and AOPA online courses
 - Participate in the FAA Wings Program
- Check PIREPS in flight:
 - Contact Flight Watch at 122.0.
 - Use EFB to check PIREPS. May require ADS-B receiver.
 - From your airplane if the MFD is equipped to display PIREPS
- Understand and practice the responsibility and authority of Pilot in Command (PIC)
 - Read and understand 14 CFR 91.3 - Responsibility and authority of the pilot in command
- Know the procedures for exiting a severe icing environment.
 - Request PRIORITY HANDLING from ATC to exit icing conditions. [“Cessna 14TY requests an immediate climb to 6,000 due to icing.”]
 - Be flexible and help ATC by being willing to accept altitude and heading changes.
 - Make your request early when the ice first starts to build, not after the situation is critical.
 - If necessary, declare an emergency to deal with the problem at hand.
 - Avoid abrupt and excessive maneuvering.
 - Do not engage the autopilot.
 - If the autopilot is engaged, hold the control wheel firmly and disengage the autopilot.
 - If an unusual roll response or an uncommanded roll control movement is observed, reduce the angle of attack.
 - Do not extend flaps when holding in icing conditions.
 - If flaps are extended, do not retract them until the airframe is clear of ice.
 - Report these conditions to ATC.

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Appendix A – Reference Materials and Online Courses

FAA Handbooks and Regulations

- [Airplane Flying Handbook](#)
- [Instrument Flying Handbook](#)
- [Pilot's Handbook of Aeronautical Knowledge](#)
- [Aeronautical Information Manual \(AIM\)](#)
- [Risk Management Handbook](#)
- [Electronic Code of Federal Regulations – Title 14 Chapter I--Federal Aviation Administration, Department of Transportation, Subchapter D – Airmen](#)
 - [14 CFR Part 61](#)
 - [14 CFR Part 91](#)

AOPA Online Courses, Safety Advisors and FAA Safety Seminars

Link to All AOPA Online Courses

<http://www.aopa.org/Education/Online-Courses.aspx>

Link to All AOPA Safety Advisors

<http://www.aopa.org/Pilot-Resources/Air-Safety-Institute/Safety-Publications/Safety-Advisors.aspx>
<http://williamjdoylejr.net/FAAST/AOPA-SA/>

WeatherWise Online Courses and References

- **Online Course - WeatherWise: Precipitation and Icing**
http://flash.aopa.org/asf/wxwise_precip/
- **Online Course - WeatherWise: Ceiling and Visibility**
http://flash.aopa.org/asf/wxwise_ceilingvis/html/weatherSafety.cfm?
- **Online Course - WeatherWise: Air Masses and Fronts**
http://flash.aopa.org/asf/wxwise_fronts/wxwise_fronts.cfm?
- **Online Course - WeatherWise: VFR into IMC**
<http://www.aopa.org/lms/courses/vfr-into-imc/#splash>
- **Online Course - WeatherWise: Thunderstorms and ATC**
http://flash.aopa.org/asf/wxwise_thunder/thunderstorms.cfm?
- **AOPA Safety Advisor SA14 - WeatherWise**
<http://www.aopa.org/-/media/Files/AOPA/Home/Pilot%20Resources/ASI/Safety%20Advisors/sa14.pdf>
http://williamjdoylejr.net/FAAST/AOPA-SA/sa14_WeatherWise.pdf
- **AOPA/Air Safety Foundation Safety Advisor: SA11 – Aircraft Icing**
http://williamjdoylejr.net/FAAST/AOPA-SA/sa11_Aircraft_Icing.pdf
<http://www.aopa.org/-/media/Files/AOPA/Home/Pilot%20Resources/ASI/Safety%20Advisors/sa11.pdf>
- **AOPA Safety Advisor SA17 – Spatial Disorientation**
<http://www.aopa.org/-/media/Files/AOPA/Home/Pilot%20Resources/ASI/Safety%20Advisors/sa17.pdf>
http://williamjdoylejr.net/FAAST/AOPA-SA/sa17_Spatial_Disorientation.pdf

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- **AOPA/Air Safety Foundation Safety Advisor: SA22 – Aircraft Deicing and Anti-icing Equipment**
http://williamjdoylejr.net/FAAST/AOPA-SA/sa22_Aircraft_Deicing_and_Anti-icing_Equipment.pdf
<http://www.aopa.org/-/media/Files/AOPA/Home/Pilot%20Resources/ASI/Safety%20Advisors/sa22.pdf>
- **AOPA Safety Advisor SA26 Thunderstorms and ATC**
<http://www.aopa.org/-/media/Files/AOPA/Home/Pilot%20Resources/ASI/Safety%20Advisors/sa26.pdf>
http://williamjdoylejr.net/FAAST/AOPA-SA/sa26_Thunderstorms_and_ATC.pdf
- **AOPA Safety Syllabus**
<http://williamjdoylejr.net/FAAST/AOPA-SA/VFRintoIMC.pdf>
- **AOPA Air Safety Institute Personal Minimums Checklist**
<http://williamjdoylejr.net/FAAST/AOPA-SA/ASIPersonalMinsChecklist.pdf>
- **AOPA Live – Accident Case Study: In Too Deep**
<http://www.aopa.org/AOPA-Live.aspx?watch={6CAEC9E8-77C4-49F3-B2AA-7D49BC1C2FC9}>
- **AOPA Live – Accident Case Study: Delayed Reaction**
<http://www.aopa.org/AOPA-Live.aspx?watch={9CC22A1C-9960-43A5-AC03-3757498BE36C}>
- **FAA Safety Seminar – VFR into IMC**
http://williamjdoylejr.net/FAAST/What_IF/What_If_VFR_into_IMC.ppt

IFR Insights Online Courses and References

IFR Insights: Cockpit Weather

- **Online Course - IFR Insights: Cockpit Weather**
https://flash.aopa.org/asf/ifrinsights_cockpitwx/swf/flash.cfm?
- **Online Course – IFR Insights: Charts**
http://flash.aopa.org/asf/ifrinsights_charts/swf/flash.cfm?
- **Online Course – IFR Insights: Regulations**
http://flash.aopa.org/asf/ifrinsights_regs/swf/flash.cfm?
- **AOPA Safety Advisor SA14 - WeatherWise**
<http://www.aopa.org/-/media/Files/AOPA/Home/Pilot%20Resources/ASI/Safety%20Advisors/sa14.pdf>
http://williamjdoylejr.net/FAAST/AOPA-SA/sa14_WeatherWise.pdf
- **AOPA Safety Advisor SA28 FARs**
<http://www.aopa.org/-/media/Files/AOPA/Home/Pilot%20Resources/ASI/Safety%20Advisors/SA28.pdf>
http://williamjdoylejr.net/FAAST/AOPA-SA/SA28_FARs.pdf

Single Pilot IFR Online Courses and References

- **Online Course - Single Pilot IFR**
http://flash.aopa.org/asf/single_pilot_ifr/site/html/index/SPIFR.htm
- **AOPA Safety Advisor SA05 – Single Pilot IFR**
<http://www.aopa.org/-/media/Files/AOPA/Home/Pilot%20Resources/ASI/Safety%20Advisors/sa05.pdf>
http://williamjdoylejr.net/FAAST/AOPA-SA/sa05_Single-Pilot_IFR.pdf
- **AOPA Safety Advisor SA17 – Spatial Disorientation**
<http://www.aopa.org/-/media/Files/AOPA/Home/Pilot%20Resources/ASI/Safety%20Advisors/sa17.pdf>
http://williamjdoylejr.net/FAAST/AOPA-SA/sa17_Spatial_Disorientation.pdf
- **FAA Safety Seminar – Single Pilot Night IFR**
http://williamjdoylejr.net/FAAST/Single_Pilot_Night_IFR.ppt

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IFR Chart Challenge Courses and References

- **Online Course – IFR Chart Challenge: ILS**
<http://flash.aopa.org/asf/chartchallengeils/swf/flash.cfm?>
- **Online Course – IFR Chart Challenge: RNAV**
<http://flash.aopa.org/asf/chartchallengernav/swf/flash.cfm?>
- **Online Course – IFR Chart Challenge: VOR**
<http://flash.aopa.org/asf/chartchallengevor/swf/flash.cfm?>

GPS Operations Courses and References

- **Online Course – GPS for IFR Operations**
http://flash.aopa.org/asf/gps_ifr/swf/flash.cfm?
- **Online Course – GPS for VFR Operations**
http://flash.aopa.org/asf/gps_vfr/swf/flash.cfm?
- **AOPA Safety Advisor SA01 – GPS from the Ground Up**
<http://www.aopa.org/-/media/Files/AOPA/Home/Pilot%20Resources/ASI/Safety%20Advisors/sa01.pdf>
http://williamjdoylejr.net/FAAST/AOPA-SA/sa01_GPS_from_Ground_Up.pdf
- **FAA Safety Seminar – GPS**
<http://williamjdoylejr.net/FAAST/gps.ppt>
- **FAA Safety Seminar – TAA (Technologically Advanced Aircraft)**
<http://williamjdoylejr.net/FAAST/TAA.ppt>

Pilot Decision Making

- **Online Course – Do the Right Thing: Decision Making for Pilots**
<http://flash.aopa.org/asf/decisionmaking/dtrt.cfm?>
- **Online Course – Air Safety Institute Flight Risk Calculator**
<http://flash.aopa.org/asf/flightrisk/>
- **Online Course – A Pilot’s Guide to Flight Service**
<http://flash.aopa.org/asf/flightservice/>
- **Online Course – Say It Right: Mastering Radio Communications**
<http://flash.aopa.org/asf/radiocomm/swf/flash.cfm?>
- **AOPA Safety Advisor SA24 Do the Right Thing**
<http://www.aopa.org/-/media/Files/AOPA/Home/Pilot%20Resources/ASI/Safety%20Advisors/sa24.pdf>
http://williamjdoylejr.net/FAAST/AOPA-SA/sa24_Do_The_Right_Thing.pdf
- **AOPA Safety Advisor SA27 Emergency Procedures**
<http://www.aopa.org/-/media/Files/AOPA/Home/Pilot%20Resources/ASI/Safety%20Advisors/sa27.pdf>
http://williamjdoylejr.net/FAAST/AOPA-SA/sa27_Emergency_Procedures.pdf
- **AOPA Safety Advisor SA19 Say Intentions ... When You Need ATC’s Help**
<http://www.aopa.org/-/media/Files/AOPA/Home/Pilot%20Resources/ASI/Safety%20Advisors/sa19.pdf>
http://williamjdoylejr.net/FAAST/AOPA-SA/sa19_Say_Intentions.pdf

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Appendix B – FAA Wings Program

The FAA Wings Program is an incredibly useful and worthwhile program for CAP members. Since all CAP pilots are required to complete a CAPF-5 check ride annually, there is a way to apply this toward a Wings Phase, which in turn will get you a flight review. You can also set up an automatic interface to get CAP Safety Education credit. Lastly, check pilots can use the Wings Program to renew their CFI certificates. So this is a win-win for CAP pilots and check pilots.

How to Get FAA Wings Credit for Your CAPF-5

Your annual CAPF-5 check ride will bring you within one or two Wings credits of completing a Wings Phase. Once you complete a Wings Phase, you get an automatic BFR. If you use AOPA's Air Safety Foundation or the FAASafety.gov website to take an online course to meet some or all of your CAP monthly safety education, you will always complete a Wings phase (and get a BFR) each time you successfully complete your CAPF-5 check ride.

The FAA Wings Activity or Seminar Select Numbers that apply to CAPF-5 check rides are listed below:

- CAP-F 5 Private / No Instrument (Airplane)
- CAP-F 5 Private / Instrument (Airplane)
- CAP-F 5 Commercial / No Instrument (Airplane)
- CAP-F 5 Commercial / Instrument (Airplane)
- CAP-F 5G Private (Glider)
- CAP-F 5G Commercial (Glider)

The details of how to do this are shown at the link below.

http://williamjdoylejr.net/FAA_Wings/How_to_Get_FAA_Wings_Credit_for_Your_CAPF5.pdf

How to Automatically Update eServices Online Safety Education with FAA and AOPA Seminars Courses

This section will provide you with ideas on how to best manage and update your CAP Online Safety Education records.

Whether we realize it or not, all of us do things that qualify for credit in the FAA Wings Program. Most of these activities qualify for transfer to your safety records in CAP's Safety Management System (SMS) / Online Safety Education. Even your CAPF-5 results in CAP Safety credit.

The link below gives a step-by-step illustration of how you can set this up so it happens automatically. It is very easy to do and only has to be done once.

http://williamjdoylejr.net/FAA_Wings/How_to_Automatically_Update_eServices_Online_Safety_Educations_with_FAA_and_AOPA_Seminars_Courses.pdf

How CAP Check Pilots Can Use the FAA Wings Program to Renew Their CFI Certificate

If a CAP check pilot gives five CAPF-5 check rides in a two year period, that check pilot can use the Wings Program to renew his/her CFI certificate. Since all CAP pilots need an annual CAPF-5 check ride, it is a relatively easy task for a CAP check pilot to fulfill.

The FAA Advisory Circular at the link below provides the regulatory justification for this.

http://williamjdoylejr.net/FAA_Wings/FAA_AC61-91J.pdf

The details of how to do this are shown at the link below.

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http://williamjdoylejr.net/FAA_Wings/How_CFI_Can_Use_the_FAA_Wings_Program_to_Renew_CFI_Certificates_Updated.pdf