Upset Prevention and Recovery Training

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NZ CAA Flightpath Management Conference, Wellington
ICAO Safety Priorities?

• Controlled flight into terrain – CFIT

• Loss of control in flight – LOC-I

• Runway safety – RS
ICAO Safety Report 2016

Chart 5: Accidents by Category

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>CFIT</td>
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<tr>
<td>GS</td>
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<td>LOC-I</td>
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<td>MED</td>
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<td>OTH</td>
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<td>RS</td>
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<tr>
<td>UNK</td>
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</tbody>
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Accident Categories

- Controlled Flight into Terrain (CFIT)
- Loss of Control in-Flight (LOC-I)
- Runway Safety (RS)
- Ground Safety (GS)
- Operational Damage (OD)
- Injuries to and/or Incapacitation of Persons (MED)
- Other (OTH)
- Unknown (UNK)

*Full details of categories can be found in Appendix 3*
Industry Trends

FATAL Accident by category 1994 to 2013

10 year moving average accident rate per million flights

- CFIT
- LOC-I

Airbus Commercial Aviation Accidents 1994-2013
Intervention

Priority and Effectiveness

1. **Machine**
   Controls, lights, warnings . . .

2. **System**
   Procedures, charts, practices, shifts . . .

3. **Human**
   Training: Increase skills / knowledge

Source: Dr Steve Jarvis
2001

265 dead
What caused this accident?
What caused this accident?

NTSB: the probable cause of this accident was:
• the in-flight separation of the vertical stabilizer – loads beyond ultimate design
• the first officer’s unnecessary and excessive rudder pedal inputs

Contributing to these rudder pedal inputs were:
• characteristics of the Airbus A300-600 rudder system design
• elements of the AA Advanced Aircraft Maneuvering Program
What caused this accident?

- Valid Training Envelope
- Negative Transfer of Training
- Negative Training
STARTLE

Surprise

CONFUSION
Airlines shall provide flight crew members 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**.
PUBLIC LAW 111–216—AUG. 1, 2010
AIRLINE SAFETY AND FEDERAL AVIATION ADMINISTRATION EXTENSION ACT OF 2010

Required the FAA to make rules:
• Fatigue
• Licensing / Experience
• Stall and Upset Training
• Full Stall model and Icing models in simulators by March 2019

EASA:
Not planning to mandate full stall training, however if an operator wishes to conduct full stall training in a simulator then the FSTD must be updated and certified.
PUBLIC LAW 111–216—AUG. 1, 2010
AIRLINE SAFETY AND FEDERAL AVIATION ADMINISTRATION EXTENSION ACT OF 2010

PREVENTION FOCUS

AURTA
Aug 98

AURTA
Aug 04
Rev 1
Rudder

AURTA
Nov 08
Rev 2
High Alt

AOA
Dec 12
OEB 45

AOA
Dec 14
OEB 48

AUPRTA
Feb 17
Rev 3

Stall Rec
Nov 10
FOTB

Upset Rec
Nov 15
AC120-109A

Stall Rec
Jul 12
FOTB

Upset Rec
Apr 14
AC120-111

Upset Rec
Jun 16
Airbus OTT

Upset Rec
Jul 12
AC120-109

Stall Rec
Oct 12
Colgan

AURTA
May 02
FOTB

Rudder
Nov 01
AA587
ICAO Doc 10011 – Lifecycle Training
Pilot Training

• Focus on Prevention

• Knowledge
• Skills
• Attitudes

1. Stall awareness
2. Energy awareness
3. Reaction to unexpected events (startle)
4. Understanding of aircraft systems (type-specific)
5. CRM to resolve precursor events

Source: Dr Sunjoo Advani
Liability

- Regulator guidance
- OEM guidance
- AUPRTA
- NTO for non-published training exercises?
Stalling Quiz – True or False?

1. If stalled, apply power
2. When I’m close to the ground, I need to apply power
3. Every stall is characterized by a nose drop
4. The airplane may indicate mild buffet before the stall
5. Available thrust decreases slightly between MSL and FL350
6. Stall depends on airspeed and bank angle.
7. Low airspeed the first indication of stall
8. I must level the wings first when recovering from a stall
Stalling Misconceptions

1. If stalled, apply power
2. When I’m close to the ground, I need to apply power
3. Every stall is characterized by a nose drop
Stalling Misconceptions

5. Available thrust decreases slightly between MSL and FL350
Stalling – AC120-109A

• Reducing Angle of attack is the primary recovery action
• “Approach to stall” = Full Stall Recovery
• Altitude loss is not a consideration unless ground contact is a factor
• Thrust as needed

Evaluation criteria for a recovery from an impending stall should not include a predetermined value for altitude loss
UPRT – AC120-111

- Extended envelope
- Startle and Surprise

UPRT is NOT to be evaluated in proficiency checks, line-oriented evaluation (LOE), or by other jeopardy events.
Extended Envelope Events – AC120-111

- Slow speed events
- Stall recovery
- Overspeed events
- Loss of reliable airspeed
- Upset recovery manoeuvres
- Bounced landing
• The most important factor affecting safety in the conduct of UPRT is a competent, qualified instructor within an SMS.

• The safety implications of poor UPRT instructional technique or misleading information is more significant than in other areas of pilot training.

• complete a UPRT instructor qualification training course
Trainer Training

• Possess sound academic and operational knowledge

• Understand limitations of FSTD

• Awareness of G loading /accelerated stall

• Instructor standardisation
On-airplane training? Transferable skills

Light Aerobatic Aircraft

Large Transport Aircraft

Source: Aviation Performance Solutions
Startle and surprise

- Fear
Simulator

• Inability to create the **sustained unload to maintain a low-angle of attack**

• Inability to present **physiological G-awareness cues**

• Cannot realistically simulate the **forces of high sideslip angles**
Simulator Requirements

• Full stall model
  – FAA requirement March 2019
  – EASA requirement if training involves full stalls

• LOFT / MOFT upset options
• IOS tablet for replay and debrief
• Video debrief

• Restrict the bandwidth of the training to fit the VTE of the devices available
Upset types

Part 1: Maneuver Training (MOFT)

- Designed for dedicated recovery training
- Scenarios will always result in true upsets
- 5 Preset trims based on upset scenarios proposed by the Airplane Upset Recovery Training Aid (AURTA)
- 3 possible altitudes (10,000ft; 20,000ft & 35,000ft)

Part 2: Recognition Training (LOFT)

- Designed for training the recognition of upsets
- Scenarios can be inserted at any point during a training session to surprise pilots.
- Rotational and longitudinal wind insertion can lead to unusual attitude scenarios:
  - High bank angle
  - Airspeed decrease
  - Airspeed increase
Simulator

- No feedback to instructor on control inputs
IDT – Simulator IOS Tablet for UPRT

**Vsw = 249 kts**

**1.3g**

Source: Dr Sunjoo Advani
Manual Handling?
Corporate Solutions

Market Announcement:
Swiss Re Corporate Solutions at the forefront of aviation safety
Company partners with industry leaders to integrate aviation safety initiative into its insurance offering
Summary

- Train the trainer
- Regulator / OEM / Industry approved training material
- Initial / Recurrent UPRT training modules
- FSTD – Upset capability and IOS tablet for UPRT
- Insurance bursary
References


• IATA UPRT Implementation Manual
  [https://www.iata.org/whatwedo/ops-infra/training-licensing/Documents/gmbp_uprt_2015.06.23.pdf]

• AUPRTA – Revision 3 [http://www.icao.int/safety/LOCI/AUPRTA/index.html]

• FAA AC120-109A
  [https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document-information/documentID/1028646]

• FAA AC120-111
  [https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document-information/documentID/1027328]
Acknowledgements

- Dr Stephen Jarvis, http://jarvisbagshaw.com/3_steve.html
Thank you