NOTE: Text that should be deleted from the outline is displayed as struck through with a red background. New text is shown in courier font with a green background.

### Study Unit 8 – Aviation Weather

Page 264, Subunit 8.7: The FAA has recently added several icing-related questions to its instrument knowledge test database. The following outline content supports several new questions Gleim is adding to better address the topic of aircraft icing.

<table>
<thead>
<tr>
<th>8. When conditions favoring the formation of ice are present, pilots should check for ice accumulation prior to flight by using a flashlight to scan the surface of the airframe and watch for light reflections.</th>
</tr>
</thead>
<tbody>
<tr>
<td>9. The most susceptible surface of the airframe to accumulate icing is the tailplane due to its position being outside the visual range as well as its thin, simple shape.</td>
</tr>
<tr>
<td>a. A tailplane stall as the result of ice accumulation is most likely to occur during the extension of the flaps to the landing position. Thus, tailplane stalls due to icing are mostly likely during the approach and landing phase of flight.</td>
</tr>
<tr>
<td>b. Any of the following symptoms, occurring singly or in combination, may be a warning of tailplane icing:</td>
</tr>
<tr>
<td>1) Elevator control pulsing, oscillations, or vibrations</td>
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<tr>
<td>2) Abnormal nose-down trim change</td>
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<tr>
<td>3) Any other unusual or abnormal pitch anomalies (possibly resulting in pilot induced oscillations)</td>
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<tr>
<td>4) Reduction or loss of elevator effectiveness</td>
</tr>
<tr>
<td>5) Sudden change in elevator force (control would move nose-down if unrestrained)</td>
</tr>
<tr>
<td>6) Sudden uncommanded nose-down pitch</td>
</tr>
<tr>
<td>c. To recover from a tailplane stall, you should retract the flaps to the last safe position and increase power only to the extent that you compensate for the loss of lift created from retracting the flaps.</td>
</tr>
<tr>
<td>1) Over-increasing the power can aggravate and deepen a tailplane stall in some aircraft.</td>
</tr>
<tr>
<td>10. If you detect icing accumulation in flight, especially if the aircraft is not equipped with a deicing system, you should leave the area of precipitation, if you are able, or fly to an altitude where the ambient temperature is above freezing.</td>
</tr>
<tr>
<td>1. Be aware that warmer temperatures are not always found at lower altitudes. In the case of a temperature inversion, for instance, warmer air will be above rather than below.</td>
</tr>
</tbody>
</table>
1. In an aircraft equipped with a pneumatic deicing system, the appropriate technique for removing ice is to operate the pneumatic deicing system several times.
   a. This technique will clear accumulated ice as well as residual ice left behind between system cycles.
   b. The FAA recommends that the deicing system be activated at the first indication of icing rather than after any significant amount of ice is allowed to accumulate.
      1) Because some residual ice continues to adhere between pneumatic boot cycles, the wing is never entirely "clean."
      2) The amount of residual ice increases as airspeed and/or temperature decrease due to the more favorable conditions for ice accumulation associated with these conditions.
      3) At airspeeds typical of small airplanes, it may take many boot cycles to effectively shed the ice.

**Page 279, Subunit 8.7, questions 73 through 81:** The following new questions are added to better address the topic of aircraft icing.

**Question 73.** What happens to residual ice that remains after deice boots are inflated and shed ice?

A. Residual ice increases with a decrease in airspeed or temperature.
B. Residual ice remains the same until the aircraft exits icing conditions.
C. Residual ice decreases with a decrease in airspeed or temperature.

**Answer (A) is correct. (AC 91-74A)**

**DISCUSSION:** The FAA recommends that the deicing system be activated at the first indication of icing. Because some residual ice continues to adhere between pneumatic boot cycles, the wing is never entirely "clean." The amount of residual ice increases as airspeed and/or temperature decrease due to the more favorable conditions for ice accumulation associated with these conditions. At airspeeds typical of small airplanes, it may take many boot cycles to effectively shed the ice.

Answer (B) is incorrect. Residual ice left behind between deicing system cycles will increase in magnitude if either airspeed or temperature decrease due to the more favorable conditions for ice accumulation associated with these conditions. Answer (C) is incorrect. The amount of residual ice increases, not decreases, as airspeed and/or temperature decrease due to the more favorable conditions for ice accumulation associated with these conditions.
74. The most susceptible surface of the aircraft for ice accumulation is the

A. Windshield.
B. Main wing.
C. Tailplane.

DISCUSSION: On most aircraft the tailplane is not visible to the pilot, who therefore cannot observe how well it has been cleared of ice by any deicing system. Both the main wings and the windshield are in plain view of the pilot, making awareness of ice accumulation more obvious. As well, the thinness of the tailplane over the main wings and its simple shape compared to the windshield make it a more efficient ice collector.

Answer (C) is correct. (IFH Chap 2)

75. If you detect icing accumulation in flight, especially if the aircraft is not equipped with a deicing system, you should

A. Move to a higher altitude.
B. Leave the area of precipitation, if able, or fly to an altitude where the temperature is above freezing.
C. Fly to an area with liquid precipitation.

DISCUSSION: Regardless of the level of anti-ice or de-ice protection offered by the aircraft, the first course of action should be to leave the area of visible moisture. This might mean descending to an altitude below the cloud bases, climbing to an altitude that is above the cloud tops, or turning to a different course. If this is not possible, then the pilot must move to an altitude where the temperature is above freezing.

Answer (B) is correct. (IFH Chap 10)

DISCUSSION: Regardless of the level of anti-ice or de-ice protection offered by the aircraft, the first course of action should be to leave the area of visible moisture. This might mean descending to an altitude below the cloud bases, climbing to an altitude that is above the cloud tops, or turning to a different course. If this is not possible, then the pilot must move to an altitude where the temperature is above freezing.

Answer (A) is incorrect. The best action is to leave the area of precipitation, but, if that is not possible, the pilot should move to an altitude where the temperature is above freezing. Only during a temperature inversion would that be a higher altitude, usually it means descending to a lower altitude. Answer (C) is incorrect. Areas of liquid precipitation do not necessarily equate to areas where the temperature is above freezing. Freezing rain is an excellent example of liquid precipitation that is incredibly hazardous.
76. When conditions favoring the formation of ice are present, pilots should check for ice accumulation prior to flight. The best way to do this is by

A. Using a flashlight and watching for light reflection.
B. Running your hand along all control surfaces.
C. Using ice detection lights.

Answer (A) is correct. (IFH Chap 11)

**DISCUSSION:** Because ice, particularly clear ice, is difficult to detect on the aircraft's surface, you can shine a flashlight along all visible surfaces of the aircraft and watch for light reflections. This would be an indication of ice on the aircraft's surface.

Answer (B) is incorrect. Physically inspecting the control surfaces is a good tactic, but you should not limit your scan merely to the aircraft's control surfaces as the skin can and will collect ice as well. Additionally, T-tail designs may make a physical inspection of the related control surfaces difficult. Answer (C) is incorrect. Ice detection lights are useful for checking for ice accumulation at night, but they are used during flight, not during the preflight inspection.

77. To recover from a tailplane stall brought on by ice accumulation, the pilot should

A. Retract the flaps and increase power, but only to compensate for the reduction in lift.
B. Decrease power and maintain a speed below $V_A$.
C. Extend the flaps and reduce power to slow the aircraft.

Answer (A) is correct. (IFH Chap 2)

**DISCUSSION:** When a tailplane stall occurs, the pilot should immediately return the flaps to the previously selected position. Tailplane stalls are aggravated by an increase in flap extension. You will need to increase power to compensate for the reduction in lift caused by raising the flaps, but be careful not to increase power too drastically because an increase in airspeed can also aggravate a tailplane stall.

Answer (B) is incorrect. This procedure is appropriate for an encounter with moderate to severe turbulence, not a recovery from a tailplane stall. Answer (C) is incorrect. Extending the flaps during a tailplane stall will make the stall worse. Flaps should be retracted to their previous position and power should be increased, not reduced, to compensate for the loss in lift created by the retraction.

78. Tailplane icing can be detected by a(n)

A. Increase in elevator effectiveness.
B. Gradual uncommanded nose-up pitch.
C. Sudden uncommanded nose-down pitch.

Answer (C) is correct. (IFH Chap 2)

**DISCUSSION:** A sudden uncommanded nose-down pitch is a symptom of tailplane icing that has caused a tailplane stall. The correct pilot reaction, unlike in a main wing stall, is to apply full aft-control pressure along with a reduction of the wing flaps to the last safe position.

Answer (A) is incorrect. A decrease, not an increase, in rudder effectiveness is a symptom of tailplane icing. Answer (B) is incorrect. A sudden, not gradual, uncommanded nose-down, not nose-up, pitch is indicative of tailplane icing accumulation that has caused a tailplane stall.
79. Tailplane icing can be detected by

A. Elevator control pulsing, oscillations, or vibrations.

B. A gradual uncommanded reduction in engine power.

C. An increase in elevator effectiveness.

Answer (A) is correct. (IFH Chap 2)

**DISCUSSION:** Elevator control pulsing, oscillations, or vibrations as well as any other unusual or abnormal pitch anomalies (possibly resulting in pilot induced oscillations) are indicative of tailplane icing accumulation. If installed, anti-ice equipment should be activated. If no anti-ice system is installed or if the accumulation is not sufficiently combated by the anti-ice system, the pilot should exist icing conditions immediately.

Answer (B) is incorrect. A gradual uncommanded reduction in engine power is indicative of induction icing, not tailplane icing. Answer (C) is incorrect. A decrease, not an increase, in elevator effectiveness is a symptom of tailplane icing.

80. In an aircraft equipped with a pneumatic deicing system, the appropriate technique for removing ice is to

A. operate the pneumatic deicing system several times.

B. operate the pneumatic deicing system once.

C. confirm that ice has accumulated prior to engaging the pneumatic boots.

Answer (A) is correct. (IFH Chap 2)

**DISCUSSION:** To clear accumulated ice as well as residual ice that may be left between cycles, you should operate a pneumatic deicing system several times.

Answer (B) is incorrect. To clear accumulated ice as well as residual ice that may be left between cycles, you should operate a pneumatic deicing system several times, not just once. Answer (C) is incorrect. While this technique was formerly accepted as a rule of thumb, current advisory guidance recommends that deicing systems be activated at the first indication of icing rather than after any significant amount has accumulated.

81. A tailplane stall as the result of ice accumulation is most likely to occur during

A. Cruise flight.

B. Approach and landing.

C. An instrument holding pattern.

Answer (B) is correct. (AC 23.143)

**DISCUSSION:** An ice-contaminated tailplane stall typically occurs either while extending the wing trailing edge flaps to the landing position or with the flaps already extended to that position when operating in, or departing from, icing conditions. Since flaps are normally only extended to the landing position during final approach to landing, tailplane stalls as the result of ice accumulation are most common in this phase of flight.

Answer (A) is incorrect. Ice-contaminated tailplane stalls are most common when the flaps are extended to the landing position, not during cruise flight. Answer (C) is incorrect. Ice-contaminated tailplane stalls are most common when the flaps are extended to the landing position, not during an instrument holding pattern.
Study Unit 9 – Aviation Weather Services

Page 294, Subunit 9.11: The outline is expanded to better cover the topic of icing as reported in the PIREP.

1. . . .
   1. The rate of icing accumulation (trace, light, moderate, severe) determines how icing is reported in a PIREP.
   1) The type of icing (rime, clear, mixed) may or may not be reported in the remarks section, but this does not impact the way icing is reported in the PIREP icing group.

Page 315, Subunit 9.11, question 60: The following question is added to cover how icing is reported in PIREP.

60. What determines how icing is reported on a PIREP?  
   A. Type of ice.  
   B. Thickness of ice.  
   C. Rate of accumulation.  

   Answer (C) is correct. (AWS Sect 3)  
   DISCUSSION: Icing intensities are classified based on the rate of icing accumulation. Answer (A) is incorrect. The type of icing accumulation can be listed in the PIREP remarks, but not in the the primary icing group. Answer (B) is incorrect. The thickness of ice would likely not be reported in a PIREP since that information doesn't provide direct information to pilots on what conditions to expect. As well, it is usually very difficult for a pilot to accurately estimate the thickness of the accumulated ice.