FAA Aircraft Icing Research at the FAA Tech Center, AJP-6350

Friends/Partner in Aviation Weather Forum

NBAA Convention, Atlanta, GA

Presented to: Progress in Icing & Winter Wx Information

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Federal Aviation Administration

Overview of FAA Aircraft Icing Research

- **In-Flight - Primarily in support of Certification Service**
  - Characterization of Atmospheric Icing Conditions
  - Simulation of Aircraft Icing Conditions
  - Determination of Critical Ice Shapes
- **Ground Operations in Icing Conditions – Primarily in support of Flight Standards Service**
  - Methods for determination of holdover times
  - Allowance times
  - Assess/develop new technology
- **Weather Information for Ground Operations in Icing Conditions**

Holdover and allowance times based on current weather conditions

- **Examples of Holdover Time (HOT), undiluted Type IV fluid**
  - Temperature = 25°F
  - Snow
    - Light -> HOT = 40 minutes
    - Moderate -> HOT = 20 minutes
- **Examples of Allowance Time (AT), undiluted Type IV fluid**
  - Temperature = 20°F
  - Ice pellets
    - Light -> AT = 30 minutes
    - Moderate -> AT = 10 minutes

Precipitation Intensity

- **Intensities for fluid endurance time testing are based on liquid water equivalent (LWE) rates measured using glycol pans (*ref.: SAE ARP 5485*)**
- **In operations, airlines rely on reported visibility and intensity tables**
- **NWS: .25 mi .50 mi**
- **heavy moderate light**
- **FAA: Thresholds vary with temperatue (above or below 30°F) and light (day/night)**

Ground Icing Weather Information Project

- **NCAR**
- **FAA Icing Research Program, AJP-6350**
- **FAA Flight Standards, AFS-200**
- **Provide precipitation type and intensities based on LWE rates in operations for more accurate use of holdover and allowance times**
- **Current conditions, nowcasting, forecasting**

Winter 2007-2008

- **Focus on Snow**
- **4 airports**
  - Pittsburgh
  - Denver
  - Minneapolis/St. Paul
  - Chicago O'Hare

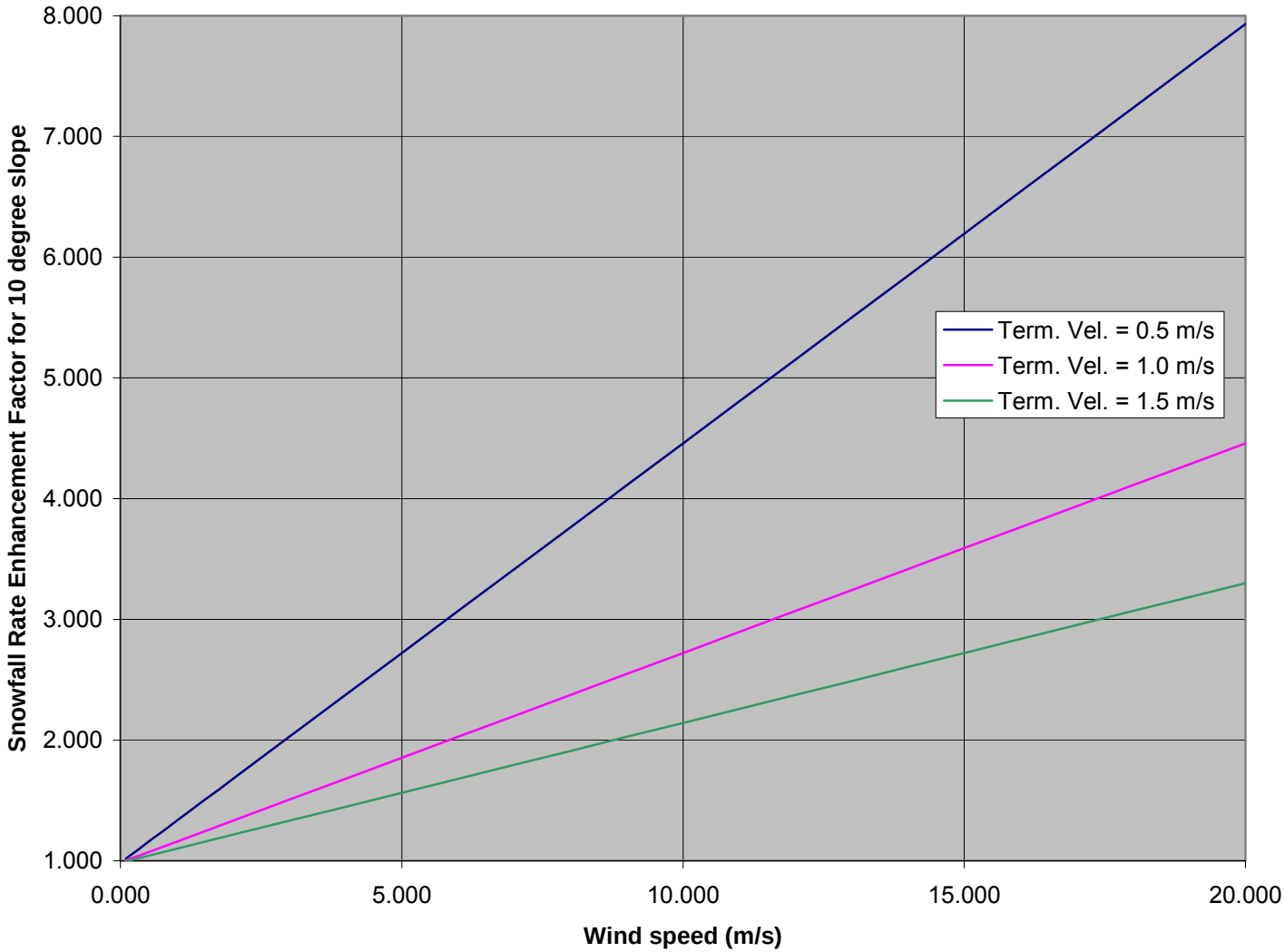
If EF is used for LWE rates from GEODFIR, what is effect on results?

- **EF = Wind Efficiency Factor**
- **Analysis is done for three cases**
  - No EF (Just presented)
  - EF with Terminal Velocity (Vt) = 1.5 m/s
  - EF with Terminal Velocity (Vt) = 1.0 m/s

Wind Enhancement Factor (E.F.)

- **E.F. = cos(θ) + sin(θ)*(Hwspd/VT)**
  - (θ) = angle of inclination = 10 deg
  - Hwspd = Horizontal Wind Speed
    - Measured operationally
  - VT = Terminal Velocity of Snow Flakes
    - Must be assumed
- **Presented in paper by Rasmussen, et. al., 2000**

Wind Enhancement Factor (E.F.)



Effect of use of EF - Rest of presentation involves:

- Fax, pp. 6 & 7.
- IntensitySmry2.xls
- Jan5l3T4E0C.xls - No EF
- Jan5l3T4E1C.xls - EF for Vt = 1.5 m/s
- Jan5l3T4E2C.xls - EF for Vt = 1.0 m/s
- Need to have all 4 files open, will be some jumping around

Effect of use of EF on conclusions for NWS Visibility Table

- **1. No EF**
  - Does not agree well with GEODFIR.
  - Strongly non-conservative.
- **2. EF for Vt = 1.5 m/s**
  - Agreement worse
  - More non-conservative.
- **3. EF for Vt = 1.0 m/s**
  - Agreement: about same as 2.
  - Non-conservative: about same as 2.

Based on totals. Can differ in some respects for a particular day, e.g., Jan 5, 2007.

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- **3. EF for Vt = 1.0 m/s**
  - Agreement: about same as 2.
  - Non-conservative: about same as 2.

Based on totals. Can differ in some respects for a particular day, e.g., Jan 5, 2007.

Effect of use of EF on conclusions for FAA Visibility Table

- **1. No EF**
  - Does not agree well with GEODFIR.
  - Strongly conservative.
- **2. EF for Vt = 1.5 m/s**
  - Agreement improves.
  - About equally conservative/non-conservative.
- **3. EF for Vt = 1.0 m/s**
  - Agreement: about same as 2.
  - Non-conservative: about same as 2.

Concluding Remarks

- **Need pan data from Marshall site to further examine validity of EF.**