Inflight Loss of Control Prevention in Commercial and General Aviation

Richard P. Morris
Fowler White Burnett, P.A.

What is Loss of Control?

- Airplane Upset
  - Pitch attitude greater than 25 degrees nose up;
  - Pitch attitude greater than 10 degrees nose down;
  - Bank angle greater than 45 degrees; or
  - Within the above parameters, but flying at airspeeds inappropriate for the conditions.

- Loss of Control in Flight (LOC-I)
  - A categorization of an accident or incident resulting from a deviation from the intended flightpath

Upset Training Requirement

- Airline Safety and FAA Extension Act of 2010
  - Public Law 111-216, signed August 1, 2010
  - Sections 202 through 217 address safety concerns
- 49 U.S.C. sec. 44701. General requirements
Sec. 208, NTSB Recommendations

... require part 121 air carriers to provide flight crewmembers with ground training and flight training or flight simulator training—

(A) to recognize and avoid a stall of an aircraft or, if not avoided, to recover from the stall; and

(B) to recognize and avoid an upset of an aircraft or, if not avoided, to execute such techniques as available data indicate are appropriate to recover from the upset in a given make, model and series of aircraft

NTSB Safety Recommendations

• A-70-21, May 1, 1970 recommended training in recovery from unusual attitudes following 1968 crash

• FAA responded, “It is inconceivable to require training maneuvers which would place a large jet airplane in a nose high, low airspeed, high angle-of-bank situation”

• A-72-152 recommended use of simulators to require pilots to demonstrate ability to recover from unusual attitudes

• FAA responded that it did not believe that simulators were capable of simulating flight beyond normal flight envelope of the aircraft
NTSB Safety Recommendations

- A-92-20 recommended recurrent training and proficiency programs for instrument-rated pilots, including recognition and recovery from unusual attitudes
- FAA responded recovery from unusual flight attitudes already on private pilot examination

NTSB Safety Recommendations

- A-93-72 recommended requiring that commuter air carriers perform hazardous training, testing, and checking maneuvers
- FAA required Part 135 air carriers to receive same level of training as Part 121

NTSB Safety Recommendations

- A-96-120 issued October 18, 1996 following several B737 incidents
- Recommended Part 121 and 135 operator training in recognition of and recovery from unusual attitudes and upset maneuvers, including while controlled by automatic flight systems
- FAA: “many operators are providing training”
Accidents

- Comair 3272 – Monroe, MI, 1/9/97
- American 587 – Belle Harbor, NY, 11/12/01
- Continental 3407 – Buffalo, NY, 2/12/09
- Air France 447 – Brazil, 6/1/09

Continental 3407 – NTSB A-10-10-34

- Fatigue risks
- Stall Training
- Stick Pusher Training
- Simulator Fidelity Requirements

FAA Actions

- NPRM 1/12/09 for training in recognizing and recovering from sudden or unexpected aircraft upsets for Part 121 operators
- Supplemental NPRM 5/20/11
- Final Rule 11/12/13
  - Section 121.423, Pilot: Extended Envelope Training
  - Section 121.424, Pilots: Initial, transition and upgrade flight training
- A-96-120 (10/18/96) Closed 6/13/14
Air France 447

• Brazil, June 1, 2009

"We lost all control of the aeroplane we don't understand we’ve tried everything"
Pilot Response

Startle
An uncontrollable, automatic muscle reflex, raised heart rate, blood pressure, etc., elicited by exposure to a sudden, intense event that violates a pilot’s expectations

Surprise
An unexpected event that violates a pilot’s expectations and can affect the mental processes used to respond to the event

Air France 447

• BEA Safety Recommendations included:
  – Training for manual airplane handling: approach to and recovery from stall, including at high altitude
  – Angle of attack measurement
Global LOC-I Accidents 2010-14

2010 to 2014 Fatal Accidents by Category

- Source: IATA 6444M

Global Effort

- 2011 – FAA ARC, ICAO, EASA
- 2012 – LOCART initiative
- 2014 – ICAO Manual on Aeroplane UPRT
  - Identified ineffective/contributory existing practices in recovery from approach-to-stall
  - Effective recovery requires reduction in AoA

General Aviation

- GAJSC re-established January 2011
- LOC Final Report, September 2012
GA Fatal Accidents, 2001-2011

- Angle of Attack (AoA) Indicators
  - Not widely used
  - Develop public education campaign
  - Develop cost-effective AoA installations for new and existing designs, and retrofit for existing fleet
  - Reduce regulatory roadblocks (AoA and Autopilot)

- Reduce Over Reliance on Automation
- Transition Training

NTSB Most Wanted 2015-2016

- Prevent Loss of Control in Flight in General Aviation
  - 47 percent of fatal fixed-wing GA accidents between 2008 and 2014 with 1,112 fatalities
  - Pilots should:
    - Be prepared to recognize stall characteristics and warning signs, and be able to apply appropriate recovery techniques before stall onset.
    - Be honest with themselves about their knowledge level of stalls, and their ability to recognize and handle them.
    - Use effective aeronautical decision-making techniques and flight risk assessment tools during both preflight planning and inflight operations.
    - Manage distractions so that they do not interfere with situational awareness.
    - Understand, properly train, and maintain currency in the equipment and airplanes they operate.
    - Take advantage of available commercial trainer, type club, and transition training opportunities.
    - Realize stall characteristics can vary with aircraft loading and are usually worse at aft CG (center of gravity)
Pilot-induced LOC-I

- Pilots were most frequently identified cause of loss of control accidents
  - Improper procedures
  - Spatial disorientation
  - Aircraft energy management
  - Distraction
  - Improper training

Spatial Disorientation

- Flash Air – Egypt, 1/3/04
- 2008 Boeing study identified 16 SD-related accidents

Always trust your instruments, son
Semicircular Canals

Vestibular Illusions
- Sub-threshold roll – roll rate below 5°/second below detection threshold
- Somatogravic illusion

Graveyard spin/spiral
Ongoing and Future Initiatives

- UPRT required for Part 121 operators
- Flight Simulator Training Devices
- Angle of Attack Indicators
- 14 CFR Part 23 changes
- Drone notification, awareness, and avoidance
- Insurance and training partnerships
- Contractual obligations

UPRT for Part 121 Air Carriers

- FAA AC120-109A: Stall Prevention and Recovery Training
- FAA AC120-111: Upset Prevention and Recovery Training
- Both encourage all airplane operators, pilot school and training centers to use guidance

Flight Simulator Training Devices

- 14 CFR Part 60, effective May 31, 2016, requires compliance by March 12, 2019 with new technical standards for:
  - Full stall and stick pusher maneuvers
  - Upset recognition and recovery maneuvers
  - Maneuvers in airborne icing conditions
  - Takeoff and landing in gusting crosswinds
  - Bounced landing recovery maneuvers
Angle of Attack Indicators

- Approval of Non-Required Angle of Attack (AoA) Indicator Systems, 14 CFR Part 21.8(d)
  - AoA manufacturer requests letter of approval
- Must be a stand-alone unit and not interface with a certificated system, or conflict with aircraft stall warning
- Must display: “not for use as a primary instrument for flight”

14 CFR Part 23 Changes

- Airworthiness Standards for Normal, Utility, Acrobatic and Commuter Category Airplanes
  - Max. 19 passengers and max. weight <19,000lbs
- NPRM issued 3/14/16, public comments close 5/13/16
- FAA holding public meetings May 3 and May 4
Part 23 LOC Changes
- FAA identified 74 stall or LOC accidents, Jan-08 to Dec-13
- Add requirements to Sections 23.200 and 23.215
- Propose requiring warnings to improve pilot awareness of stall margins, e.g. AoA or energy awareness, or envelope protection systems with forward force when speed and attitude approach stall

Attack of the Drones
- FAA Annual Aerospace Forecast anticipates increase in overall air travel
- UAS sales growth from 2.5 million in 2016 to 7 million in 2020
  - Hobbyists 1.9 million to 4.3 million
  - Commercial 600,000 to 2.7 million
- Section 333 Exemption altitude to 400 feet

Drone Sightings
- FAA receives more than 100 a month
- Various altitudes and distance from both commercial and general aviation aircraft
- 2011 study of 71 LOC-I business aviation accidents found 63% occurred below 1,000 feet (takeoff and approach/landing)
Center for the Study of the Drone

• 58% within 5 miles of an airport
• 36% “Close Encounters” within 500 feet
• 36% involved multi-engine jet aircraft (80% commercial passenger)
• 24 within 50 feet
• 11 evasive maneuvers

92% reported above 400 feet

Insurance and UPRT Partnerships

• SwissRe and APS in Phoenix, AZ
  — premium rebates up to $25,000 for training costs
• USAIG and APS in Phoenix, AZ or Dallas, TX
  — complimentary tuition for 2-day/3-flight course
• QBE and Flight Research in Mojave, CA
  — Underwriting incentives and 5% no-claim bonus at end of policy year
• Global Aerospace and Calspan in Buffalo, NY
  — Dividends up to 10.5% of premiums and subsidize 25% of cost per pilot training
UPRT or URRT

- Emphasize Prevention or Recognition
- Importance of Instructors
  - Simulator capabilities
  - Avoid negative transfer of training
  - Activating startle/surprise response
- Litigation Issues

Thank you