NTSB National Transportation Safety Board

Office of Aviation Safety

Airspeed Selection and Stall Training Procedures

Operations presentation

Landing Airspeed Bugs

Indicated Airspeed Display

Current Airspeed

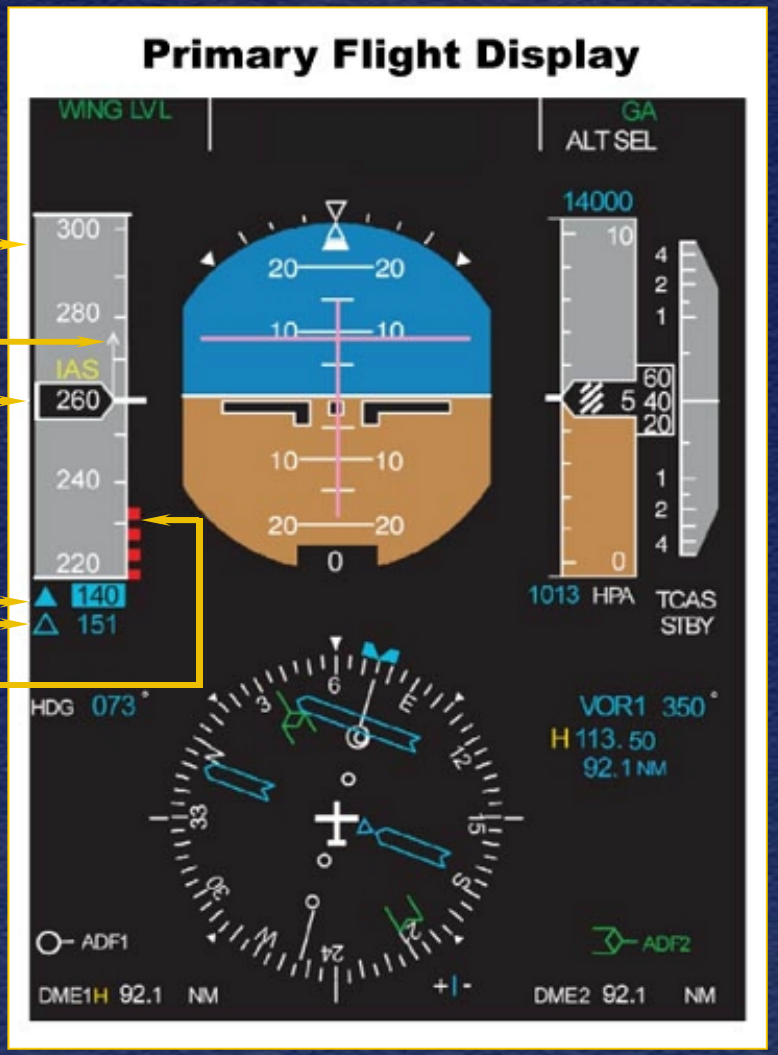
Trend Vector

Landing Bugs

V_{ref}

V_{ga}

Low-speed Cue



Ice Protection Panel

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Ref Speeds Switch

- Ref speeds switch causes stick shaker to activate at lower AOA
- Provides same margin above stall in icing as in non-icing conditions
- Landing speeds must increase 15 to 25 knots depending on flap position

Obtaining Landing Speeds

- Colgan Q400s used ACARS to obtain landing performance data
- Required crew entries were airport, runway, and airplane gross weight
- Other entries optional, but “icing” or “eice” must be entered in icing conditions

Crew ACARS Entry

```
FI 9L3407/AN N200WQ
DT DDL ELM 130252 M82A
-  LDR01,130252,A,KEWR,KBUF,23,,,0,0,15,250,23,+05,2978,54700,,,,,A22A
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ICING or EICE not entered

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Engine Display

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Colgan Checklist

- Normal checklist did not mention ref speeds switch once “after start” check was complete
- Procedure did not require crews to cross-reference bugs with ref speeds switch position
- Items corrected after accident

Colgan's Training Program

- Ground school covered function of ref speeds switch but not actual use
- Neither training manual nor simulator training modules mentioned switch
- Colgan guidance after accident discussed switch position in relation to airspeed bugs

Approach to Stall

- Air carrier pilots trained on "approach to stall," requiring recovery with minimal altitude loss
- Altitude loss standards not appropriate for fully developed stall
- Positive nose-down control force necessary once actual wing aerodynamic stall occurs

Stall Training

- Conformed to industry standard practices
- Ref speeds switch not set to increase position during training
- Not conducted with element of surprise
- Did not involve autopilot disconnect
- Did not address actions needed to recover from fully developed stalls

Stick Pusher Training

- Captain exposed to pusher as Saab pilot
- Pusher training not consistently provided to Colgan's Q400 pilots
  - Most pilots receiving pusher demonstration tried to override pusher
- Revised *Airplane Upset Recovery Training Aid* does not address pusher familiarization training

Simulator Fidelity

- Flight crew training on full stalls and recoveries not done because of lack of post-stall simulator fidelity
- Advances in technology can allow post-stall aircraft behavior to be modeled in simulators

Tailplane Stall Training

- Colgan included NASA-produced video on tailplane stalls during training
- Tailplane procedure opposite of wing stall recovery procedure
- Bombardier: Q400 demonstrated to be free from tailplane stalls
- FAA: no current Part 121 airplanes susceptible to tailplane stalls

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