Module 3 – Day 1

Implementing UPRT in an airline
Flight Plan

- Safety Data
- Regulatory matters
- Training content
- Instructor qualification
- FSTD requirements
- Evaluation
Safety data: big picture
Accident per million sectors per region of operator APR 2016
Global Accidents (2011-2014)
Global Fatal Accidents (2011-2014)
## Accident count

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of accidents</th>
<th>Number of fatalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>3</td>
<td>82</td>
</tr>
<tr>
<td>2011-2015</td>
<td>31</td>
<td>1083</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>2015</th>
<th>‘11-‘15</th>
</tr>
</thead>
<tbody>
<tr>
<td>IATA Member</td>
<td>33%</td>
<td>16%</td>
</tr>
<tr>
<td>Full-Loss Equivalents</td>
<td>91%</td>
<td>81%</td>
</tr>
<tr>
<td>Fatal</td>
<td>100%</td>
<td>97%</td>
</tr>
<tr>
<td>Hull Losses</td>
<td>100%</td>
<td>97%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Passenger</th>
<th>Cargo</th>
<th>Ferry</th>
<th>Jet</th>
<th>Turboprop</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>33%</td>
<td>67%</td>
<td>0%</td>
<td>0%</td>
<td>100%</td>
</tr>
<tr>
<td>2011-2015</td>
<td>68%</td>
<td>32%</td>
<td>0%</td>
<td>32%</td>
<td>68%</td>
</tr>
</tbody>
</table>

19 Dec 16
LOC-I Accidents by Region (2011-2015)
LOC-I Accidents by Region (2011-2015)
LOC-I Accidents by Phase (2011-2015)
LOC-I Accidents by Propulsion Type

Jet/Turboprop: LOC-I Fatal Accident Rates

Accidents per Million Sectors

<table>
<thead>
<tr>
<th>Year</th>
<th>Jet Fatal</th>
<th>Turboprop Fatal</th>
<th>Source: IATA GADM</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>0.11</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>0.11</td>
<td>0.67</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>0.07</td>
<td>0.41</td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td>0.10</td>
<td>0.70</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>0.07</td>
<td>0.54</td>
<td></td>
</tr>
</tbody>
</table>

Collaborating to address LOSS OF CONTROL IN-FLIGHT
Upset Prevention and Recovery Training Workshop
Environmental & Airline Threats

![Bar chart showing percent of LOCI accidents](chart.png)

- **Meterology**: 37%
- **Thunderstorms**: 13%
- **Poor visibility / IMC**: 13%
- **Wind/Windshear/Gusty wind**: 11%
- **Icing Conditions**: 11%
- **Lack of Visual Reference**: 13%
- **Air Traffic Services**: 3%
- **Wildlife/Birds/Foreign Object**: 3%
- **Nav Aids**: 3%
- **Ground-based nav aid malfunction or not available**: 8%
- **Aircraft Malfunction**: 37%
- **Contained Engine Failure/Powerplant Malfunction**: 24%
- **Flight Control**: 3%
- **Primary Flight Controls**: 3%
- **Fire / Smoke (Cockpit/Cabin/Cargo)**: 5%
- **Other**: 8%
- **Operational Pressure**: 8%
- **Maintenance Events**: 5%
- **Manuals / Charts / Checklists**: 3%
- **Fatigue**: 3%

*Source: IATA GADM*
Flight Crew Errors

- Manual Handling / Flight Controls: 29%
- Automation: 5%
- Systems / Radios / Instruments: 5%
- SOP Adherence / SOP Cross-verification: 26%
- Intentional: 16%
- Unintentional: 11%
- Checklist: 3%
- Abnormal Checklist: 3%
- Callouts: 8%
- Pilot-to-Pilot Communication: 8%
- Failure to GOA after Destabilized Approach: 3%

Source: IATA GADM
Collaborating to address LOSS OF CONTROL IN-FLIGHT

Upset Prevention and Recovery Training Workshop

http://www.iata.org/whatwedo/safety/Pages/loss-of-control-inflight.aspx
Available studies & reports on IATA website

➢ SAFETY REPORT 2015 Issued April 2016

➢ Loss of Control In-Flight Accident Analysis Report

➢ Environmental Factors Affecting Loss of Control In-Flight: Best Practice for Threat Recognition & Management

➢ Loss of Control In-flight (LOC-I) Prevention: Beyond the Control of Pilots
Flight Plan

- Safety Data
- Regulatory matters
- Training content
- Instructor qualification
- FSTD requirements
- Evaluation
References & regulatory frame work

- 2008/2017 Airplane Upset Recovery Training Aid (AURTA) Revision 2/3
- 2010 FAA SAFO 10012 (Recovery from stall does not mandate a predetermined value for altitude loss)
- 2012 FAA AC No: 120-109 Stall and Stick Pusher Training
- 2013 FAA SAFO 13002 (encourage manual flying)
- 2013 EASA SIB No.: 2013-02 Stall and Stick Pusher training
- 2013 TCAA AC 700-031
- 2013 FAA NOTICE N 8900.241
- 2013 ICATEE Research and Technology Report (FSTD)
- 2014 ICAO Annex 1 – Amdt.172; Annex 6 – Amdt.38; PANS-TRG – Amdt. 3; Doc 10011
- 2015 FAA AC No: 120-111
- 2015 EASA SIB No.: 2015-07 (low speed high altitude)
Collaborating to address 
LOSS OF CONTROL IN-FLIGHT

References & regulations

- 2008/2017 Airplane Upset Recovery Training (AURTA)
- 2010 FAA SAFO 10012 (Recovery from stall does not mandate a predetermined value for altitude loss)
- 2012 FAA AC No: 120-109 Stall and Stick Pusher Training
- 2013 FAA SAFO 13002 (encourage manual flying)
- 2013 EASA SIB No.: 2013-02 Stall and Stick Pusher training
- 2013 TCAA AC 700-031
- 2013 FAA NOTICE N 8900.241
- 2013 ICATEE Research and Technology Report
- 2014 ICAO Annex 1 – A
- 2015 FAA AC No: 120-
- 2015 EASA SIB No.: 2015-
Collaborating to address
LOSS OF CONTROL IN-FLIGHT

Regulatory

- **FAA:**
  All part 121 Carriers / until **12 March 2019**
  Initial, transition, upgrade, recurrent
  (FAA notice N 8900.241 of 11/4/13)

- **EASA:**
  EASA ED 2015/012/R (Air Operations)
  CAT Operators / since **04 May 2016**
  Conversion course, recurrent
  Licensing (Aircrew expected **08 April 2018**)

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Regulatory, FAA example

FAR 121.423
(Extended Envelope Training)

- FAR 121.423 requires the following manually controlled maneuvers:
  - Slow Flight
  - Loss of reliable airspeed
  - Instrument departure and arrival
  - Recovery from bounced landing
  - Upset Recovery maneuvers

- FAR 121.423 also requires experience of full stall and stick pusher recovery procedures
  - Instructor-guided
  - Upgraded simulator modeling required

- Extended Envelope Training is required during:
  - Initial
  - Transition
  - Upgrade
  - Differences
  - Requalification
  - Recurrent
Flight Plan

- Safety Data
- Regulatory matters
- Training content
- Instructor qualification
- FSTD requirements
- Evaluation
### Initial training

**The ideal complete UPRT program**

<table>
<thead>
<tr>
<th>Academic Preparation</th>
<th>Exposure to flight within the full range of the FAA25/CS25 certification g-envelope, all attitude exposure, essential human factor training.</th>
</tr>
</thead>
</table>
| On-aeroplane UPRT     | • Adapting to all attitudes  
| MPL, CPL              | • Adapting to g-exposure (-1g to 2.5g)  
|                       | • Overcoming surprise and startle  
|                       | • Developing counter-intuitive recovery skills  
|                       | • Developing AOA awareness  
|                       | • Recovery from aerodynamic stall  
|                       | • Recovery from all attitude aeroplane upsets  |
| Academic Preparation  | Non-type-specific upset prevention and recovery training, consolidation of OEM recommendations |
| Non-type-specific UPRT in FSTDs | MPL, CPL |

*ref IATA guide*
Conversion & Recurrent training *ref IATA guide*

- **Academic Preparation**
- **Type-specific UPRT in FSTDs**
  - Operator training (type rating, conversion, recurrent, command upgrade) and MPL

Type-specific upset prevention and recovery training including SOPs, OEM recommendations and operator training methodologies.
ICAO Doc 10011

A. Aerodynamics
B. Causes and contributing factors of upsets
C. Safety review of accidents and incidents relating to upsets
D. G-awareness
E. Energy management
F. Flight path management (manual handling skills included)
G. Recognition (importance of monitoring)
H. Upset prevention and recovery techniques
I. System malfunction (fbw)
J. Specialized training elements
K. Human Factors (importance of TEM)
### K. Human Factors importance of TEM

<table>
<thead>
<tr>
<th>Subjects and training elements</th>
<th>Academic training</th>
<th>On-aeroplane training — CPL(A)/MPL</th>
<th>Non-type-specific FSTD training — (CPL(A)/MPL)</th>
<th>Type-specific FSTD training</th>
<th>AURTA, Revision 2, references</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) inattention, fixation, distraction</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>iii) perceptual illusions (visual or physiological) and spatial disorientation</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>iv) instrument interpretation</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>2) startle and stress response</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>i) physiological, psychological, and cognitive effects</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>ii) management strategies</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>3) threat and error management (TEM)</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>i) TEM framework</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>ii) active monitoring, checking</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>iii) fatigue management</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>iv) workload management</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>v) crew resource management (CRM)</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

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K. Human Factors importance of TEM
Cascading effect
G. Recognition: importance of monitoring
Monitoring & Competencies

Countermeasures are:

<table>
<thead>
<tr>
<th>Competencies</th>
<th>Threats</th>
<th>Errors</th>
<th>Undesired Aircraft State</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Application of Procedures</td>
<td>Threats (expected)</td>
<td>Errors (spontaneous or threat induced)</td>
<td></td>
</tr>
<tr>
<td>2 Communication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Flight Path Management, manual control</td>
<td>Threats (unexpected/pop-up or latent)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Flight Path Management, automation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Leadership and Teamwork</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Problem Solving and Decision Making</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Situation Awareness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Workload Management</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: IATA considers the Core-Competencies of ICAO DOC 9995 (EBT) to be a valid example-set of countermeasure
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Upset Prevention and Recovery Training Workshop

https://m.youtube.com/watch?v=QVaQYhd_Qy0
ICAO Doc 10011

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### ICAO Doc 10011

<table>
<thead>
<tr>
<th>Subjects and training elements</th>
<th>Academic training</th>
<th>On-aeroplane training — CPL(A)/MPL</th>
<th>Non-type-specific FSTD training — (CPL(A)/MPL)</th>
<th>Type-specific FSTD training</th>
<th>AURTA, Revision 2, references</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Aerodynamics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1) general aerodynamic characteristics</td>
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<td></td>
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<tr>
<td>2) advanced aerodynamics</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3) aeroplane certification and limitations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4) aerodynamics (high and low altitudes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5) aeroplane performance (high and low altitudes)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6) angle of attack (AOA) and stall awareness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: The table shows the distribution of training elements across different types of training.*

*Section 2.5*
Collaborating to address
LOSS OF CONTROL IN-FLIGHT

Upset Prevention and Recovery Training Workshop

Academics & Practical application
Collaborating to address
LOSS OF CONTROL IN-FLIGHT

Upset Prevention and Recovery Training Workshop

Academics & Practical application

I Max = Max Bank angle

(N1 CL - N1) x 5 ≈ i° Max

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Academics & Practical application

How is AoA defined?

- AoA - the difference between aircraft pitch and flight-path angle

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Upset Prevention and Recovery Training Workshop

Academics & Practical application

3 Airplane at Work

3.2 The Critical AoA 1/2

- How is the critical AoA defined?

Lift

controllable

un-controllable

Not stalled

Stalled

Maximum lift

Critical angle of attack

AoA

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LOSS OF CONTROL IN-FLIGHT

Upset Prevention and Recovery Training Workshop

Academics & Practical application

3 Airplane at Work

3.2 The Critical AoA 2/2

- The critical AoA (at a given airplane configuration) depends on Mach No.
Academics & Practical application

4 How the airplane talks to you

4.1 High AoA / Stall Warning

Natural Indications
- Aerodynamic buffeting
- Reduced roll stability and aileron effectiveness
- Reduced elevator authority
- Inability to maintain altitude or arrest rate of descent
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Academics & Practical application: Stall speed
ICAO Doc 10011

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I. System malfunction (fbw)
J. Specialized training elements
K. Human Factors (importance of TEM)
C. Safety review of accidents and incidents relating to upset

Towards the end of the 2000’s, the BEA observed that a number of public air transport accidents or serious incidents were caused by a problem relating to “aeroplane state awareness during go-around” (ASAGA). Other events revealed inadequate management by the flight crew of the relationship between pitch attitude and thrust, with go-around mode not engaged, but with the aeroplane close to the ground and with the crew attempting to climb.
C. Safety review of accidents and incidents relating to upset
Collaborating to address
LOSS OF CONTROL IN-FLIGHT

ICAO Doc 10011

A. Aerodynamics
B. Causes and contributing factors of upsets
C. Safety review of accidents and incidents relating to upsets
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F. Flight path management (manual handling skills included)
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H. Upset prevention and recovery techniques
I. System malfunction (fbw)
J. Specialized training elements
K. Human Factors (importance of TEM)
IATA recommends to combine UPRT with manual flying skills training

- Continuous use of auto flight systems could lead to degradation of the pilot’s manual handling skills and ability to recover the aircraft from an upset.

- Manual handling errors have been increasing. Operators and authorities have recognized that operators need to enhance the manual flying skills of flight crews.

- This includes new guidance by regulators, OEMs, and the review of the operator’s policy to promote manual flying and manual throttle/thrust operation where appropriate in line operations, and the respective adaptation of recurrent training programs in FSTDs.
Scenario-Based Training and Upset Prevention

- Training scenarios should be designed in a way that crews can develop the competencies to recognize and manage threats, errors and undesired aircraft states successfully and to achieve a safe outcome.

- The ultimate training objective of scenario-based training is to avoid or arrest a divergence from the intended flight path as early as possible and secure the intended flight path.

- Scenarios leading to upsets, despite correct intervention by the crew, are not recommended.
Maneuver-Based Training and Upset Recovery

➢ The instructor, not the crew, takes responsibility for the creation of the upset condition. Training starts after the upset condition has been established.

➢ Reasons/causes for upset conditions may be taken from case studies but should not be the responsibility of the crew under training.

➢ The ultimate training objective is to effectively apply recovery actions and to return the aircraft to a stabilized flight path.
“OEM recommendation”

6 Recovering from Upsets
6.2 Nose-High Recovery 1/3

Nose HIGH Recovery

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Autopilot disconnect</td>
</tr>
<tr>
<td>2</td>
<td>Autothrust/Autothrottle OFF</td>
</tr>
<tr>
<td>3</td>
<td>APPLY as much nose-down control input as required to obtain a nose-down pitch rate</td>
</tr>
<tr>
<td>4</td>
<td>THRUST adjust (if required)</td>
</tr>
<tr>
<td>5</td>
<td>ROLL adjust (if required)</td>
</tr>
<tr>
<td>6</td>
<td>When airspeed is sufficiently increasing RECOVER to level flight</td>
</tr>
</tbody>
</table>

UPRT Implementation
“OEM recommendation”

6.3 Nose-Low Recovery

Nose LOW Recovery

- "NOSE LOW" (or callout by operator)
  - MONITOR
    - Monitor airspeed and attitude throughout the recovery and
    - Announce any continued divergence

1. Autopilot disconnected
2. Autothrust/Autothrottle OFF
3. RECOVERY from stall if required
4. ROLL in the shortest direction to wings level
5. THRUST and DRAG adjusted (if required)
6. RECOVER to level flight
LH Learning methodology

Nose-HIGH
- PUSH to unload
- Thrust & Drag
- ROLL
- STABILIZE

Nose-LOW
- PUSH to unload
- ROLL
- Thrust & Drag
- STABILIZE
LH learning methodology

1. PUSH to unload
2. ROLL
   thrust and drag as required
3. STABILIZE
Stall event

As soon as any stall indication (could be aural warning, buffet...) is recognized, apply the immediate actions:

NOSE DOWN PITCH CONTROL ... APPLY
This will reduce angle of attack

Note: In case of lack of pitch down authority, reducing thrust may be necessary.

BANK ... WINGS LEVEL

- When out of stall (no longer stall indications):
  THUST ... INCREASE SMOOTHLY AS NEEDED
  Note: In case of one engine inoperative, progressively compensate the thrust asymmetry with rudder.

SPEEDBRAKES ... CHECK RETRACTED
FLIGHT PATH ... RECOVER SMOOTHLY

- If in clean configuration and below 20 000 ft:
  FLAP1 ... SELECT
  Note: If a risk of ground contact exists, once clearly out of stall (no longer stall indications), establish smoothly a positive climb gradient.
### Example of training syllabi

<table>
<thead>
<tr>
<th>Module</th>
<th>Content</th>
<th>Terminal training objectives</th>
</tr>
</thead>
</table>
| 1      | Advanced Manual Flying Skills | - Handling characteristics - airplane response to specific primary and secondary flight control inputs  
- Gain confidence for appropriate application of manual flight control inputs required during upset prevention and recovery conditions  
- Energy awareness |
| 2      | AOA awareness | - Vn diagram in practical application, loading and unloading  
- Stall is independent from attitude and speed  
- Stall recovery is based on AOA-reduction only - must be separated from the application of thrust  
- High Altitude ops |
| 3      | Recoveries | - Apply the OEM-recommendations  
- Separate “push/unload” from “roll”, control thrust at the correct time during recovery  
- Apply the airplane specific STALL-RECOVERY SOP correctly  
- Increase resilience by managing surprise and startle, and develop counterintuitive actions |
Flight Plan

- Safety Data
- Regulatory matters
- Training content
- Instructor qualification
- FSTD requirements
- Evaluation
PERSONNEL PROVIDING FSTD UPSET PREVENTION AND RECOVERY TRAINING (UPRT)

Standardisation and training should ensure that personnel providing FSTD UPRT:

(1) are able to demonstrate the correct upset recovery techniques for the specific aeroplane type;

(2) understand the importance of applying type-specific Original Equipment Manufacturers (OEMs) procedures for recovery manoeuvres;

(3) are able to distinguish between the applicable SOPs and the OEMs recommendations (if available);

(4) understand the capabilities and limitations of the FSTD used for UPRT;

(5) are aware of the potential of negative transfer of training that may exist when training outside the capabilities of the FSTD;
PERSONNEL PROVIDING FSTD UPSET PREVENTION AND RECOVERY TRAINING (UPRT)  

Standardisation and training should ensure that personnel providing FSTD UPRT:

(6) understand and are able to use the IOS of the FSTD in the context of effective UPRT delivery;

(7) understand and are able to use the FSTD instructor tools available for providing accurate feedback on flight crew performance;

(8) understand the importance of adhering to the FSTD UPRT scenarios that have been validated by the training programme developer; and

(9) understand the missing critical human factor aspects due to the limitations of the FSTD and convey this to the flight crew receiving the training.

ref GM5 ORO.FC.220&230
Instructors UPRT qualification process

- **Core group**
  - design course & teach senior instructors

- **Senior instructors**
  - Teach instructors

- **Instructors**
  - teach pilots

- **Pilots**
IATA recommends for the “core group”

<table>
<thead>
<tr>
<th>Pre-studies and Academic instructor training</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-aeroplane UPRT (human factors – counter intuitive behaviors)</td>
</tr>
<tr>
<td>FTSD training</td>
</tr>
</tbody>
</table>
Collaborating to address LOSS OF CONTROL IN-FLIGHT

Upset Prevention and Recovery Training Workshop

Core group & On-Aeroplane UPRT

- Ab initio ATO (example LH)
- Flight test school (example AF)
- Specialized ATO (example Delta Airline)
All Instructors: initial training

- Academics ½ day up to 1 day
- Practical FFS instruction 4H00

Examples of exercises:

- Uncommanded FLAPS retraction during climb
- High pitch attitude protection and Steep Turns at FL 100
- Steep Turns at high altitude
- STALL RECOVERY (at high altitude)
- Uncommanded flight controls inputs
- Demo low speed protections
- STALL RECOVERY (at low altitude)
Flight Plan

- Safety Data
- Regulatory matters
- Training content
- Instructor qualification
- FSTD requirements
- Evaluation
FSTD Requirements

- The FFS level C and D if maintained in the VTE (Validated Training Envelope) are suitable for UPRT initial and recurrent training sessions. For the time being, EASA does not require full stall exercises.
- FSTD Enhancements (Stall modelling)
  To be evaluated by a competent authority
- Recognition of FSTD motion limitations
- Additional IOS displays or tools

See Doc 9625, 4th edition
FSTD limitations

- AOA
- Sideslip
- Buffet
- Icing
- G-loads
FSTD limitations

VTE
- No pitch limit
- No roll limit
- At high AOA (alpha)
  very narrow sideslip limits (beta)
FSTD Limitations

- G-loads below 1g
- G-loads above 1g
- FSTD motion limitations

FSTD motion limitations

Motion systems of modern full flight simulators are only capable of delivering less than 10% of the real g-loads. When training upset recovery the simulation environment, they cannot deliver the real sensations.

These human factors play a key role in UPRT. To compensate for the shortcomings of FSTD motion this CBT and your instructor will emphasize on human factors, especially during counterintuitive actions.
Flight Plan

- Safety Data
- Training content
- Instructor qualification
- Training delivery
- FSTD requirements
- Evaluation
Evaluation of training course effectiveness

- Assessment of exercises
- Pilot proficiency assessment
- Pilots’ feedback
- Instructors’ Observations
- Line Check/observation
- FDM (FOQA) improvements

Not discussed here
Exercise / Pilot Assessment
Pilot Proficiency: Competencies
(Doc 9995 – Manual of Evidence-Based Training)

- Aircraft Flight Path Management, manual control
- Aircraft Flight Path Management, automation
- Application of Procedures

- Communication
- Situation Awareness
- Workload Management
- Leadership and Teamwork
- Problem Solving and Decision Making

Technical

Human Performance
### Collaborating to address LOSS OF CONTROL IN-FLIGHT

**Upset Prevention and Recovery Training Workshop**

<table>
<thead>
<tr>
<th>Assessment and training topic</th>
<th>Frequency</th>
<th>Description (include type of topic, being threat, error or focus)</th>
<th>Desired outcome (includes performance criteria OR training outcome)</th>
<th>Example scenario elements</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Upset recovery</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TO APD</td>
<td>ALL</td>
<td>An airplane upset is defined as an airplane in flight unintentionally exceeding the parameters normally experienced in line operations or training.</td>
<td>Recognize upset condition. Take appropriate action. Assure aircraft control. Maintain or restore a safe flight path. Assess consequential issues. Manage outcomes.</td>
<td>Upset recognition and recovery — Severe wind shear or wake turbulence during take-off or approach. x x x</td>
</tr>
<tr>
<td>CLB DES</td>
<td>C CRZ</td>
<td>1. Pitch attitude greater than 25° nose up. 2. Pitch attitude greater than 10° nose down. 3. Bank angle greater than 45°. 4. Within pitch and bank angle normal parameters, but flying at airspeeds inappropriate for the conditions.</td>
<td>Upset recognition and recovery — at the maximum cruise flight level for current aircraft weight, turbulence to trigger overspeed conditions (if FSTD capability exists, consider use of vertical wind component to add realism).</td>
<td>x x x x</td>
</tr>
<tr>
<td>APP</td>
<td></td>
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</tr>
</tbody>
</table>

**Generation 4 Jet — Recurrent Assessment and Training Matrix**

**Competency map**

- x
- x
- x
- x

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19 Dec 16  UPRT Implementation
Pilot Proficiency: competencies

- ✓ MAN
- ✓ AUTO
- ✓ PRO
- ✓ COM
- ✓ SA
- ✓ WOR
- ✓ LEA
- ✓ DEC
Pilot Proficiency: Core competencies

- Aircraft Flight Path Management, manual control
- Aircraft Flight Path Management, automation
- Application of Procedures
- Communication
- Situation Awareness
- Workload Management
- Leadership and Teamwork
- Problem Solving and Decision Making
Collaborating to address
LOSS OF CONTROL IN-FLIGHT

Upset Prevention and Recovery Training Workshop

Competencies trends

One competency over 5 Q

19 Dec 16
UPRT Implementation
Line ops checks / observations

Area of special emphasis, example:

- Flight level choice
- Radar tilt selection
- Weather avoidance (icing, ...)

Strategy 3

REC MAX

OPT
Flight data monitoring

Speed below design maneuvering speed
Flight Safety and UPRT

- Global approach
- Safety culture promotion
- Crew debriefing promotion
- ASR customization
- Weather event trends (precursor)
Crew debriefing Example

<table>
<thead>
<tr>
<th>An Operator’s Debriefing Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TEM:</strong> Did we anticipate/identify all threats? Did we develop the proper mitigation strategies? Did we detect and correct our errors? Did we recognize and recover undesired aircraft states? Which countermeasures worked effectively?</td>
</tr>
<tr>
<td><strong>Procedures:</strong> As a crew, did we make any procedural error? How did we detect and correct the error?</td>
</tr>
<tr>
<td><strong>Pending questions:</strong> Are there any phases of flight to clarify (CRM...)? Any report to be completed? (Air Safety Report, Technical Log...)</td>
</tr>
<tr>
<td><strong>Improvements:</strong> What could we have done better?</td>
</tr>
</tbody>
</table>
Take away UPRT

➤ Program development: Time and Resources
➤ Instructor ADD-ON training: Essential
➤ Content: Practical and Basic knowledge
➤ FSTD: Remain in VTE

Train to Proficiency
Collaborating to address
LOSS OF CONTROL IN-FLIGHT

Upset Prevention and Recovery Training Workshop

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