

STARR CONSULTING SERVICES

RASG-AFI LOC-I and UPRT Workshop

10-11 November 2021)



Exclusive training
provider for SCS

Sunjoo Advani's Presentations from Day 1

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| First day, 10 November 2021 | | |
|--|---|-------------------|
| 14h00-14h10 | Opening address | Regional Director |
| 14h10-14h15 | Introduction to the Workshop | ICAO-PIM |
| 1 - UPRT in academic and simulator training during the pandemic | | Jeffery/Sunjoo |
| 14h15-15h55 | 1.1 Competency fade during the pandemic | Sunjoo |
| 15h55-16h35 | 1.2 Exemptions/Deviations granted and their impact | Jeff/Sunjoo |
| 16h35-16h45 | Break | |
| 16h45-17h25 | 1.3 Experience in conducting training during the pandemic | Jeff/Sunjoo |
| 2 - UPRT delivery using available resources, including unmodified simulators, and recognition/awareness as minimum training | | Sunjoo/Jeffery |
| 17h25-18h05 | 2.1 Training programs for prevention & recovery | Sunjoo |
| 18H05-18h25 | 2.2 Rwandair experience-Training Programme and SMS | Capt Kojo |
| 18h25 | Closure for the first day | |

| Second day, 11 November 2021 | | |
|--|--|-------------------|
| 2 - UPRT delivery using available resources, including unmodified simulators, and recognition/awareness as minimum training | | Sunjoo/Jeffery |
| 14h00-14h40 | 2.3 Advert practices on prevention and recovery | Jeff/Sunjoo |
| 14h40-15h20 | 2.4 Instructor training and instructor standardization | Sunjoo |
| 3 - Global Status of UPRT and lessons learned | | |
| 15h20-16h20 | 3.1 Issues arising during the past year | Jeff |
| 16h20-16h30 | Break | |
| 4 - Review of accident reports, risks factors and tools | | |
| 16h30-17h00 | 4.1 UPRT preliminary thoughts on Sriwijaya Air Flight 182 accident | Jeffery/Sunjoo |
| 17h00-17h30 | 4.2 UPRT in RPAS: early Considerations | Jeffery/Sunjoo |
| 17h30-17h50 | 4.3 IATA-Fight Data Analysis and LOC-I | Blessing Kawai |
| 17h50-18h15 | 4.4 KCAA- Inflight incapacitation in the era of COVID-19 | Dr. Ilako |
| 18h15-18h30 | 4.5 Updates on RASG-AFI Guidance and reporting tools Wrap-up | ICAO-PIM |
| 18h30 | Closure of the Workshop | Regional Director |

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1. UPRT in academic and simulator training
during the pandemic

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IDT

Providing valuable, practical training to improve commercial aviation safety

Aviation Safety Expertise for

- National Aviation Authorities
- Airline Operators



IDT & Starr: A New Alliance



- IDT is a member of Starr Consulting Services
- Exclusive services to airlines to implement:
 - Upset Prevention & Recovery Training
 - Final Approach Standardisation Training





Training during a Pandemic

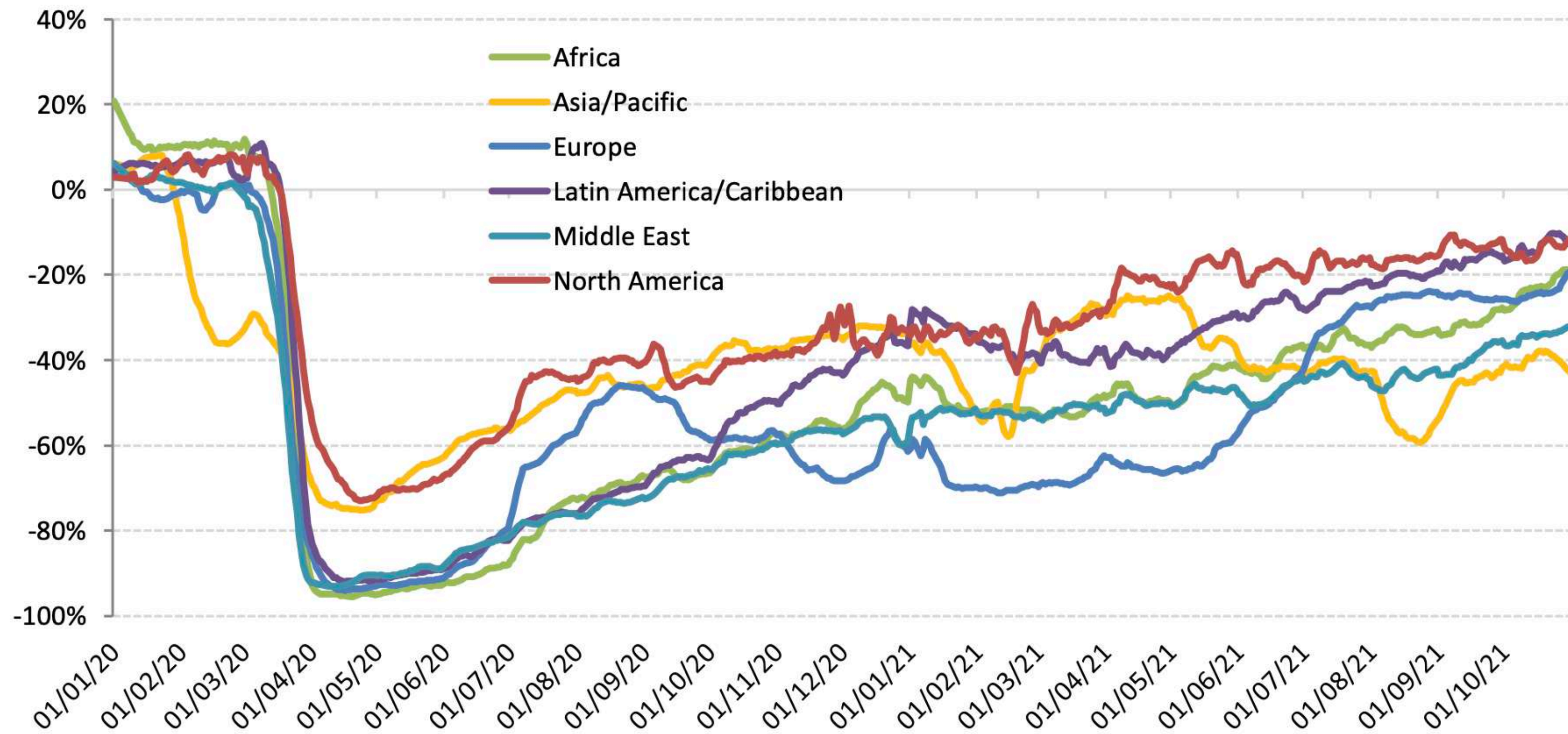
Introduction

- Pilots furloughed, dismissed, retired (early)
- Sporadic operations
- Training levels variable
- Reported competency fade



Impact on Africa

Comparison of total seat capacity by region (7-day average, YoY compared to 2019)



Impact of the Pandemic

- Pilots furloughed, dismissed, retired (early)
- Sporadic operations
- Training levels variable
- Reported competency fade

Impact of COVID-19 on Africa's aviation sector



Revenue loss 2020 compared to 2019
- 8.6 billion Euro

International passengers



Domestic passengers



Source: International Civil Aviation Organisation (ICAO), April 2021

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1.1 Competency Fade

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Competency Fade

Which ones?

- Is there a problem?
- Some airlines saw Covid as a training opportunity. Others lagged behind
- Compensation for competency fade: **train!**
- Both ongoing and re-training require investment
- During a pandemic, more training resources may be available

Competency Fade

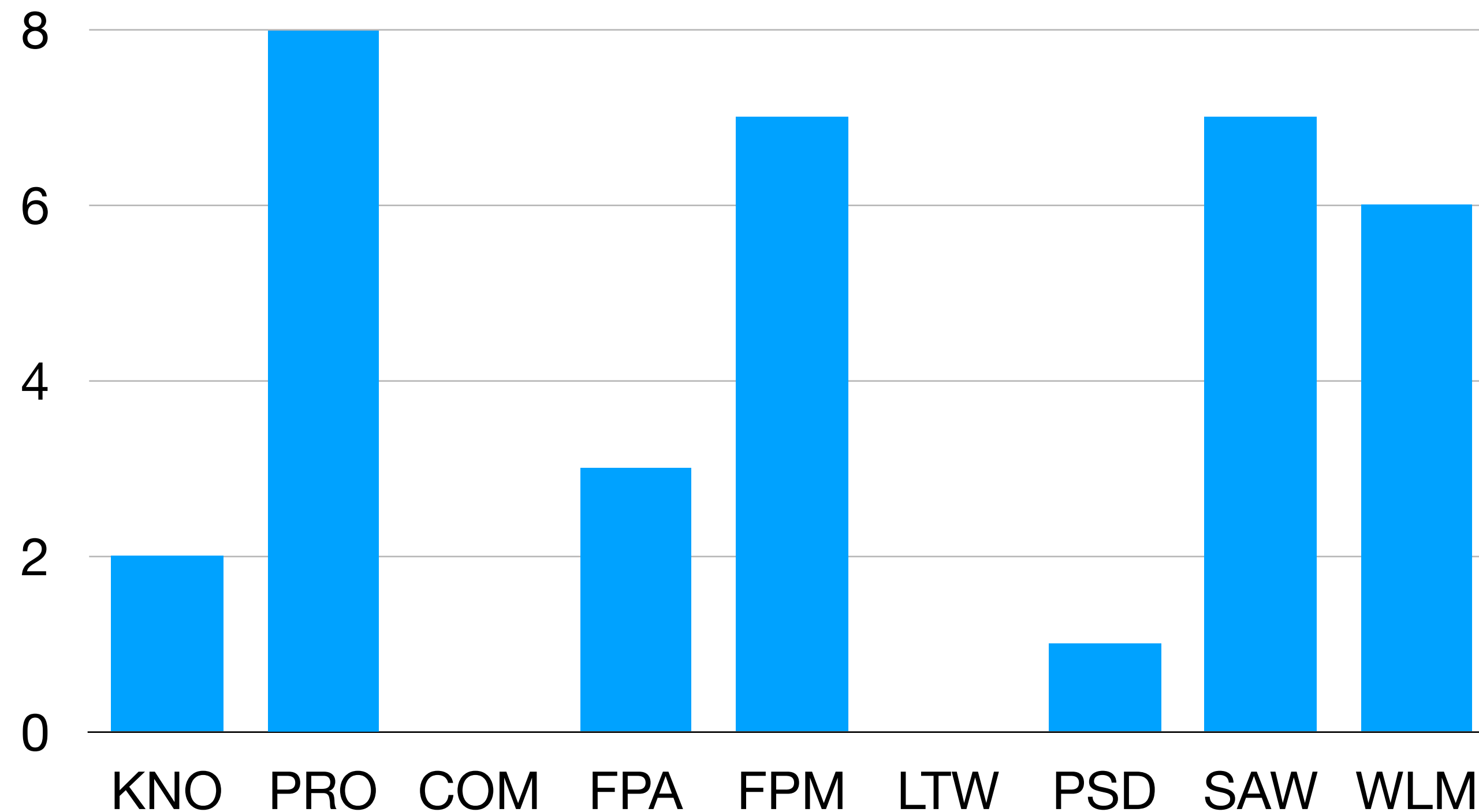
Heads-of-Training Report

- 25 heads-of-training from a variety of airlines commented on their observations
- Each asked to select two “most significant” areas of concern, based on post-pandemic training
- Observed degradation in application of procedures, flight-path management, situation awareness and workload management
- These are observations, not measured values

Competencies

- KNO – Knowledge
- PRO – Application of Procedures
- COM – Communication
- FPA – Flight Path Management, Automation
- FPM – Flight Path Management, Manual
- LTW – Leadership & Teamwork
- PSD – Problem Solving & Decision Making
- SAW – Situation Awareness
- WLM – Workload Management

Results of Survey



- FPM often initially reported, but often not the actual underlying competency weakness
- PRO suffered largest fade; easily re-trained to competence
- SAW significant fade; simulators did not seem to provide good scenarios to train this
- WLM often associated with PRO; delayed actions leading to higher workload
- Outcome of survey helps adjust recurrent training recommendations

EASA Recommendations

Dealing with lack of recent practice



Recommendations

Mitigating decay

- Competency-Based Training (CBT), uses actual performance to determine appropriate amount/timing of training
 - Focus on areas requiring most reinforcement
 - Shift FSTD use from checking to training
 - Expand use of LOFT to close the gap between training & operations
 - CBT takes time to implement properly
- Alternative training media
 - Blended learning (lower-level devices combined with FSTD)

Recommendations

Automation

- Automation during return to service may be promoted
- Crews must be trained to properly use automation
- Automation should not be viewed as mitigation against low proficiency:
 - Automation places demand on cognitive resources
 - During automation failures/unserviceability, crews must be able to manage subsequent non-standard operations & manual flight
 - This also connects with UPRT!

Solution Recommendations

for Air Operators and ATOs

- Pair crews with one who has recent flying experience; avoid challenging destinations
- Expand training beyond minimum requirements
- Maximize LOFT
- Adjust recurrent training to pilot performance (combined with close monitoring/validation of SMS, FRMS and self-reporting)
- Enhance startle/surprise training
- Promote digital/remote training
- Review SOPs
- Emphasise manual flying

Solution Recommendations

for Air Operators and ATOs

Possible Roles of UPRT

| | |
|--|---|
| <ul style="list-style-type: none"> • Pair crews with one who has recent flying experience; avoid challenging destinations | |
| <ul style="list-style-type: none"> • Expand training beyond minimum requirements | CBT approach |
| <ul style="list-style-type: none"> • Maximize LOFT | LOFT Scenarios |
| <ul style="list-style-type: none"> • Adjust recurrent training to pilot performance (combined with close monitoring/validation of SMS, FRMS and self-reporting) | UPRT encourages performance-based skill maintenance |
| <ul style="list-style-type: none"> • Enhance startle/surprise training | Central to UPRT |
| <ul style="list-style-type: none"> • Promote digital/remote training | Integrated with UPRT |
| <ul style="list-style-type: none"> • Review SOPs | In UPRT programs |
| <ul style="list-style-type: none"> • Emphasise manual flying | Central to UPRT |

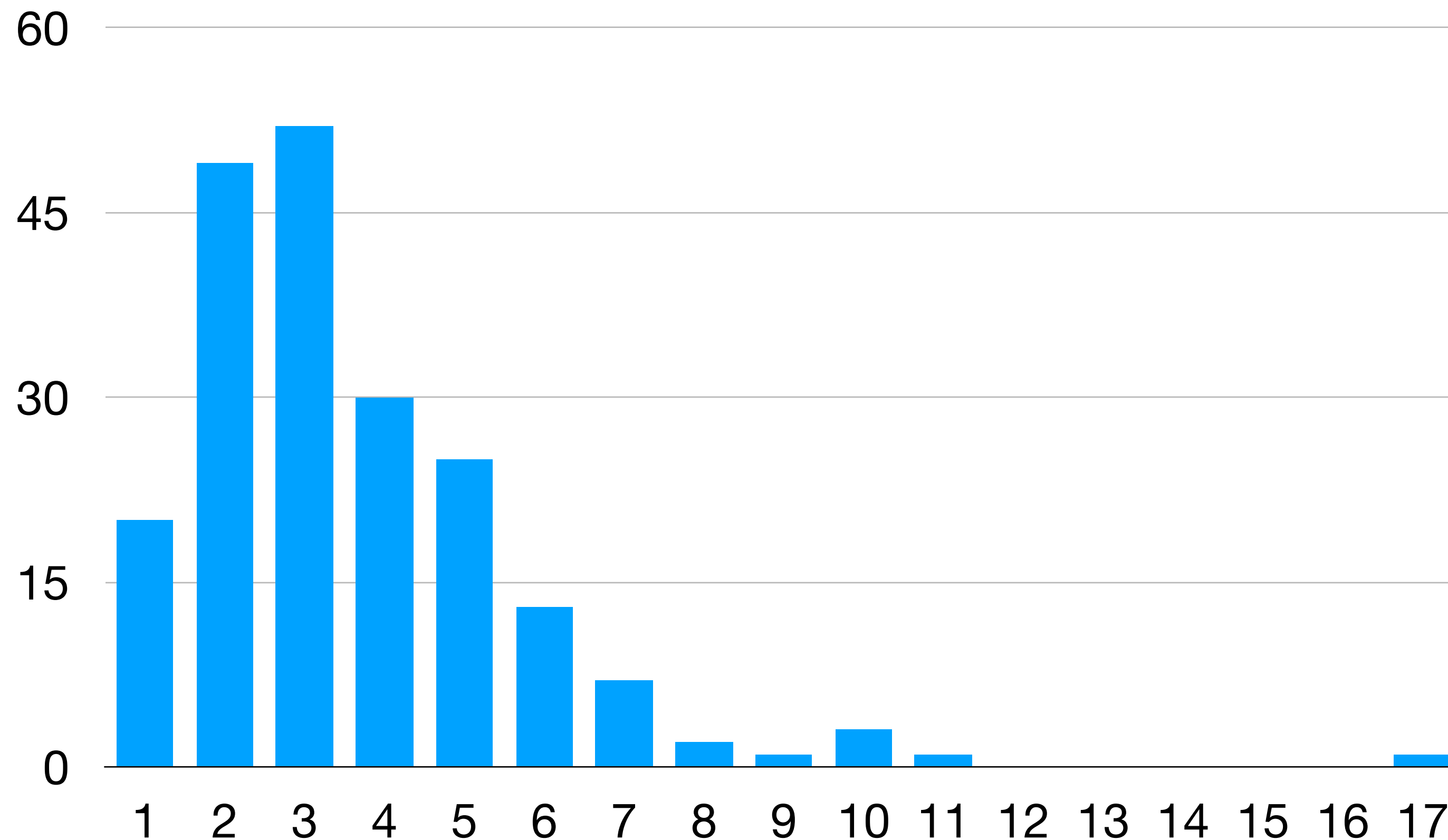
EASA Recommendations

Dealing with lack of recent practice



Some objective data on landings

FDM time between main wheel and nose wheel touchdown



- Data from 240 landings
- Spread is larger than expected
- What do outliers say?
- Opportunity to use FDM, instructor reports to create competency-based EBT

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1.2 Exemptions/deviations granted and their impact



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UPRT 'delays' due to COVID-19 (EASA)

- In ED Decision 2019/025/R 'AMC & GM to Part ORO – Issue 2, Amendment 16' of 17 December 2019, the AMC to points ORO.FC.220 and ORO.FC.230 of Annex III (Part-ORO)
- Dynamic upsets, high-altitude stall events and icing effects require FSTDs updated to CS-FSTD(A) – Issue 2
- Covid deferred applicability date of CS-FSTD(A) – Issue 2 for providing UPRT in accordance with Annex III (Part-ORO) from 30 Aug 2020 until 31 March 2021

UPRT delays due to other reasons

- In reality, several airlines have conducted a “minimum” UPRT course
- Competency-based UPRT is now becoming more commonplace
- Many airlines/regions have done little or nothing on UPRT

Solution Recommendations

Many airlines/regions have done little or nothing on UPRT

- lack of knowledge at operator/regulator
- belief of “need” to upgrade simulators before starting UPRT
- shortage of properly trained instructors
- fear of time/investment required
- other priorities taking front row
- hesitation to bring in outside expertise

Solution Recommendations

Many airlines/regions have done little or nothing on UPRT

| | |
|---|--|
| <ul style="list-style-type: none">• lack of knowledge at operator/regulator | Can be trained quickly (external experts) |
| <ul style="list-style-type: none">• belief of “need” to upgrade simulators before starting UPRT | Can conduct majority of training in any qualified device (prevention) |
| <ul style="list-style-type: none">• shortage of properly trained instructors | Outside experts can help |
| <ul style="list-style-type: none">• fear of time/investment required | Can be combined with regular training |
| <ul style="list-style-type: none">• other priorities taking front row | Preventing LOC-I (safety) should remain top priority. What can be more important? |
| <ul style="list-style-type: none">• hesitation to bring in outside expertise | Outside help can accelerate the process, avoid errors, assure high quality if done correctly |

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1.3 Experience in conducting training during a pandemic



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Safety-Critical Aspects of UPRT

- Combination of knowledge and skill – multiple competencies
- TEM: Recognition and intervention of upsets as early as possible
- Manage the human startle reflex
- Decision making: How to intervene **effectively**
- **Risk of inadequate training or information transfer can be catastrophic**
- **Conversely, properly structured and delivered training can have lasting impact**

During the Pandemic

Operational Challenges

- Academics:
 - Remote learning ground school
 - Applications (eLearning)
- Simulator:
 - COVID protocols
 - Travel restrictions and constant changes
- **No compromises on quality of instructor training**
 - **Requires thorough comprehension of concepts**

Possible negative training (or transfer)

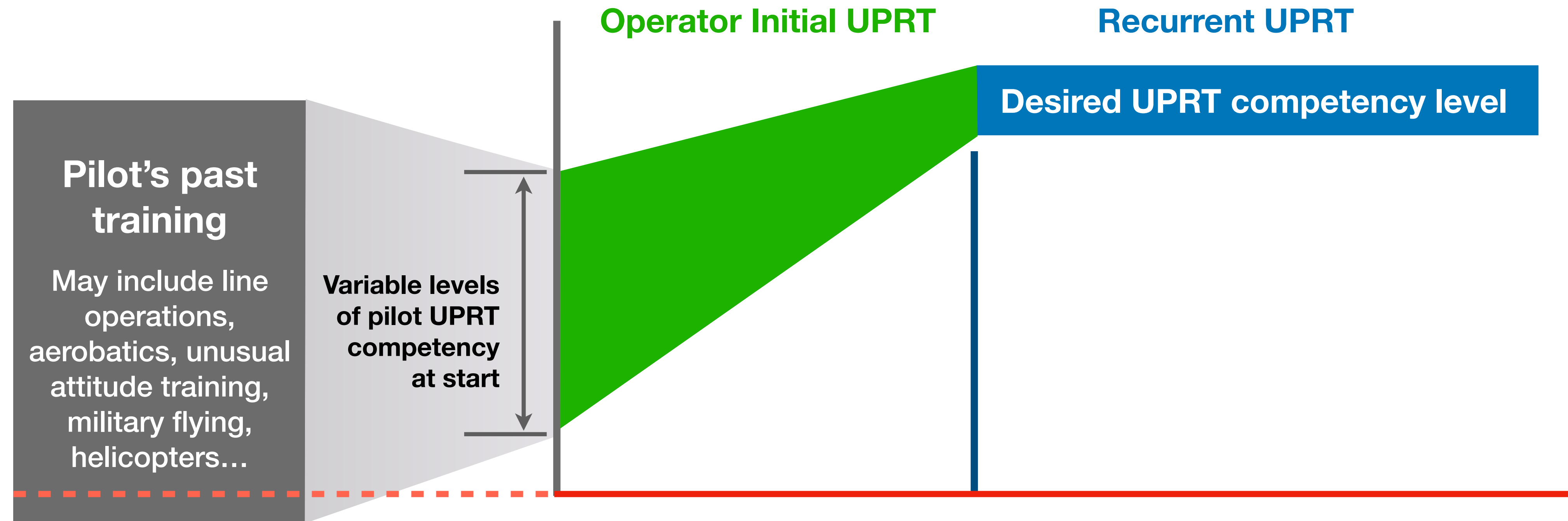
- Negative Training: Introducing incorrect information
- Negative Training Transfer: Improper application of training
- No ATO, Operator or instructor intentionally introduces errors
- Lack of knowledge and experience can lead to faults
- In the example:
 - Outside the Valid Training Envelope (simulator may not be valid here)
 - Lack of consideration of simulator's limitations (missing g-loads, effect on systems)
 - Lack of consideration for OEM training recommendations
- It all comes down to the **syllabus** and **instructor**. Both must be correct!

Finding the Right Balance

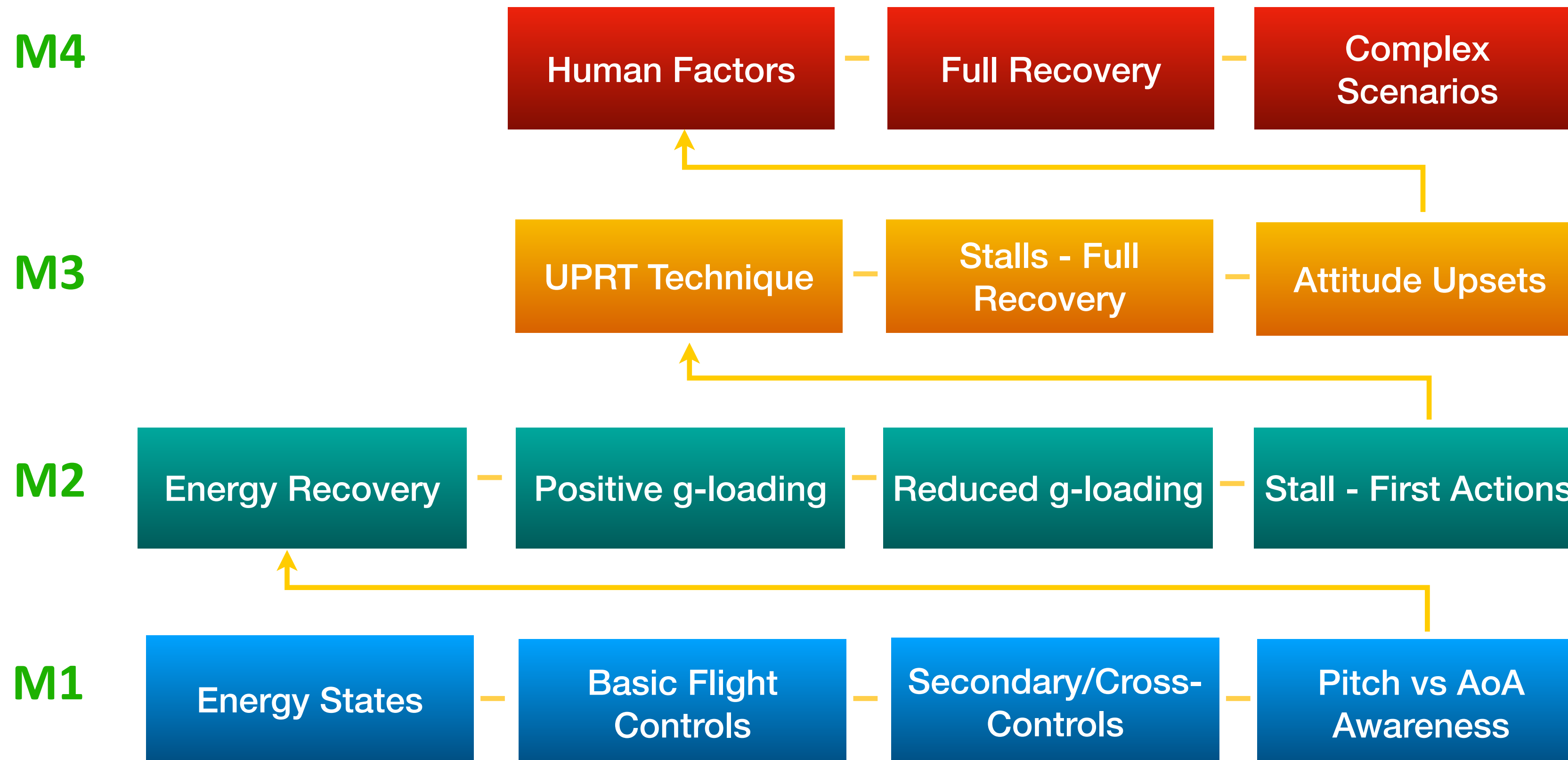
How to implement an effective, affordable training program

- Graduated learning
- Operator Initial UPRT:
 - Small doses to develop competencies
 - Easier for instructors and pilots
- Recurrent UPRT:
 - After elevating standards, then continue with recurrent UPRT
 - Maintain the high standards

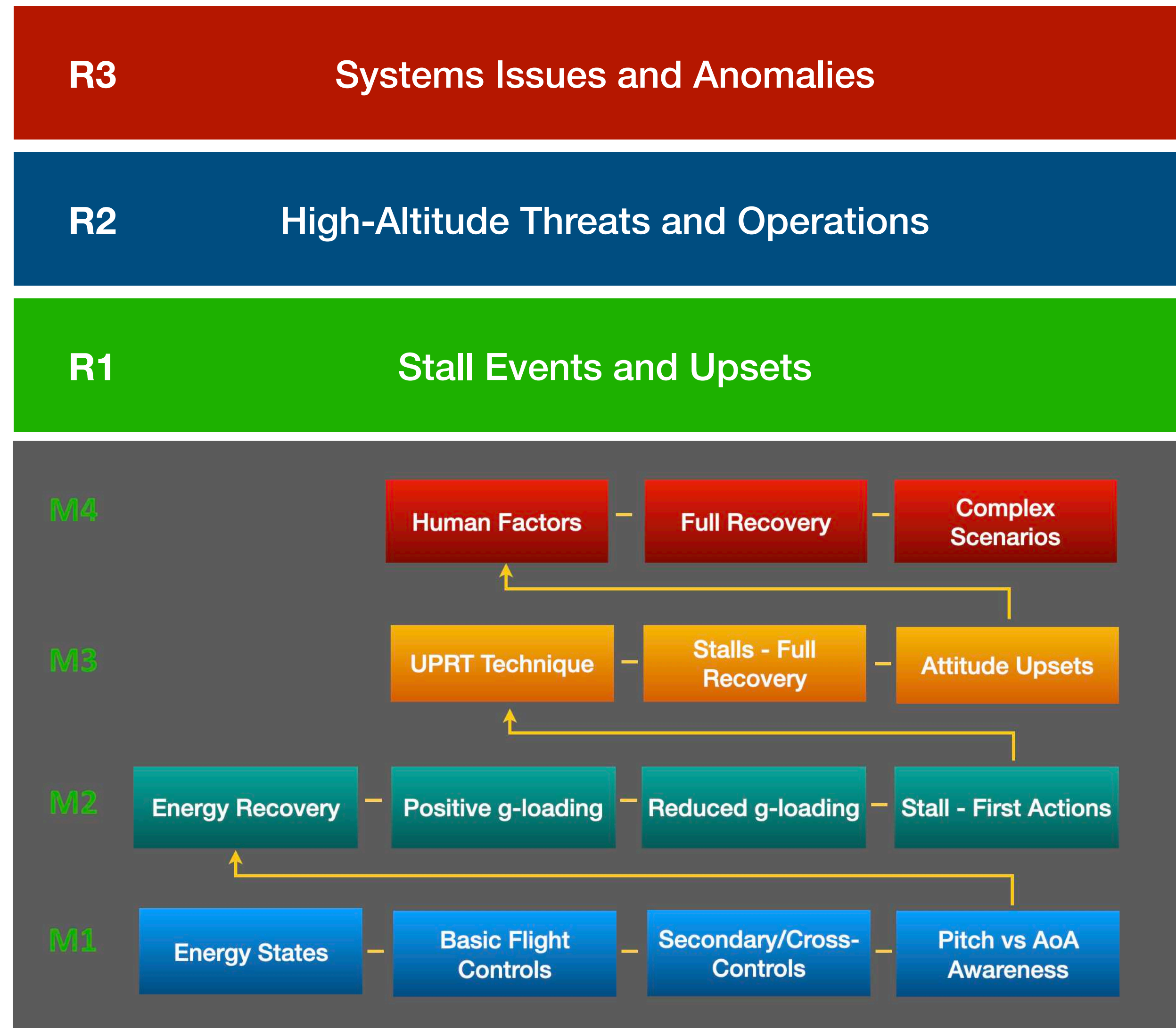
Achieving the required level of competence



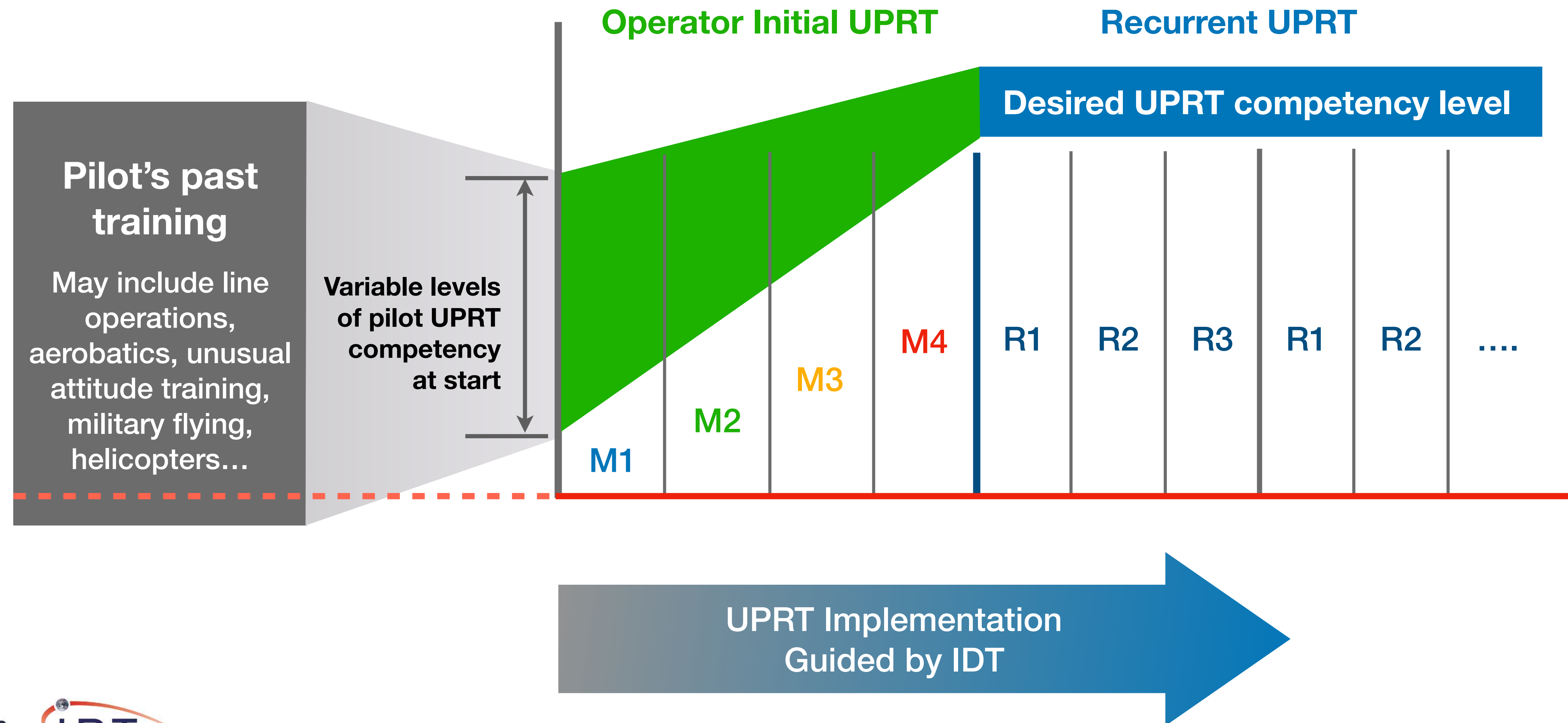
Modular UPRT Training Program



Operator Initial and Recurrent UPRT



Achieving the required level of competence (and maintaining it)



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2.1 Training Programs for Prevention & Recovery



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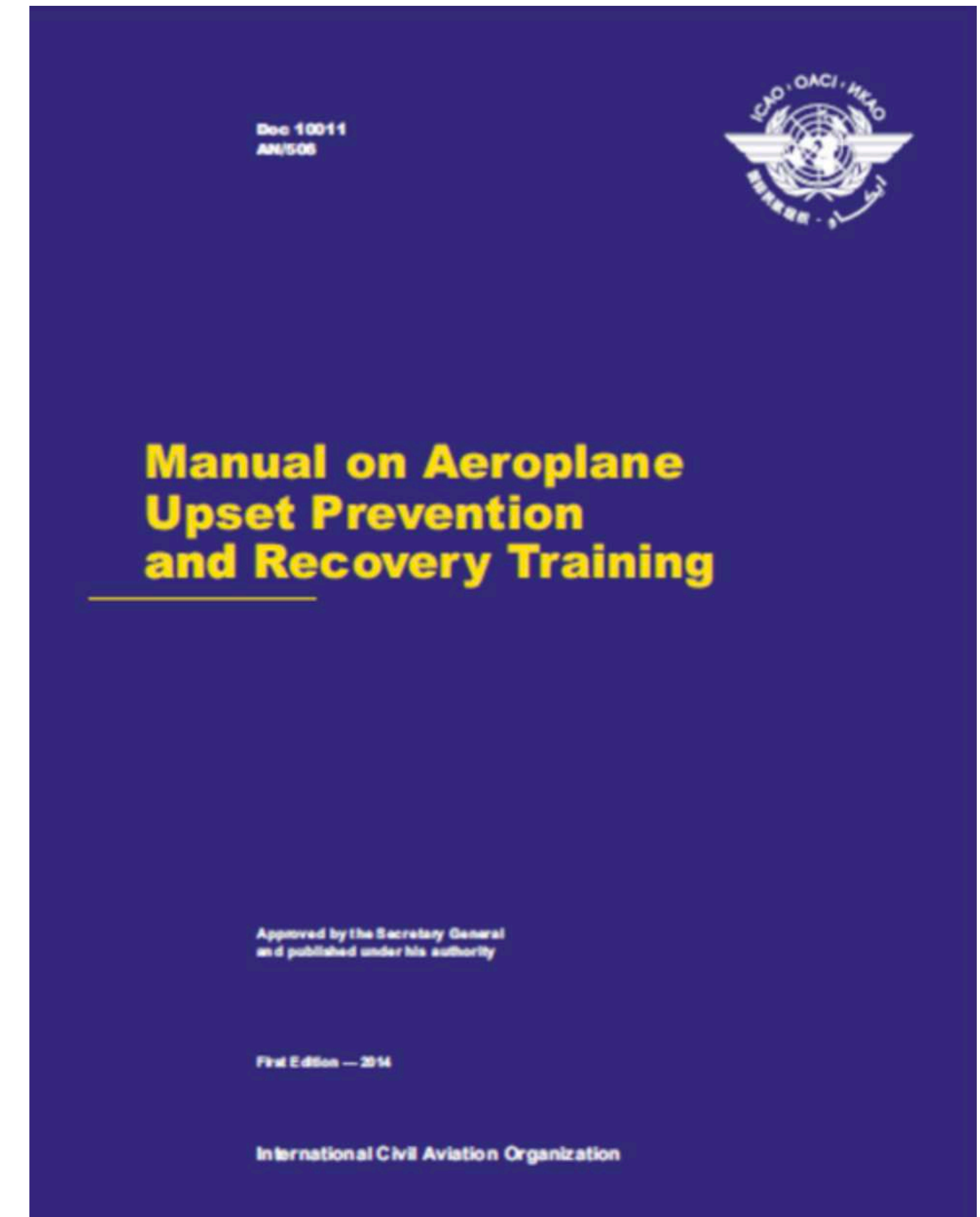
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Components of a UPRT program

1. The Ingredients

- ICAO 10011 - Manual on Aeroplane UPRT:
 - UPRT academic training
 - Instructor upgrading
 - Proficiency-based training

ICAO Intent: Develop competencies to prevent and recover from upsets



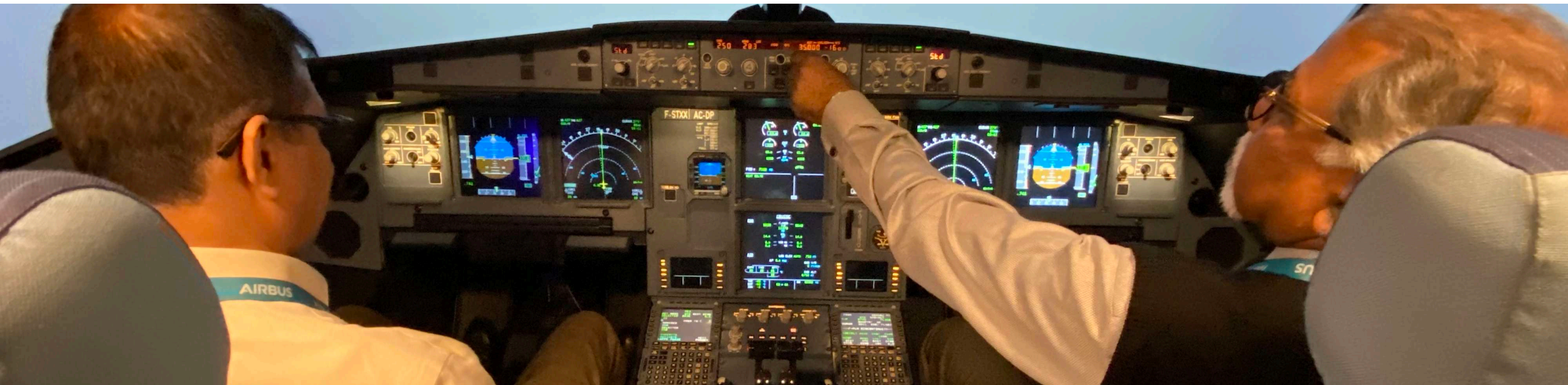
Outline

- What makes UPRT successful?
- What makes UPRT challenging to implement?
- How are airlines “stepping up” to these challenges?
- How are the authorities dealing with the qualification of UPRT?



Instructors

- Most Flight Instructors are not familiar with airline operations
- Most airline simulator instructors are not actually flight instructors



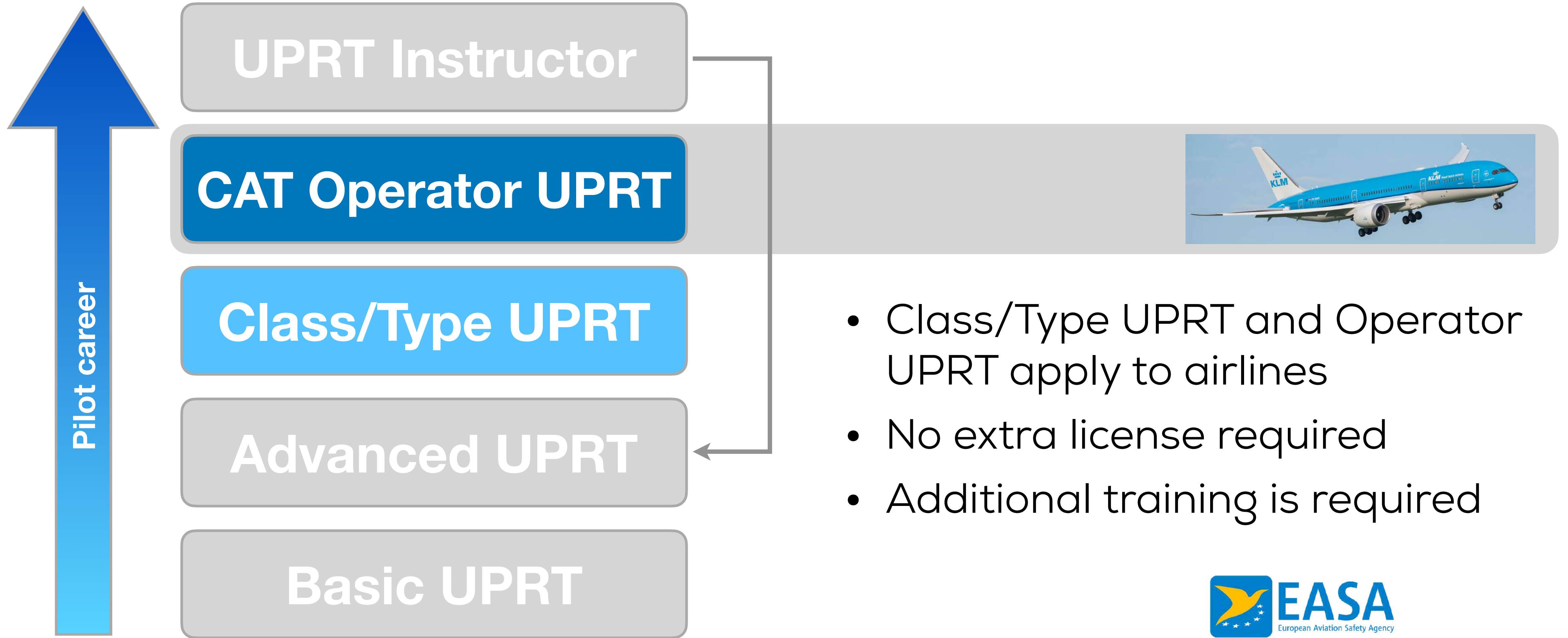
Simulation of Upsets (attitudes)

- Recovery from large pitch/bank attitudes of the airplane
- Motion cueing does not reproduce motions – it tries to approximate them
- During recovery, pilots encouraged to apply full control inputs

What drove the need for UPRT?

- Lack of awareness of stalls and causal factors
- Inappropriate pilot response to startle
- Inconsistent training by instructors
- Improper application of simulators for upset training
- Lack of consistent regulations
- Changing demographics: fewer military pilots in airlines
- Less or no aerobatics training
- Current pilots may have had relevant skills years ago
- Jet theory only as student pilot
- Many FI's never flew jets
- Operator instructors are not FI's
- Smaller, cheaper, easier training aircraft
- Pilots – system operators – flight managers – HR managers
- Courses more commercial

EASA UPRT Structure



UPRT applicability under EASA – Pilots

| PART | Level | What is it? | Objective | Pre-requisite for |
|-----------|------------------|--|--|--|
| Operator | Recurrent | 36-month cycle of prevention and recovery exercises | Ongoing UPRT training for skills/knowledge maintenance | |
| | Operator Initial | Training of all pilots to proficiency standards in upset prevention and recovery | UPRT skills/knowledge aligned with Operator's processes | Entering the airline |
| Licensing | Class/Type UPRT | UPRT related to class/type specificities | Airline training level UPRT skills & knowledge | <ul style="list-style-type: none"> • Mandatory for: • SP certified complex aeroplanes • MP certified aeroplanes |
| | Advanced UPRT* | Part of MPL and ATPL Integrated Course Additional theory & flight training in an aeroplane | Expose students to dynamic upsets, build pilot psychological, physiological resilience | <ul style="list-style-type: none"> • SP aeroplanes in MPO • SP HP complex aeroplanes • MP aeroplanes |
| | Basic UPRT* | Required for MPL, CPL and ATPL courses. Additional instructor requirements to deliver this are not required. | Theory (briefing) and flight exercises <ul style="list-style-type: none"> • Critically low airspeeds • Unusual attitudes • Spin avoidance | |
| | | * on-aircraft UPRT | | |

Sources of Information

- ICAO Annexes 1 & 6
- ICAO 10011
- ICAO 9868 PANS-TRG
- ICAO 9625 (FSTD)
- IATA "Guidance Material and Best Practices for UPRT" (2015)
- FAA AC120-109A Stalls
- FAA AC120-111 UPRT
- EASA ED

UPRT

When is it considered “successful”?

Defining “successful” UPRT

- The pilot is trained to be resilient, to recognise and respond to every upset threat before the upset occurs*
- The pilot is resilient, anticipates threats, and is trained to analyze, decide and react appropriately
- The pilot is able to recover from every upset
- UPRT builds pilot self-confidence (awareness, understanding, skills/knowledge)
- LOC-I statistics go down

*an noble, ambitious goal

Causes of Upsets in Commercial Aviation

- **Environmental**

- Wake vortex
- Clear Air Turbulence
- Mountain Wave
- Thunderstorm
- Icing
- Microburst

- **System Anomaly**

- Flight Instruments
- Autopilot
- Flight Control System

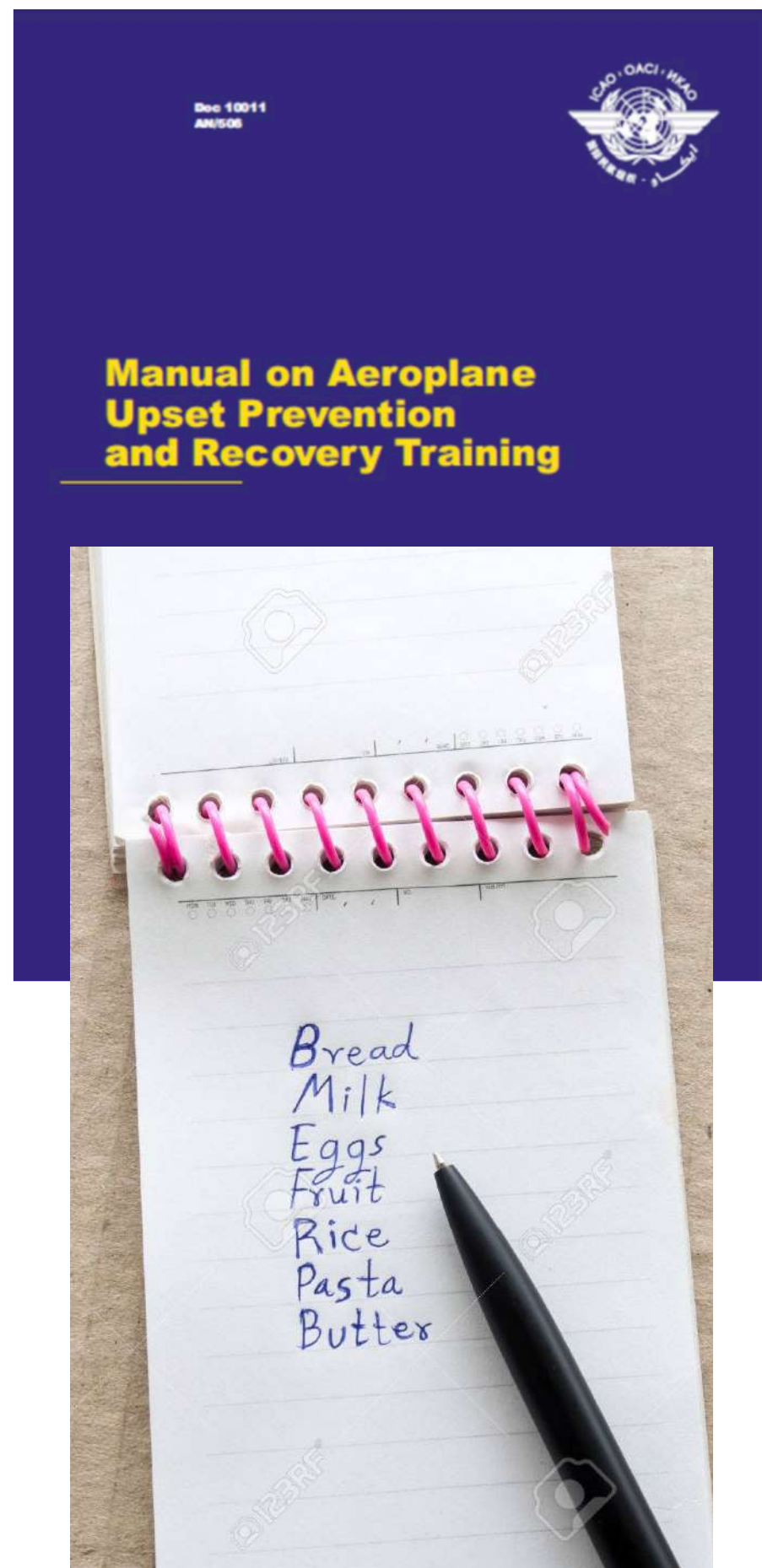
- **Pilot Induced**

- Inappropriate use of A/P
- Spatial Disorientation
- Somatogravic Illusion
- Pilot technique
- Incapacitation
- Vertigo
- Distraction
- Inattention
- Adjusting attitude & PWR
- Instrument crosscheck

What does this require?

- Regulation that supports **competency-based** UPRT
- **Instructors** that can properly teach UPRT, and work within the capabilities and limits of the simulator
- Training programs that **gradually** build a high standard of training
- Pilots that **always react appropriately** to upset threats in any condition (prevention and recovery)
 - Recovery is a nearly bullet-proof vest
 - Prevention ensures the gun does not fire!
- **How do we create the right solution for the pilot?**

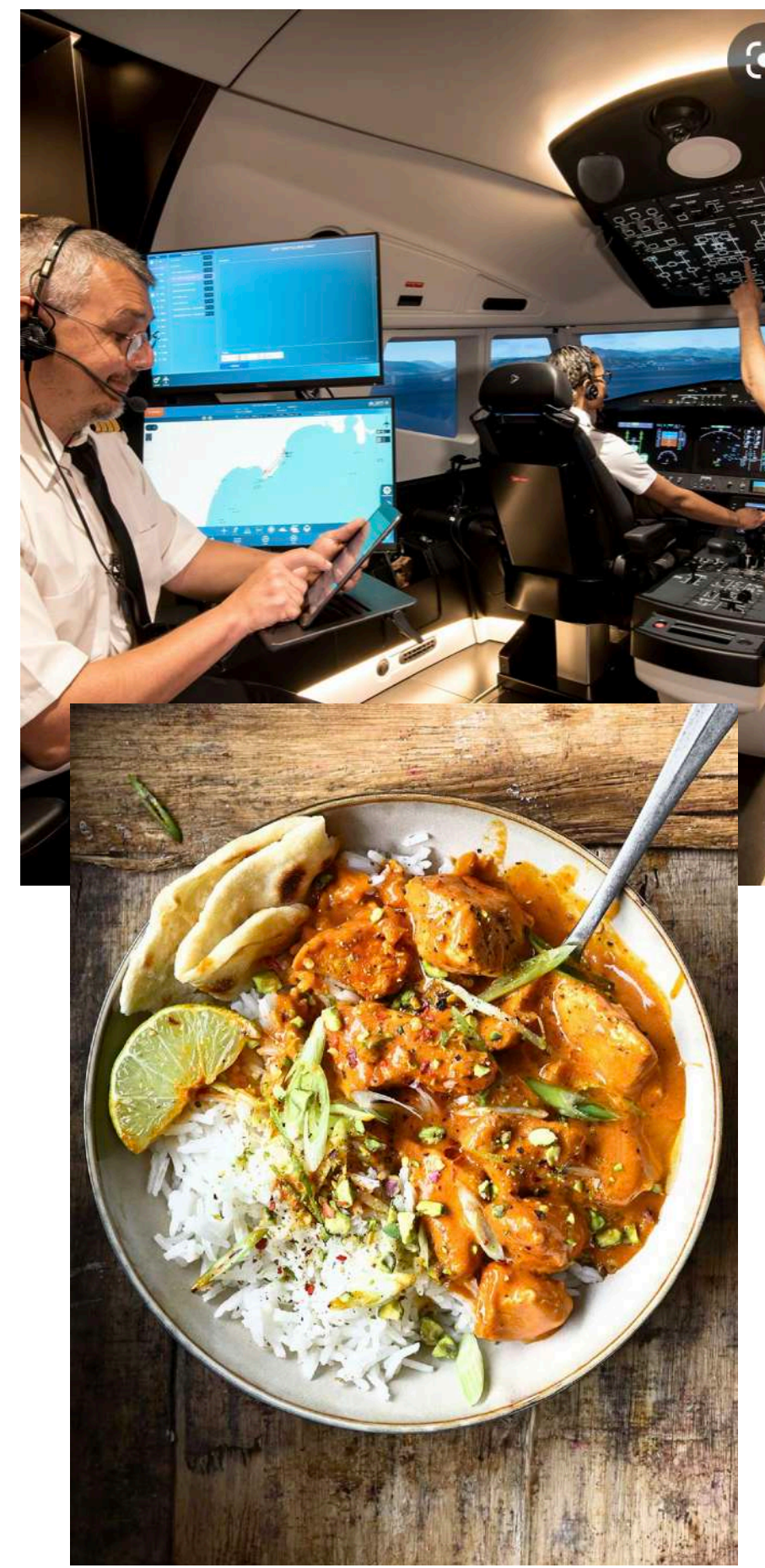
Using the Right Ingredients



ICAO: Shopping List



Airline: Menu



Instructor: Meal



Inspector: Quality

Creating the Best Training for the Pilot

- Regulation provide a “shopping list” of all the required items
- Pilots need a meal
- Airlines create the menu (in their own ways)
- Airlines have best intentions: need to do “the right thing”
- Example - “Understanding Trim”
 - Could be integrated into **one** exercise that also encompasses several other required items
 - OR
 - Could be taught in the FSTD from different perspectives in several small exercises
- NAA’s task is to assist the airlines by ensuring they interpret and apply best practices, and NOT simply translate

Example: Training of “Use of Trims”

- Training elements constitute a long list of ingredients
- How do we prioritise and deliver these in an effective way?

Table 1: Elements and respective components of upset prevention training

| Elements and components | | Ground training | FSTD/ Aeroplane training |
|-------------------------|---|-----------------|-----------------------------|
| A. | Aerodynamics | | |
| 1. | General aerodynamic characteristics | • | |
| 2. | Aeroplane certification and limitations | • | |
| 3. | Aerodynamics (high and low altitudes) | • | • |
| 4. | Aeroplane performance (high and low altitudes) | • | • |
| 5. | Angle of attack (AOA) and stall awareness | • | • |
| 6. | Stick shaker or other stall-warning device activation (as applicable) | • | • |
| 7. | Stick pusher (as applicable) | • | • |
| 8. | Mach effects (if applicable to the aeroplane type) | • | • |
| 9. | Aeroplane stability | • | • |
| 10. | Control surface fundamentals | • | • |
| 11. | Use of trims | • | • |
| 12. | Icing and contamination effects | • | • |
| 13. | Propeller slipstream (as applicable) | • | • |
| B. | Causes of and contributing factors to upsets | | |
| 1. | Environmental | • | • |
| 2. | Pilot-induced | • | • |
| 3. | Mechanical (aeroplane systems) | • | • |

Trim Awareness Training

- part of our UPRT Program



What is trim?

- Adjust the aerodynamic forces to maintain attitude
- All Forces are balanced
- All Moments are balanced



Thomsonfly G-THOF incident (2007)

- Where: Approach to Bournemouth Airport, U.K.
- What: 737-300
 - Night ILS approach
 - Un-commanded autothrottle disengagement
 - **Autopilot trims stabilizer up to stay on path**
 - Go around called after aircraft slows below speed
 - Pitch up to 44 deg, speed 82 kts
 - Full column forward ineffective, **trim not applied**
 - Thrust reduced to 86%. Recovered.
- **Why: Unnoticed autothrottle disconnect, lack of trim awareness and application**



AF447

Published July 2012

Final Report

On the accident on 1st June 2009
to the Airbus A330-203
registered F-GZCP
operated by Air France
flight AF 447 Rio de Janeiro - Paris

BEA

Bureau d'Enquêtes et d'Analyses
pour la sécurité de l'aviation civile

Ministère de l'Écologie, du Développement durable, des Transports et du Logement

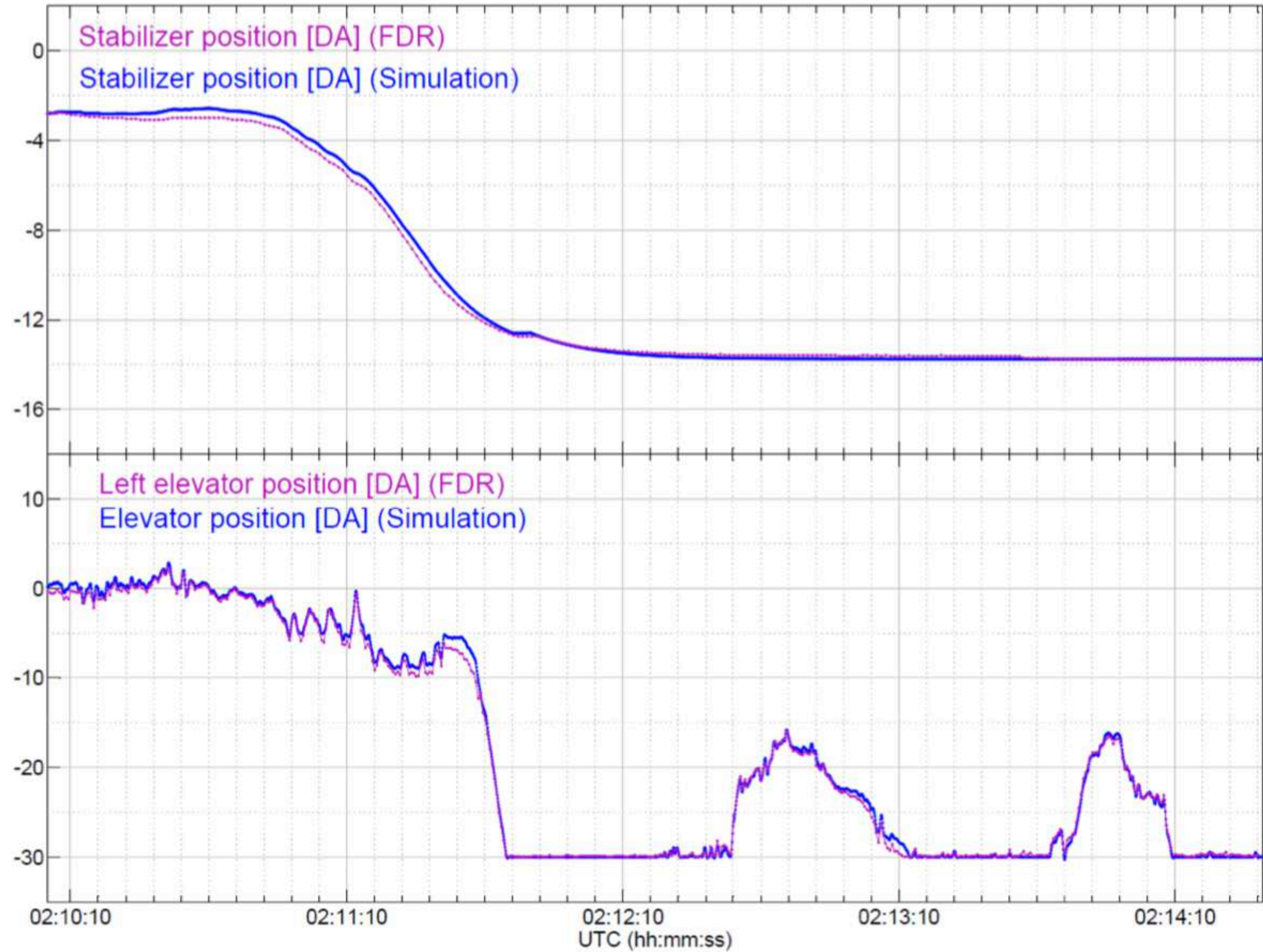
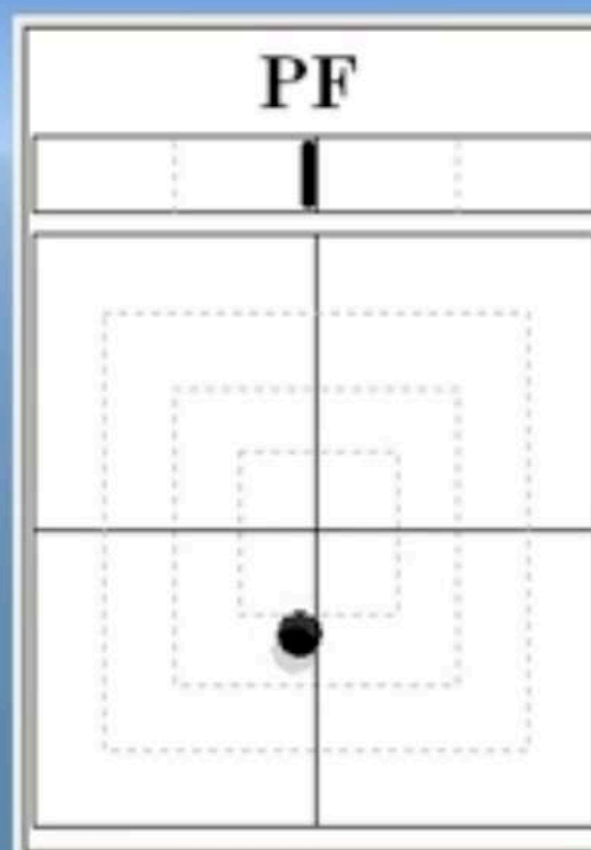
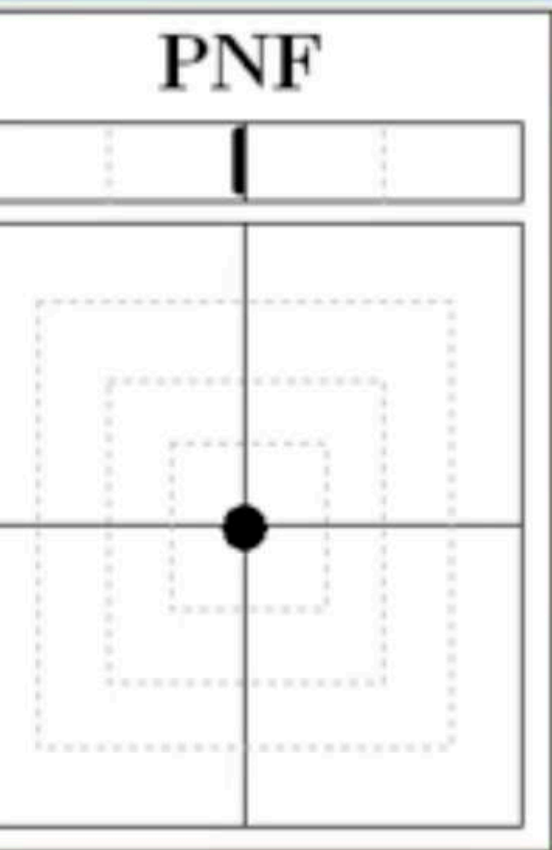
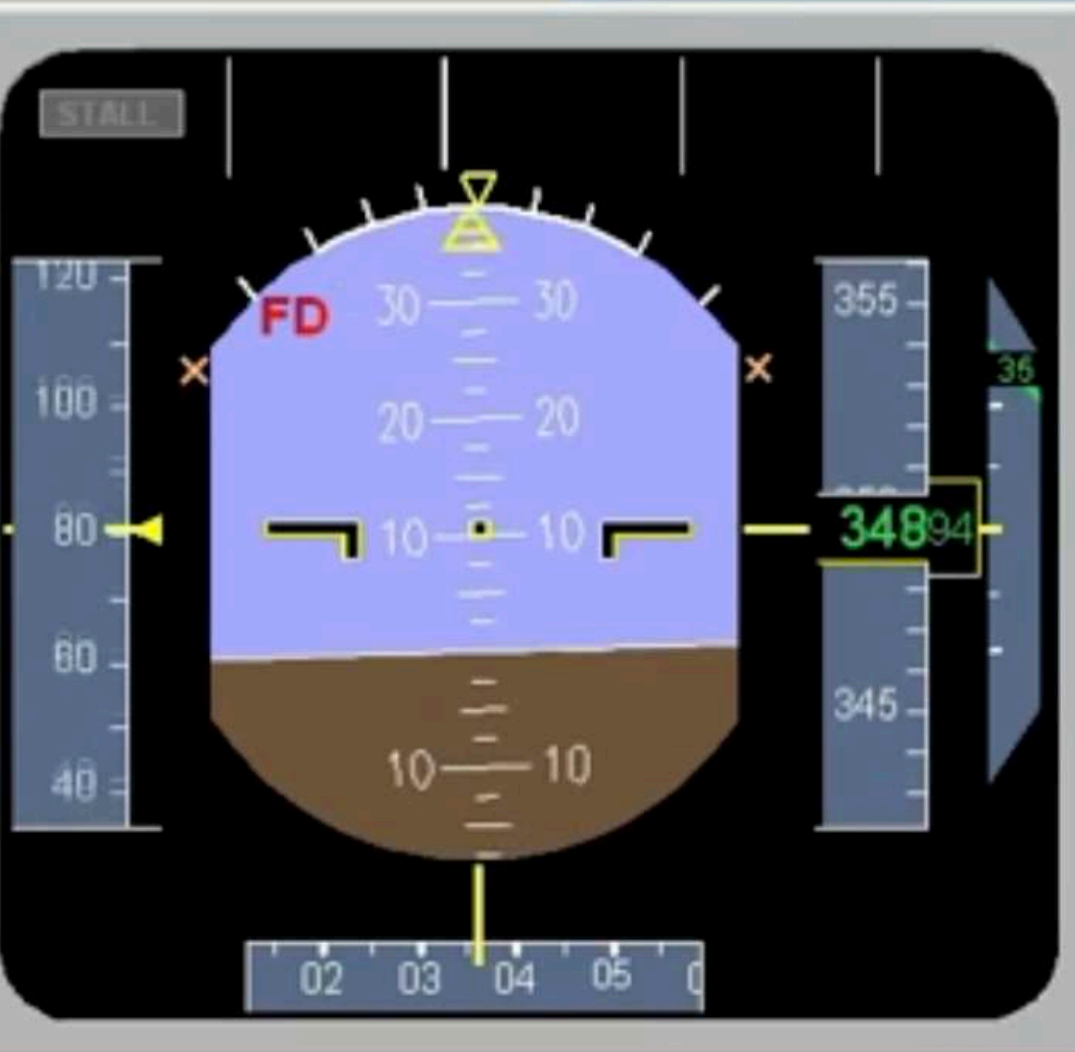


Figure 63: Comparison between the recorded positions of the elevator and THS and the simulation



On a perdu les vitesses alors

On n'a pas une bonne annonce de



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STAB -2

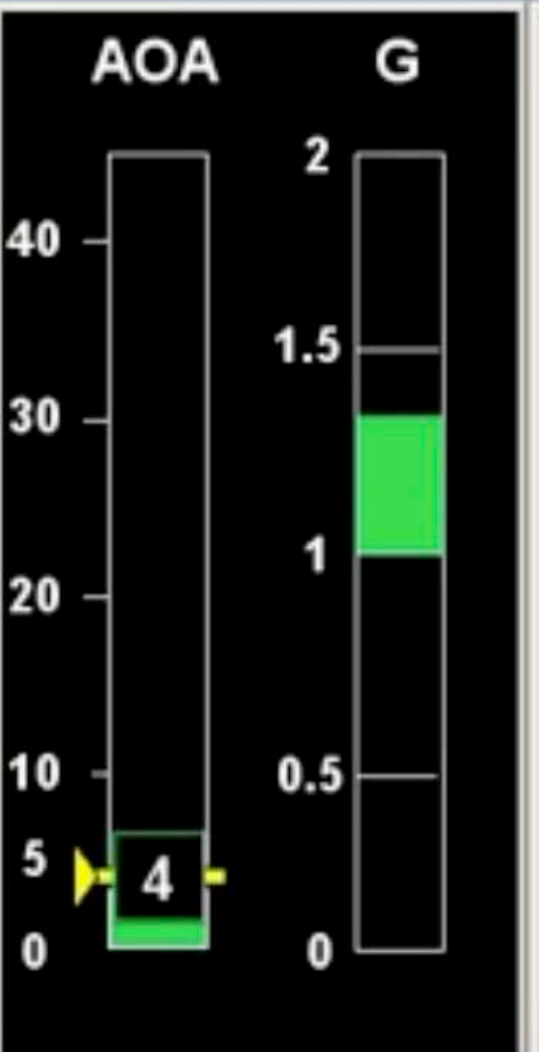
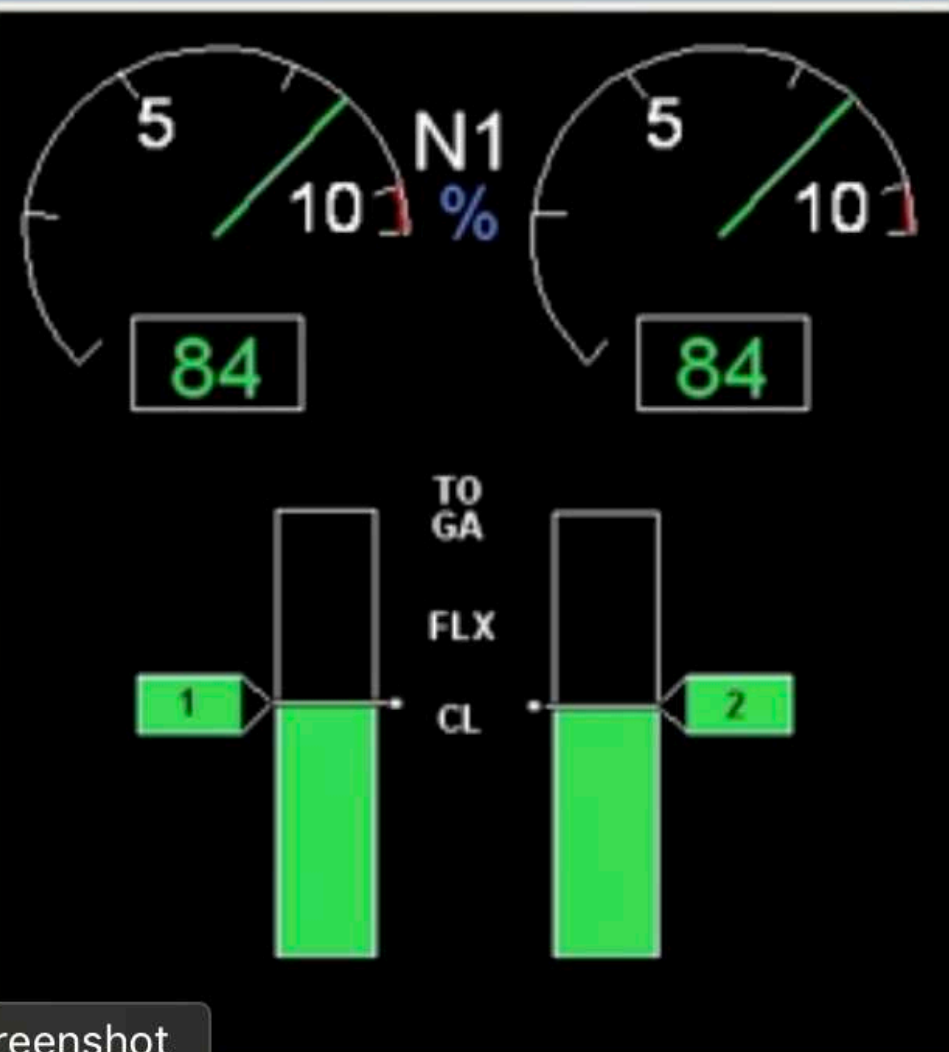
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AUTO FLT

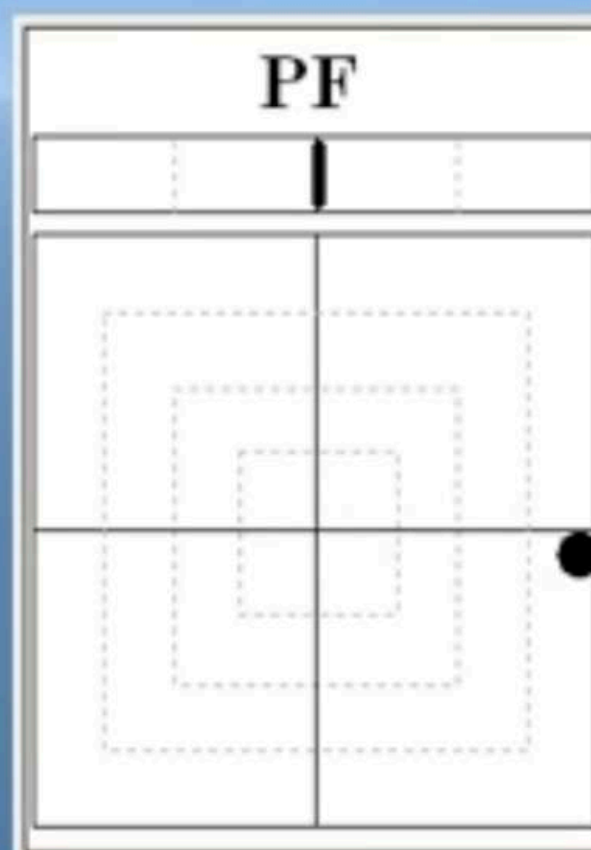
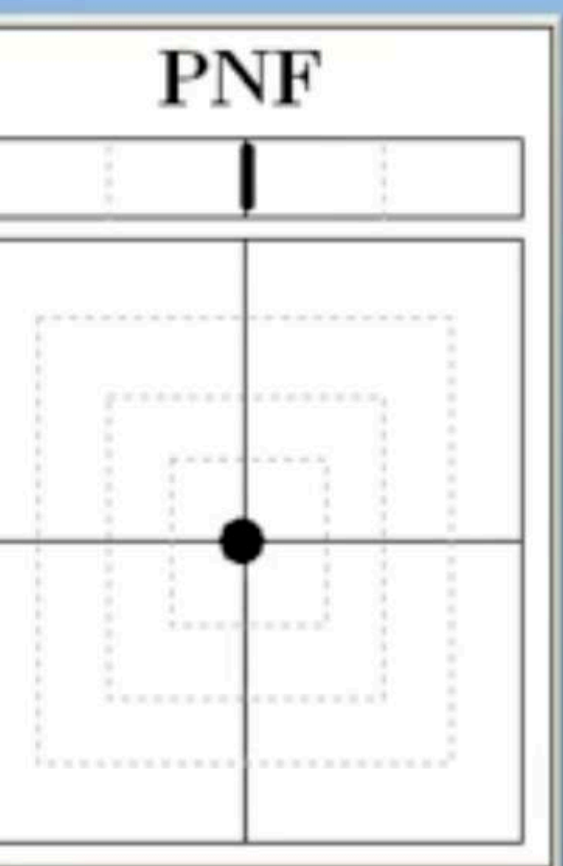
AUTO FLT AP OFF
ENG THRUST LOCKED
-THR LEVERS.....MOVE

AUTO FLT A/THR OFF
-THR LEVERS.....MOVE

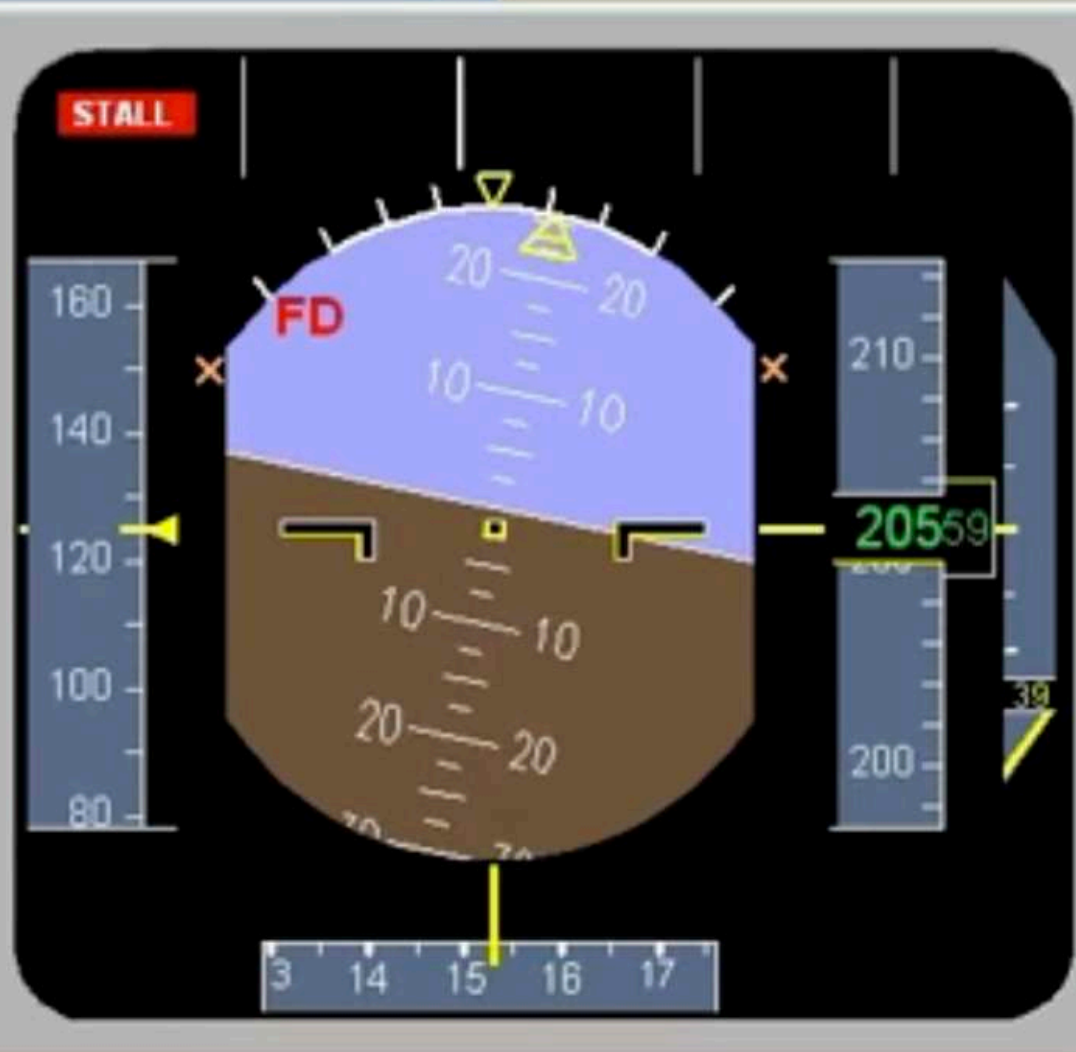
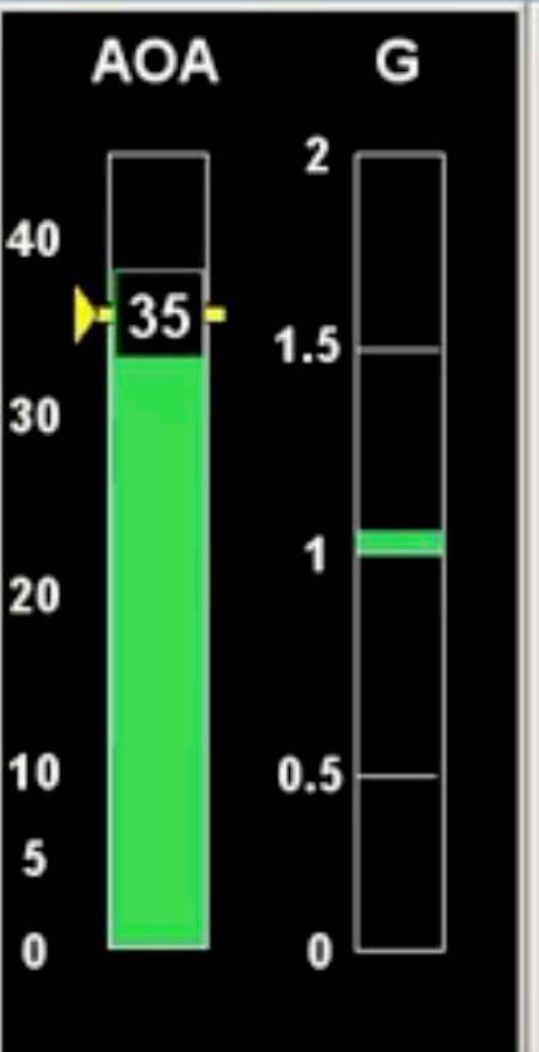
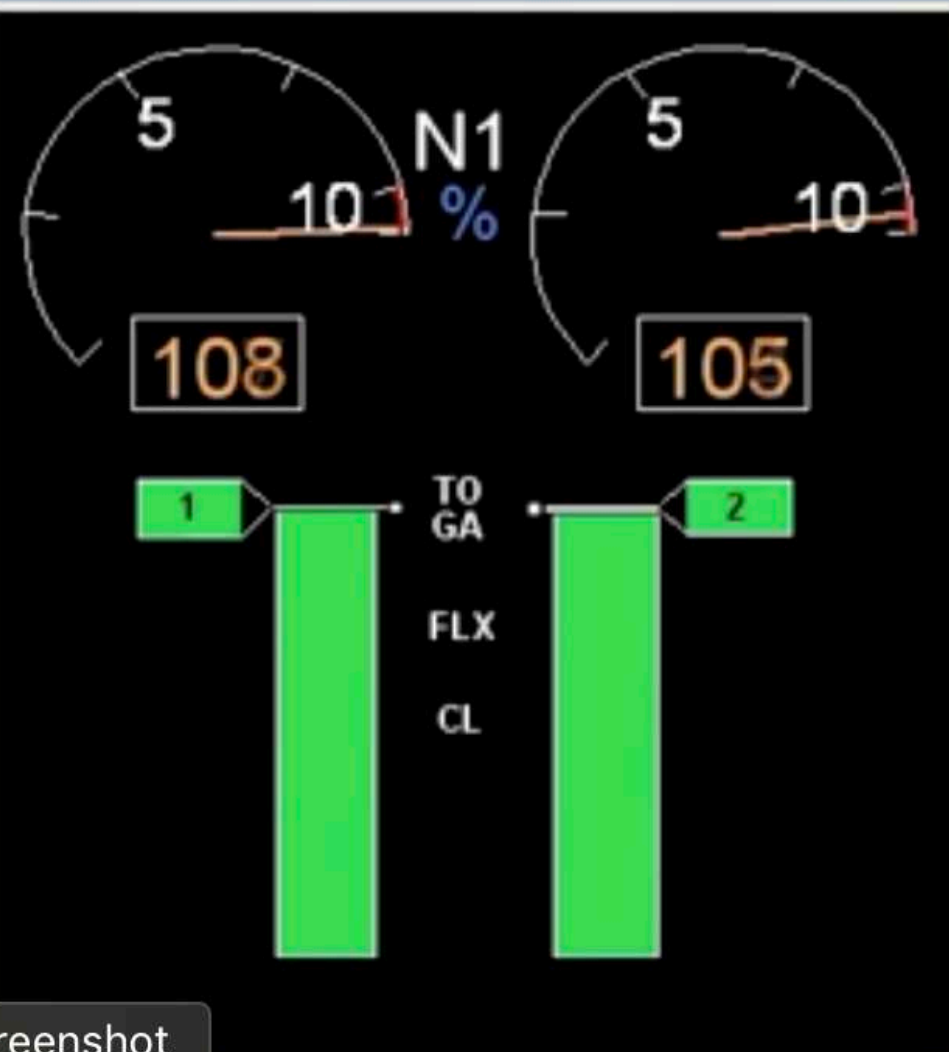
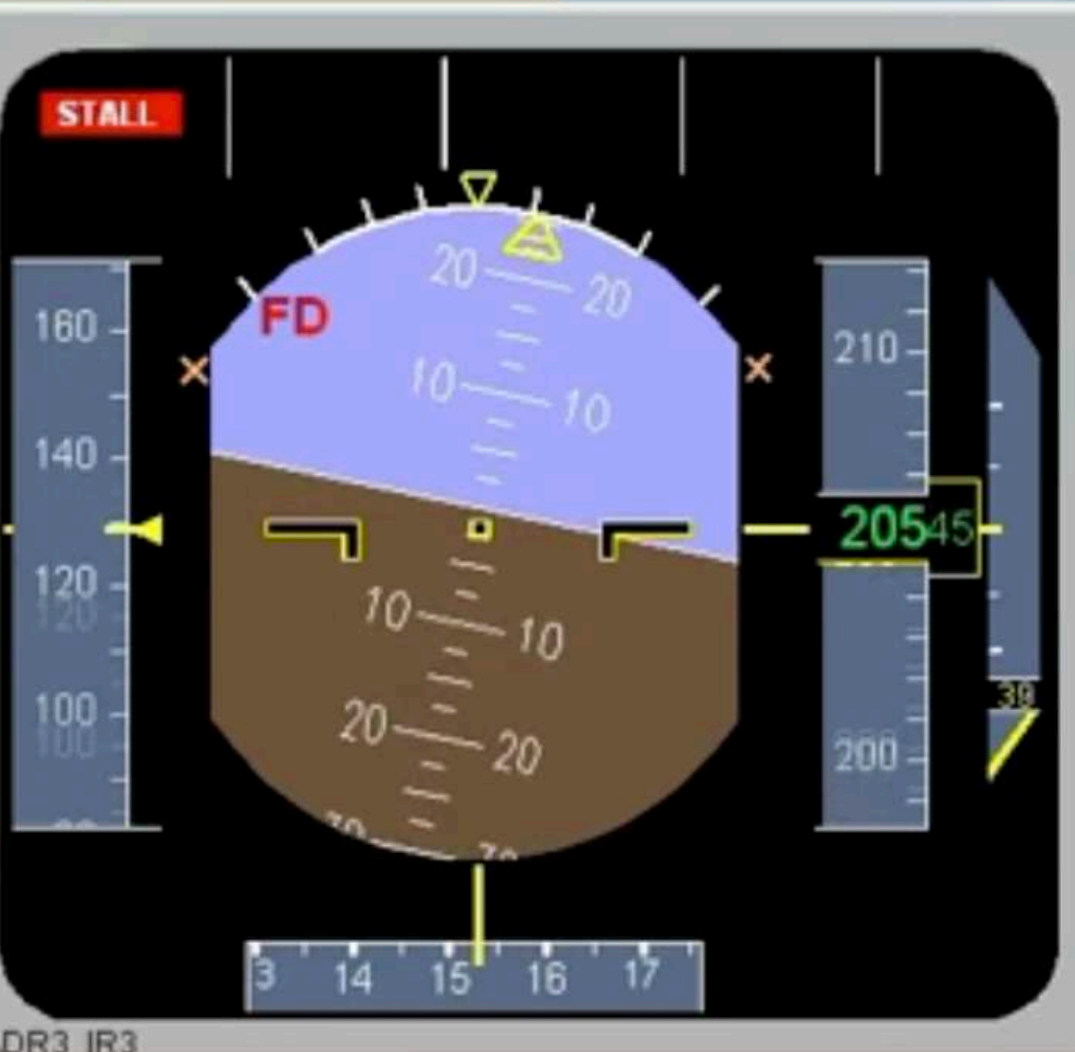
F/CTL ALTN LAW
(PROT LOST)



Temps : 02h 12mn 42s 100



On est quoi là en alti on a quoi ?



AF447

- Positive longitudinal static stability provides a sensory return (via the position of the stick) in terms of speed in relation trim at constant thrust
- **Approach to stall classically associated with nose-up input**
- Not always the case on FBW a/c (e.g. alternate law)
- When thrust is insufficient, airplane can stall without any inputs on the stick



Civil Aviation Authority

SAFETY NOTICE

Number: SN-2019/005



Issued: 01 July 2019

Avoidance of Loss of Control In-Flight – Flight Crew Training

Pilot awareness of aircraft trim state, intervention strategies and techniques, during both automated and manual flight



Position Paper

LOC-I and Aircraft Trim Systems

Mar 11, 2019

Abstract

Loss of Control In-flight (LOC-I) are accidents or incidents in which the control of the aircraft in flight is lost, resulting in major deviations from the intended flight path. In the past decade, LOC-I airplane accidents have overtaken Controlled Flight into Terrain-related (CFIT) accidents as the first contributor to fatalities in commercial aviation. This Position Paper focuses on LOC-I due to trim-related issues and ways to mitigate these risks.

[DOWNLOAD \(159 KB\)](#)

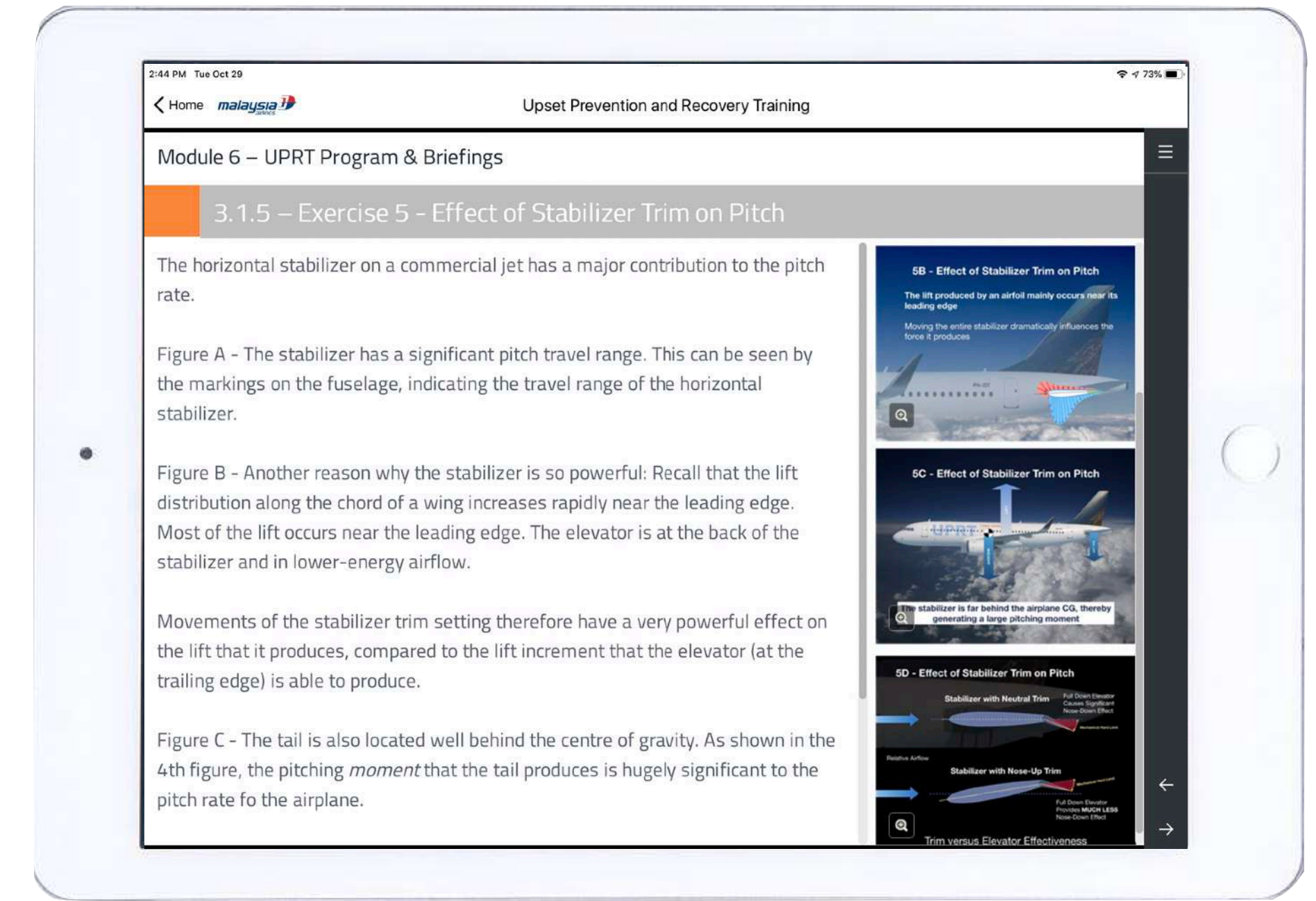
ICAO 10011 - Manual on Aeroplane UPRT

- Trim-related training to include:
 - Manual skills, in non-normal laws when manual trimming required
 - Stalls or Upset recovery from partial or full out-of-trim conditions on different axis. (i.e. "trimmed stalls") in order to mitigate startle
 - Awareness of out-of-trim condition upon autopilot disconnect



Training Examples

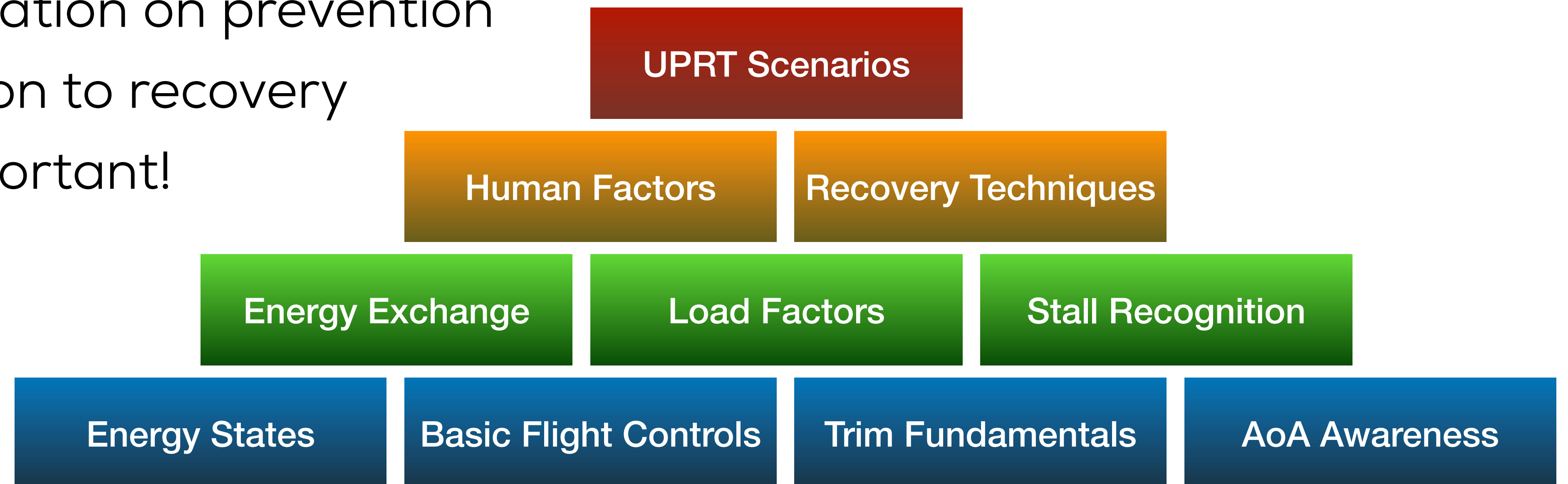
- Academics
 - How does trim work?
 - Basic concepts
 - Mach effects on trim
- Skill-based training (in building blocks)
 - Stabilizer versus elevator control authority
 - SOP's for trim runaway
 - Stall events and effect of trim



UPRT building-block approach

Back to basics

- Build up the training - very basics first
- Type-specific exercises (≈ 55)
- A solid foundation on prevention
- Equal devotion to recovery
- Both are important!



Success stories

- Modular programs
- **Priority-driven training**
- Type-specific exercises, simulator-specific execution
- Start with thorough understanding of the aircraft, flight displays, information presentation
- Draw attention to the key variables:
 - When an upset occurs, mind focuses on these
 - How to utilize information properly
- Use the simulator to demonstrate concepts
- Instructor can often demonstrate; student observes

Final Delivery

- Use the ingredients properly (comprehensive program)
- Nutrition, taste (development of competencies)
- Avoid food poisoning (negative training/transfer)



| First day, 10 November 2021 | | |
|--|---|-------------------|
| 14h00-14h10 | Opening address | Regional Director |
| 14h10-14h15 | Introduction to the Workshop | ICAO-PIM |
| 1 - UPRT in academic and simulator training during the pandemic | | Jeffery/Sunjoo |
| 14h15-15h55 | 1.1 Competency fade during the pandemic | Sunjoo |
| 15h55-16h35 | 1.2 Exemptions/Deviations granted and their impact | Jeff/Sunjoo |
| 16h35-16h45 | Break | |
| 16h45-17h25 | 1.3 Experience in conducting training during the pandemic | Jeff/Sunjoo |
| 2 - UPRT delivery using available resources, including unmodified simulators, and recognition/awareness as minimum training | | Sunjoo/Jeffery |
| 17h25-18h05 | 2.1 Training programs for prevention & recovery | Sunjoo |
| 18H05-18h25 | 2.2 Rwandair experience-Training Programme and SMS | Capt Kojo |
| 18h25 | Closure for the first day | |

| Second day, 11 November 2021 | | |
|--|--|-------------------|
| 2 - UPRT delivery using available resources, including unmodified simulators, and recognition/awareness as minimum training | | Sunjoo/Jeffery |
| 14h00-14h40 | 2.3 Advert practices on prevention and recovery | Jeff/Sunjoo |
| 14h40-15h20 | 2.4 Instructor training and instructor standardization | Sunjoo |
| 3 - Global Status of UPRT and lessons learned | | |
| 15h20-16h20 | 3.1 Issues arising during the past year | Jeff |
| 16h20-16h30 | Break | |
| 4 - Review of accident reports, risks factors and tools | | |
| 16h30-17h00 | 4.1 UPRT preliminary thoughts on Sriwijaya Air Flight 182 accident | Jeffery/Sunjoo |
| 17h00-17h30 | 4.2 UPRT in RPAS: early Considerations | Jeffery/Sunjoo |
| 17h30-17h50 | 4.3 IATA-Fight Data Analysis and LOC-I | Blessing Kawai |
| 17h50-18h15 | 4.4 KCAA- Inflight incapacitation in the era of COVID-19 | Dr. Ilako |
| 18h15-18h30 | 4.5 Updates on RASG-AFI Guidance and reporting tools Wrap-up | ICAO-PIM |
| 18h30 | Closure of the Workshop | Regional Director |

Take-Away Message

- UPRT will focus on **Prevention**
- Manage and reduce **Angle of Attack** first
- Understand **capabilities and limits** of simulator
- UPRT is about **TRAINING**, not checking – it's an opportunity to learn!

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