We aren’t along for the ride!

Captain John Steinnes, Boeing 737 Chief Technical Pilot

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UPRT – Prevention or Recovery?

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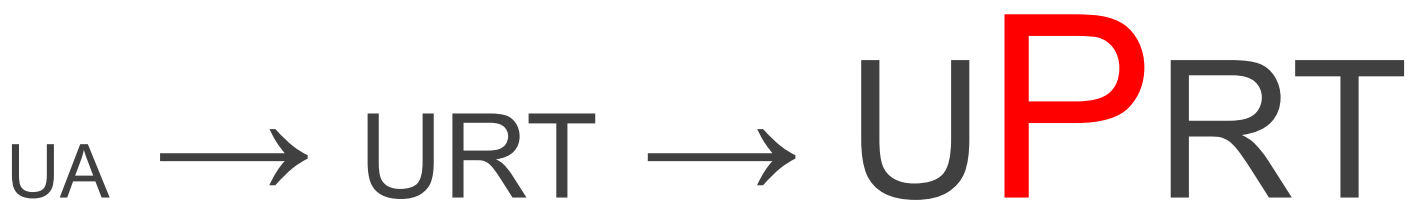
Loss of Control-Inflight Countermeasures



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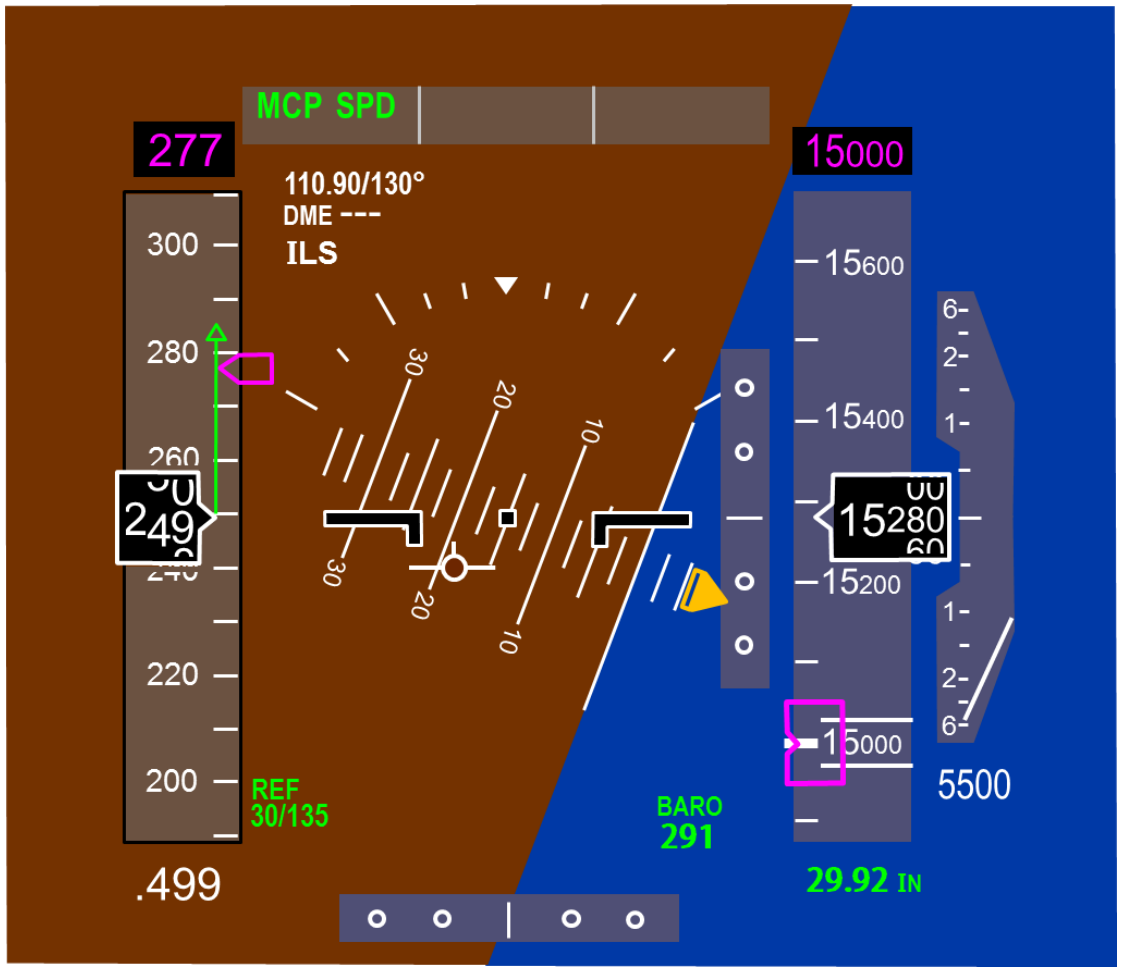
Unusual Attitude Definition

- Nose high pitch > 25 Degrees
- Nose low pitch < -10 Degrees
- Bank angle > 45 Degrees
- Airspeed inappropriate for phase of flight
- Or an *Undesired Aircraft State*



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FAA Part 121 Requirements

All part 121 air carriers, including those who train under an Advanced Qualification Program (AQP), are required to conduct UPRT beginning March 12, 2019. The requirement for part 121 pilots to receive upset training is statutorily mandated in Public Law 111-216, Section 208 and the FAA does not have the authority to exempt any part 121 air carrier from this requirement. Air carriers must include UPRT [and stall event training] for pilots during:

- Initial training
- Transition training
- Differences and related aircraft differences training (if differences exist)
- Upgrade training
- Requalification training (if applicable) and
- Recurrent training

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FAA Part 121.423 Pilot: Extended Envelope Training

a) Each certificate holder must include in its approved training program, the extended envelope training set forth in this section with *respect to each airplane type for each pilot.* The extended envelope training required by this section must be performed in a Level C or higher full flight simulator, approved by the Administrator in accordance with § 121.407 of this part.

b) Extended envelope training must include the following maneuvers and procedures:

(1) Manually controlled slow flight;
(2) Manually controlled loss of reliable airspeed;
(3) Manually controlled instrument departure and arrival;
(4) Upset recovery maneuvers; and
(5) Recovery from bounced landing.

a) Extended envelope training must include *instructor-guided hands on experience* of recovery from full stall and stick pusher activation, if equipped.

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Our Goal – To Meet and Exceed all Global Standards

- FAA
  - 14 CFR Part 121.423-Pilot: Extended Envelope Training
  - 14 CFR Part 60 FTSD Evaluation and Qualification for Extended Envelope Training
  - AC 120-109A Stall Prevention and Recovery Training
  - AC 120-111 Upset Prevention and Recovery Training
  - AC 120-123 Flight Path Management
- EASA
  - Opinion No 06/2017 Loss of Control and Recovery Training
  - EASA NPA 2017-13 Flight Simulation Training Device Requirements
- CASA Consultation Draft: Guidance on Upset Prevention and Recovery Training
- ICAO Document 10011: Manual on Aeroplane UPRT
- IATA Loss of Control In-Flight (LOC-I) Prevention
- ICATEE International Committee for Aviation Training in Extended Envelopes (Royal Aeronautical Society)
- AUPRTA (Rev 2 & 3) Airplane Upset Prevention & Recovery Training Aid

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AC 120-111 Upset Prevention and Recovery Training

- *Enhanced instructor training* on the limitations of simulation
- Comprehensive pilot academic training on *aerodynamics*
- *Early recognition* of divergence from intended flight path
- Upset prevention through improvements in *manual handling skills*
- Training that integrates *Crew Resource Management (CRM)* including progressive intervention strategies for the pilot monitoring

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AC 120-109A Stall Prevention and Recovery Training

- *Reducing Angle of Attack (AOA) is the most important pilot action* in recovering from an impending or full stall.
- Pilot training should emphasize teaching the *same recovery technique* for impending stalls and full stalls.
- Evaluation criteria for a recovery from an impending stall *should not include a predetermined value for altitude loss.* Instead, criteria should consider the multitude of external and internal variables that affect the recovery altitude.
- Once the stall recovery procedure is mastered by maneuver-based training, stall prevention training should include *realistic scenarios* that could be encountered in operational conditions, including impending stalls with the autopilot engaged at high altitudes.
- *Full stall training* is an instructor-guided, hands-on experience of applying the stall recovery procedure and will allow the pilot to experience the associated flight dynamics from stall onset through the recovery. (e.g., increased buffet, reduced stability and control, and roll off)

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AC 120-123 Flight Path Management

- Flight Path Management is the planning, execution, and assurance of the guidance and control of aircraft trajectory and energy, in flight or on the ground.
- Ensuring that the aircraft is on a safe and correct flightpath is the highest priority of all pilots on the flightcrew.
- Each pilot is responsible for:
    - Being fully aware of the current and desired flightpath of the aircraft, and
    - Being fully capable of manually flying the aircraft to achieve the desired flightpath.
- The following chapters include guidance:

    Chapter 3, Manual Flight Operations.

    Chapter 4, Managing Automated Systems.

    Chapter 5, Pilot Monitoring (§ 121.544) (including attention management).

    Chapter 6, Energy Management.

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Our Philosophy

- Design a UPRT/EET training program that meets or exceeds global standards.
- Emphasize Crew Resource Management and Threat/Error Management skills.
- Reinforce role of the Monitoring Pilot(s) and Flight Path Management.
- Improve Manual Flying Skills and effective use of Automation.
- Support simulator stall models with actual aircraft data.
- Mitigate negative transfer risk with realistic scenarios and effective instruction.
- Require rigorous instructor training and standardization.
- Use portable tablet for UPRT/EET scenario activation and to provide student feedback.
- Use data and instructor/customer feedback for continuous improvement.

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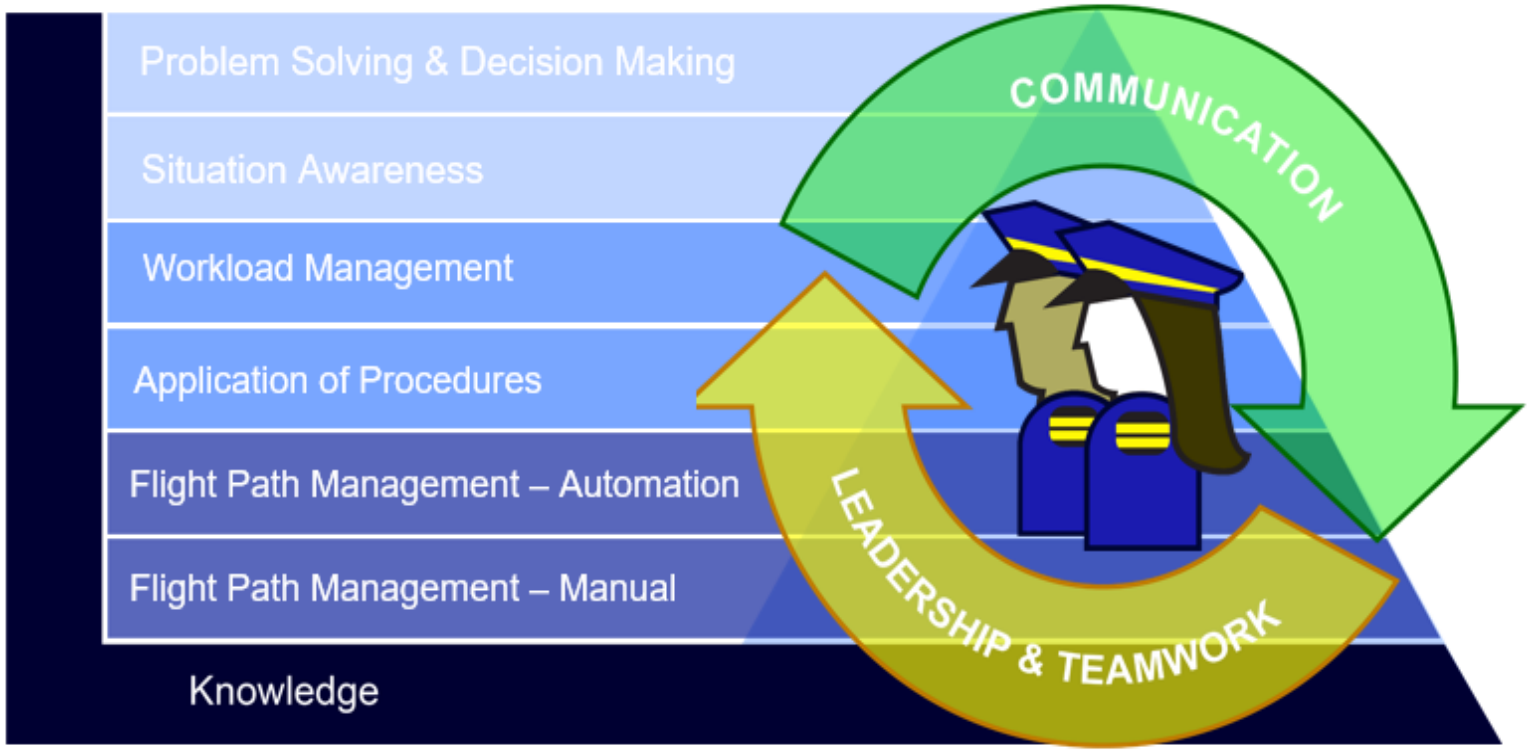
Competency Based Training-Assessment (CBTA)



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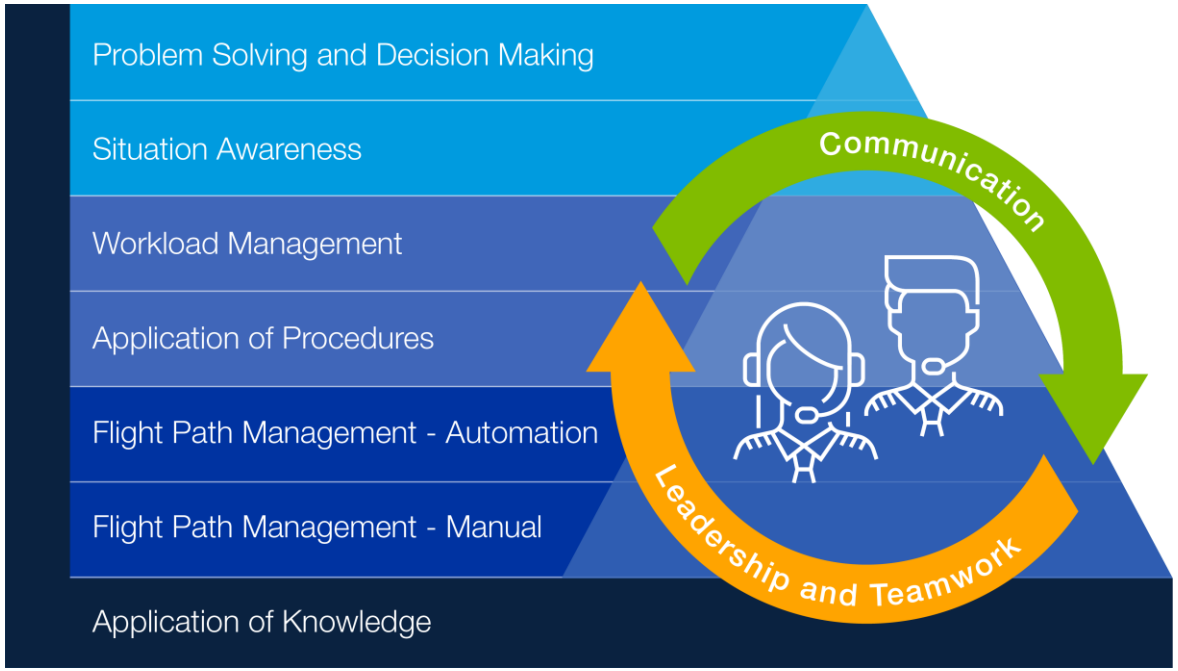
Competency Frameworks

- Pilot Competencies



Instructor Competencies

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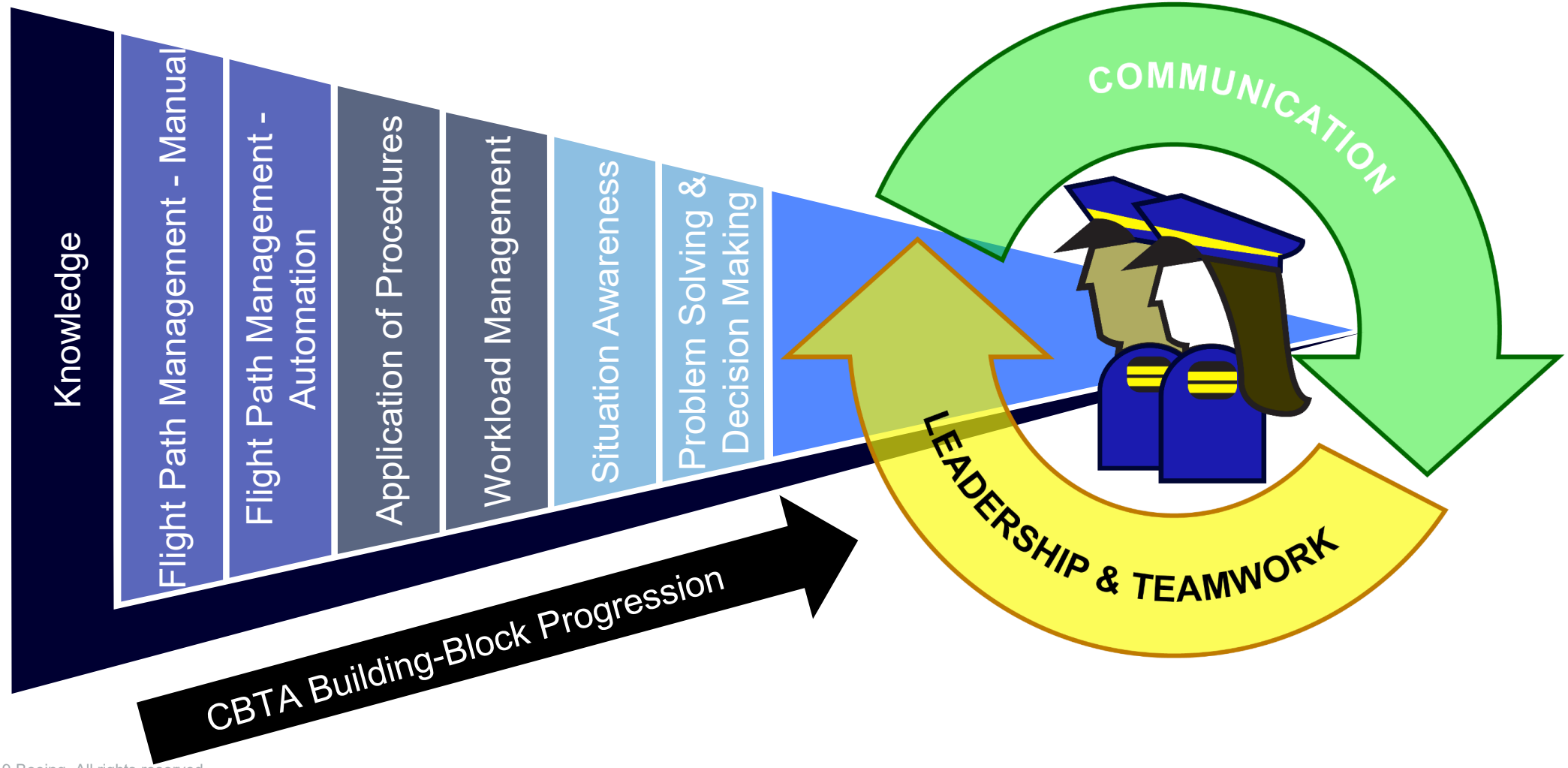
Building Block Approach



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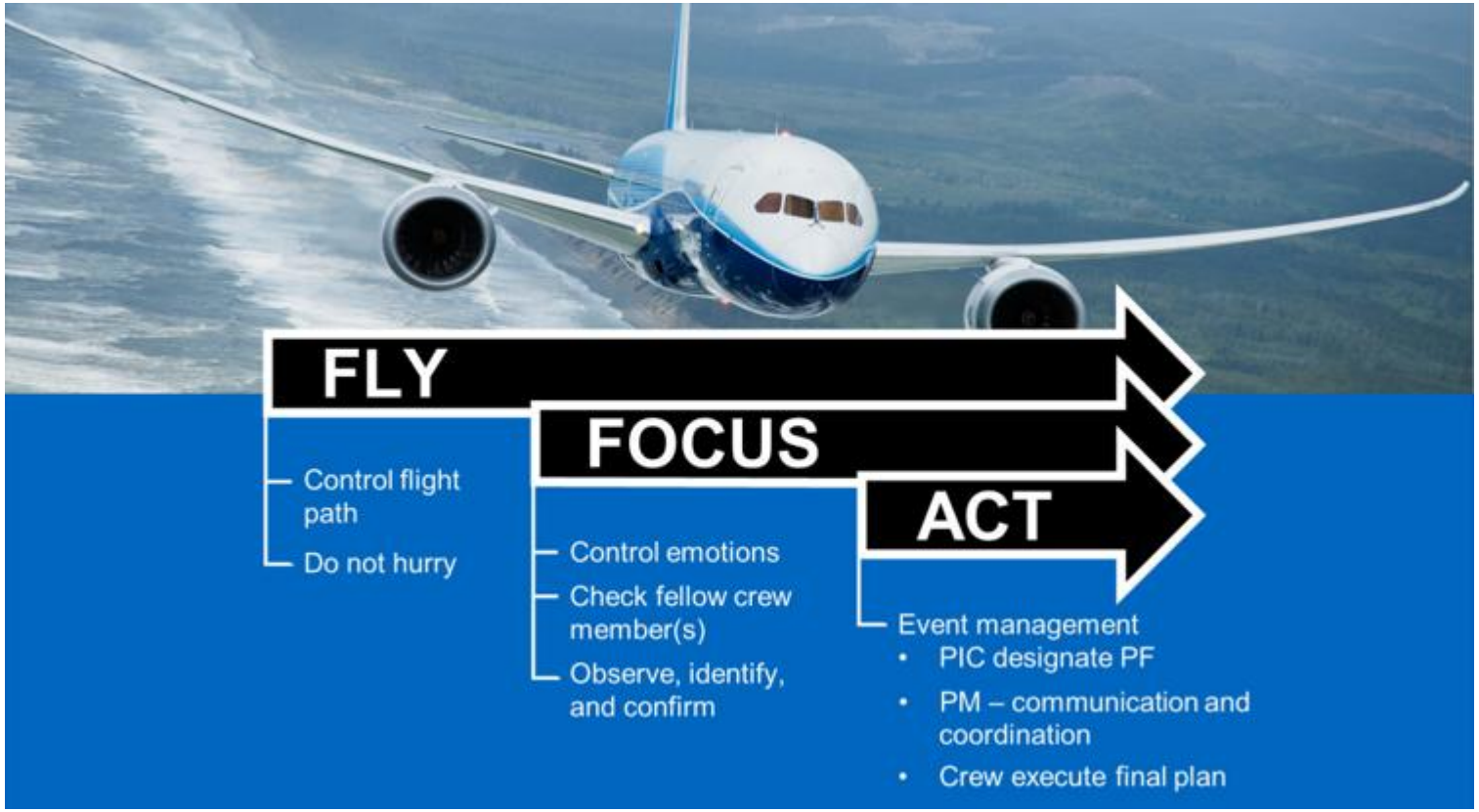
Mnemonic for Priorities



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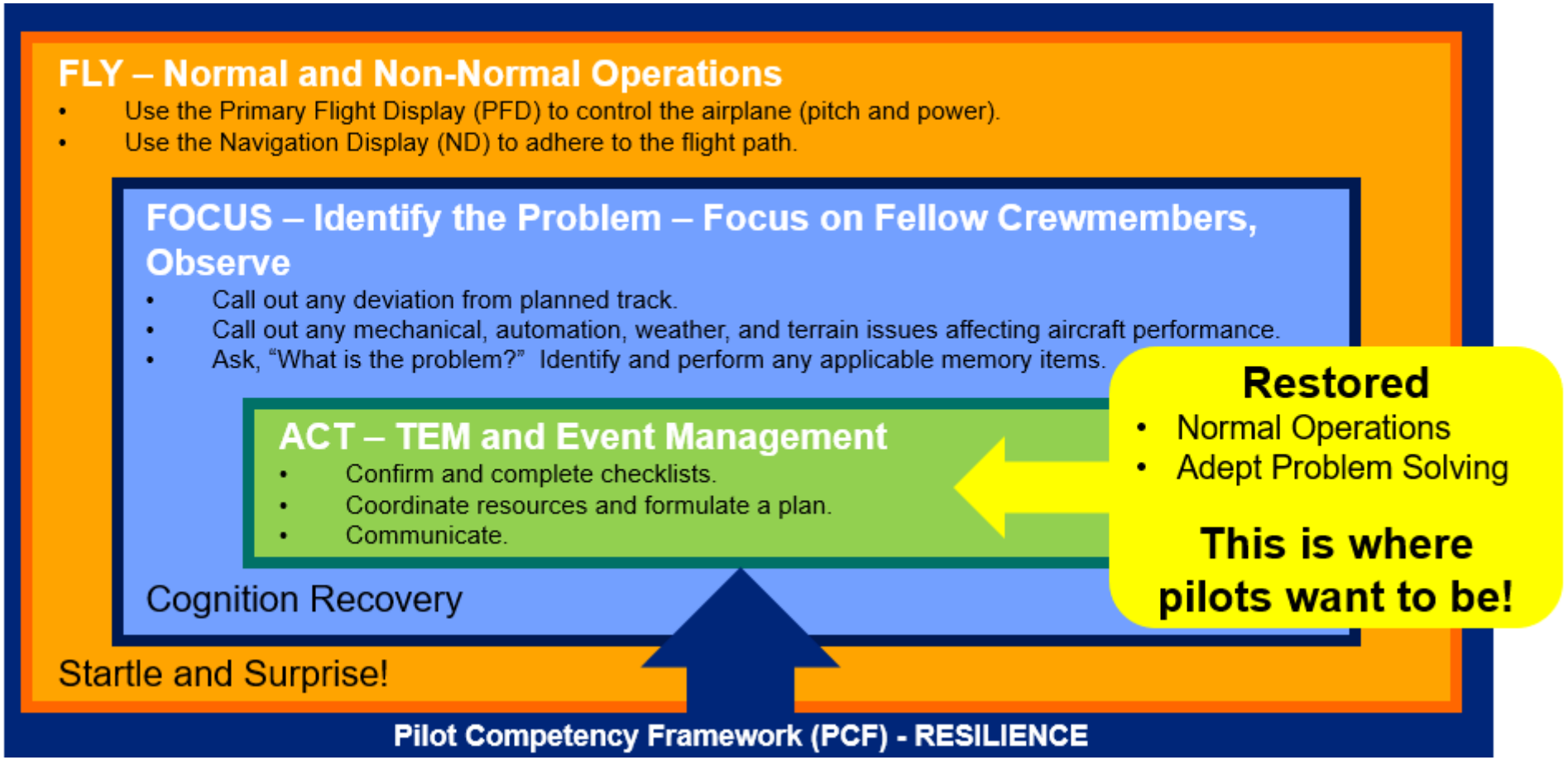
FLY ➡ Focus ➡ ACT



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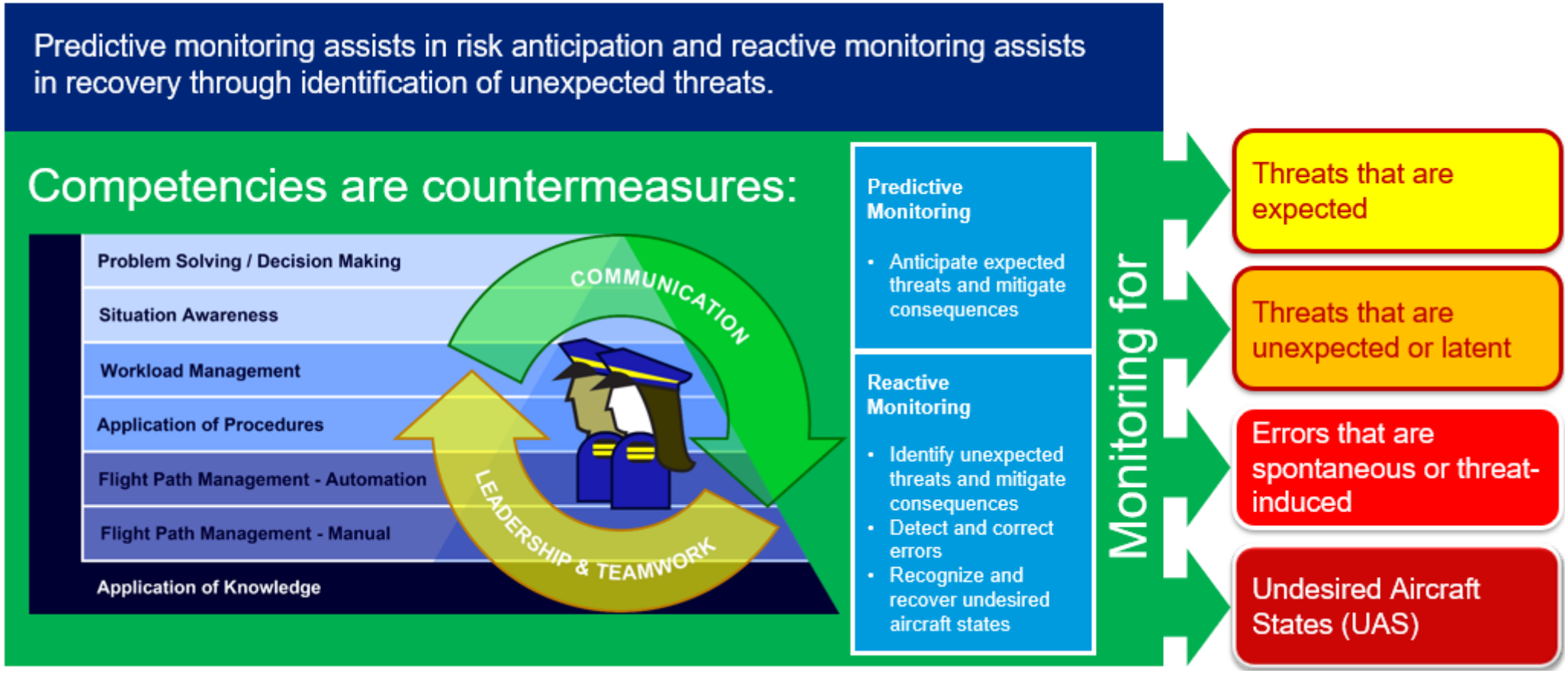
Threat and Error Management



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Threat and Error Management - Mitigation

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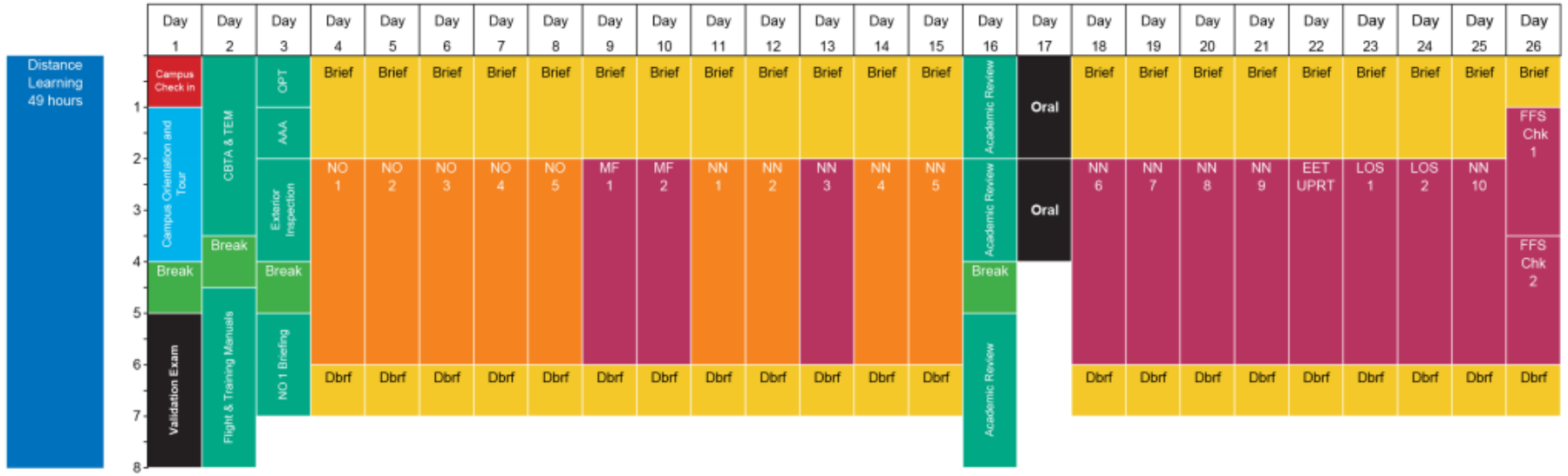
737 MAX FAA Type Rating Footprint (CBT-A)



Color Legend
Computer-Based
Tour
Classroom
Break
FTD
FFS
Brief/Debrief
Exam

Code	Meaning
CBTA	Competency-Based Training and Assessment
TEM	Threat and Error Management
OPT	Onboard Performance Tool
AAA	Airplane Airworthiness Assessment
NO	Normal Operations
MF	Manual Flight
NN	Non-Normal Operations
EET/UPRT	Extended Envelope Training / Upset Prevention and Recovery Training
LOS	Line-Oriented Scenarios

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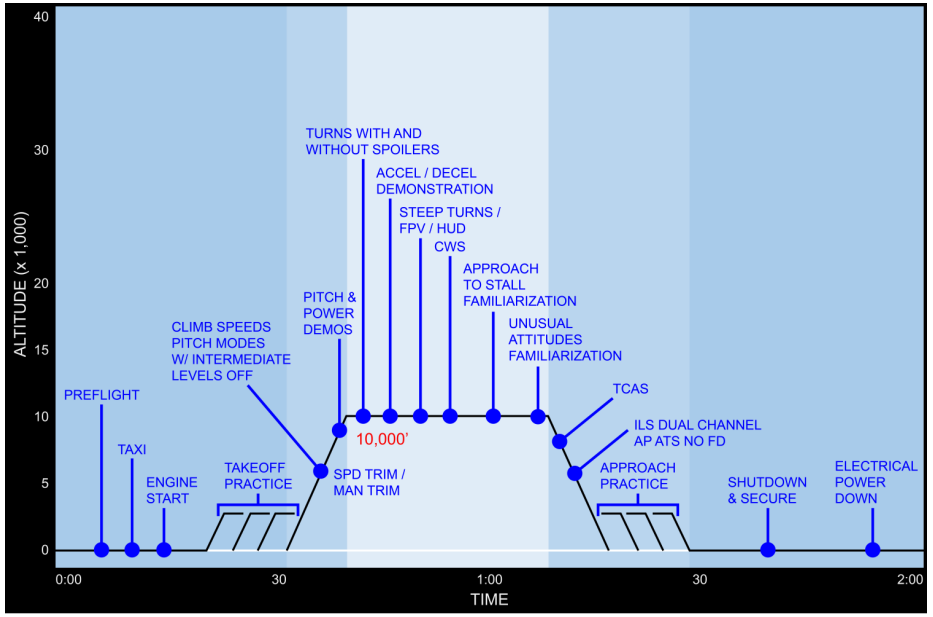
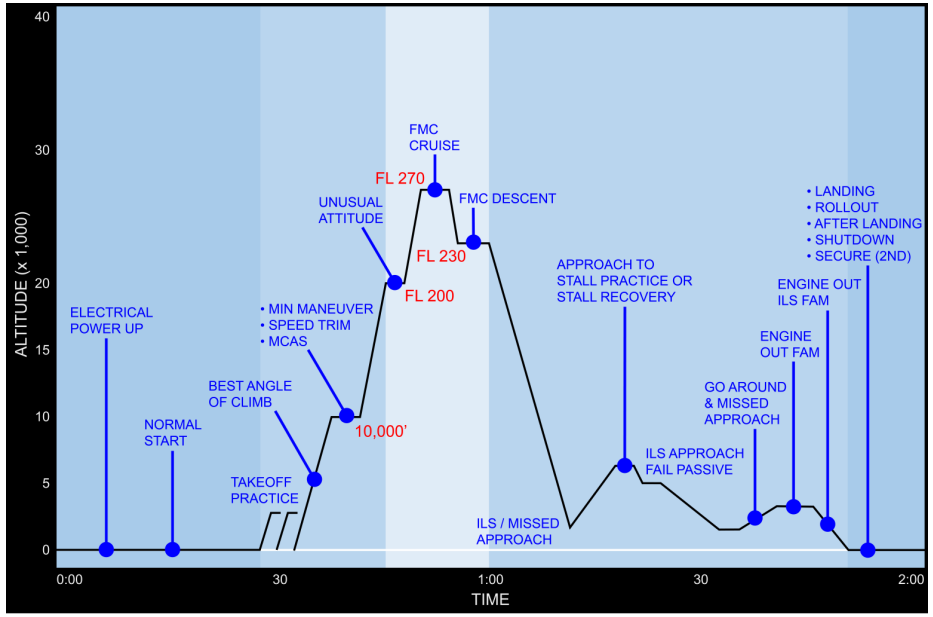
Flight Path Management - Manual



KSEA (Day) KSEA (Day)



KDFW (Day) KIAH (Day)

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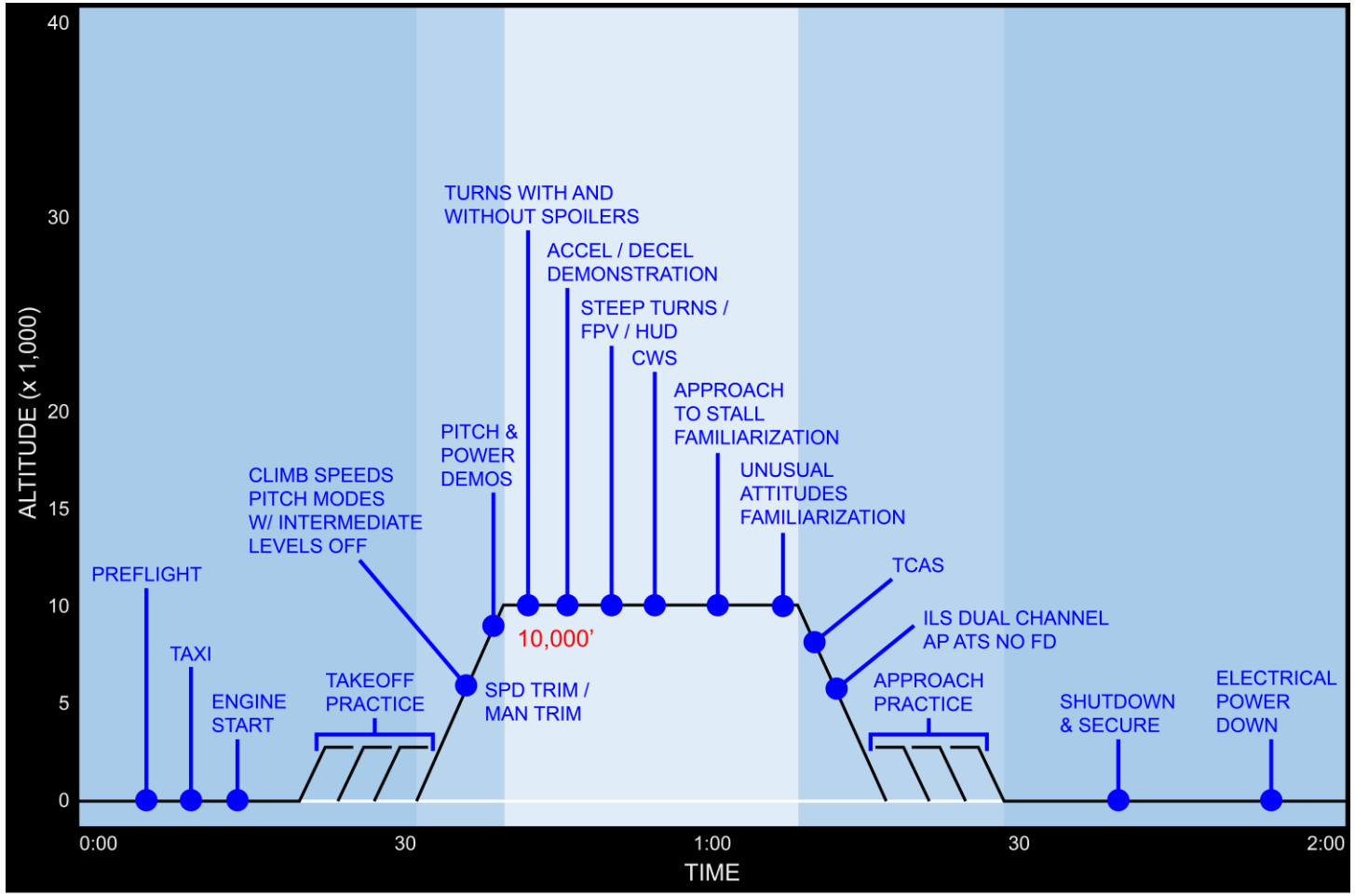
Flight Path Management – Manual FFS Session 1



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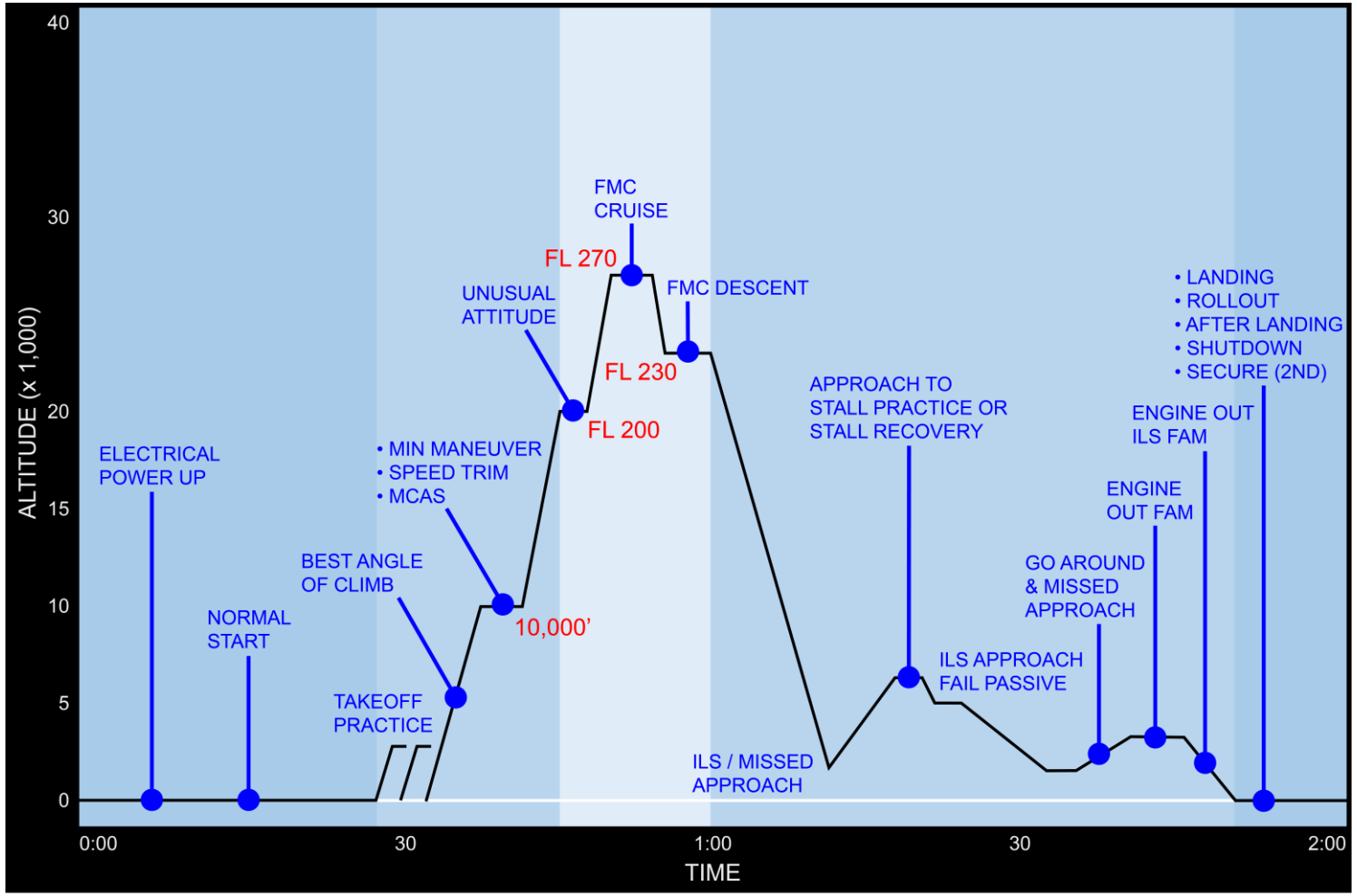
Flight Path Management – Manual FFS Session 2



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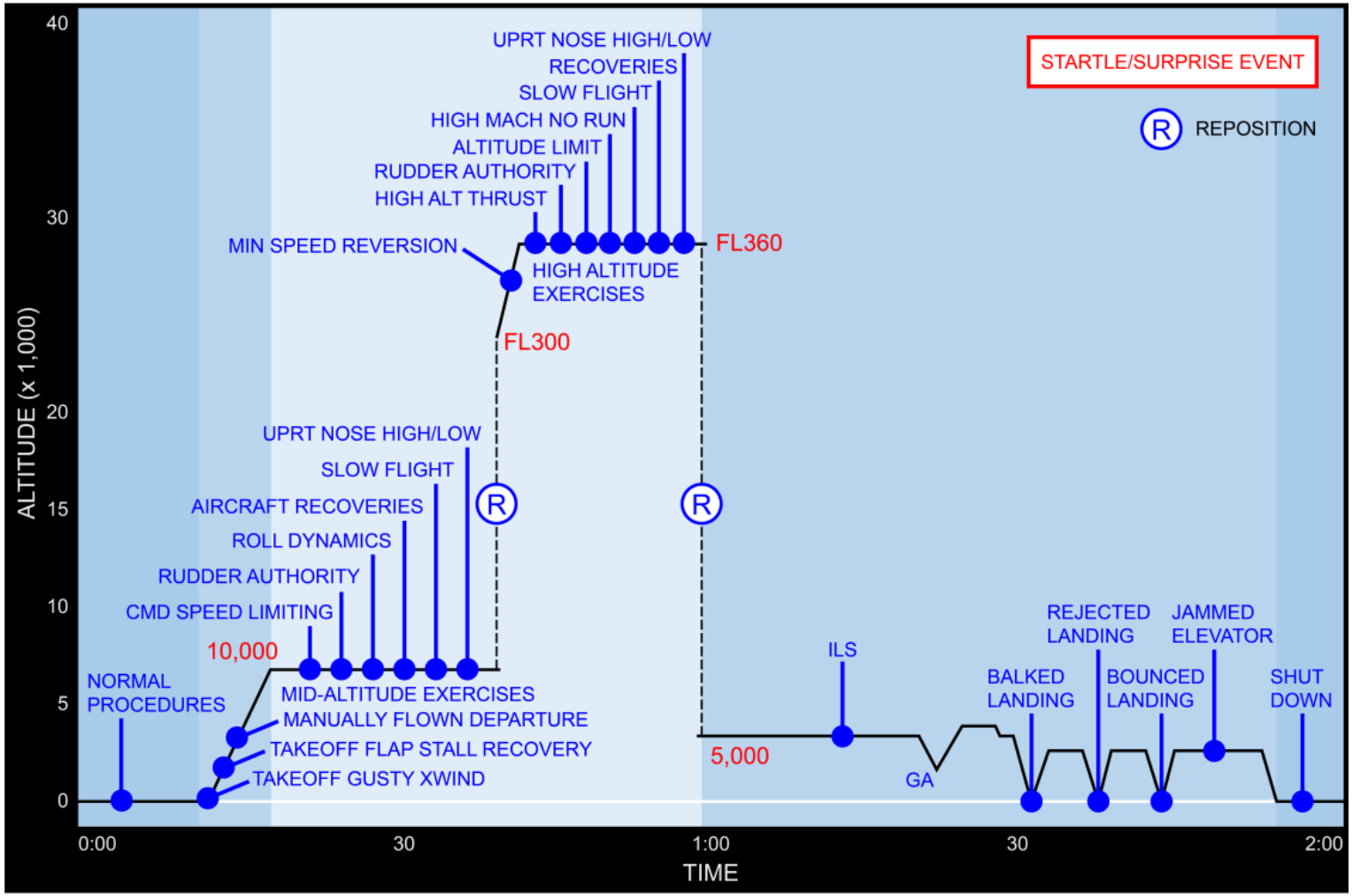
737 MAX Type Rating UPRT Lesson Profile

Day 21	Day 22	Day 23	Day 24
Brief	Brief	Brief	Brief
NN 9	EET UPRT	LOS 1	LOS 2
Dbrf	Dbrf	Dbrf	Dbrf



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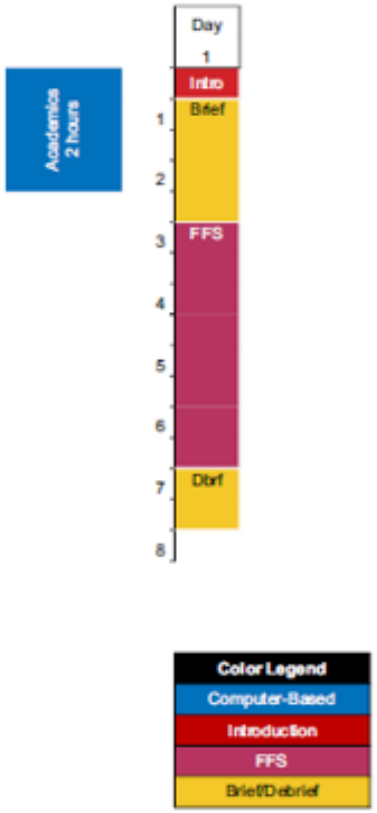
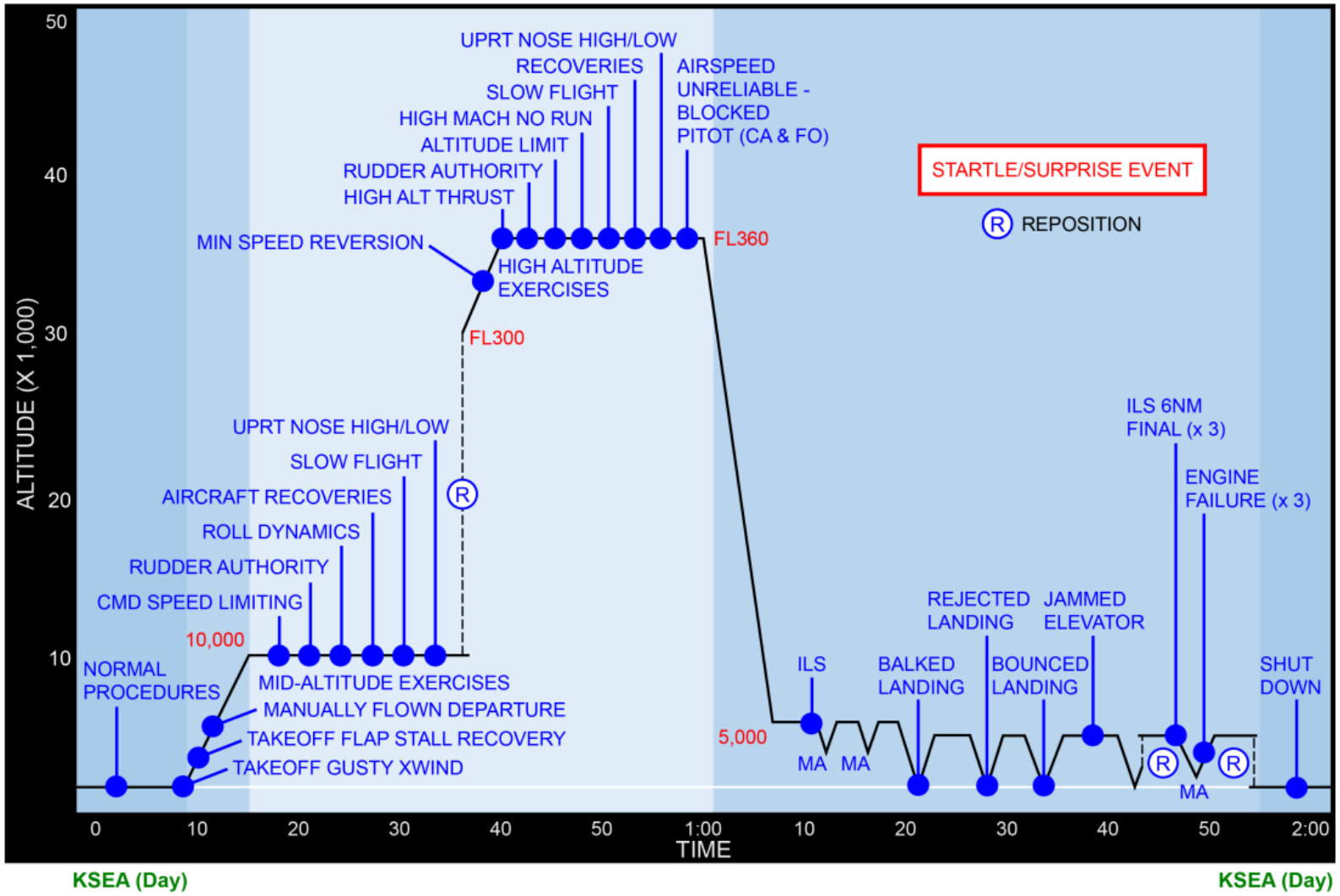
737NG/MAX UPRT Lesson Profile





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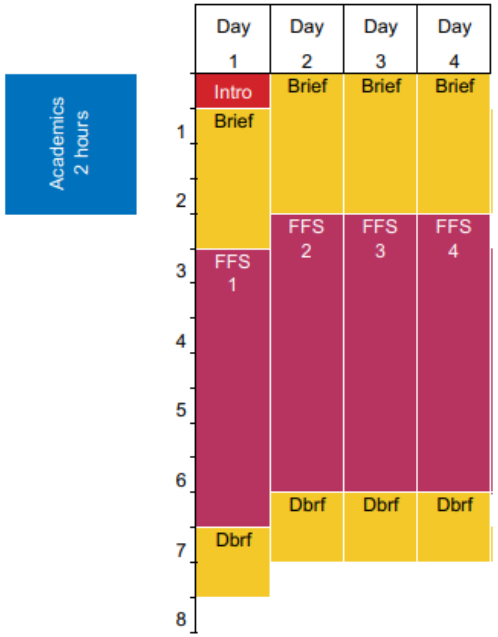
Boeing UPRT Instructor Training Course



Notes:

- 3 instructor candidates require 4 FFS training sessions
- 2 instructor candidates require 3 FFS training sessions
- 1 instructor candidate requires 2 FFS training sessions

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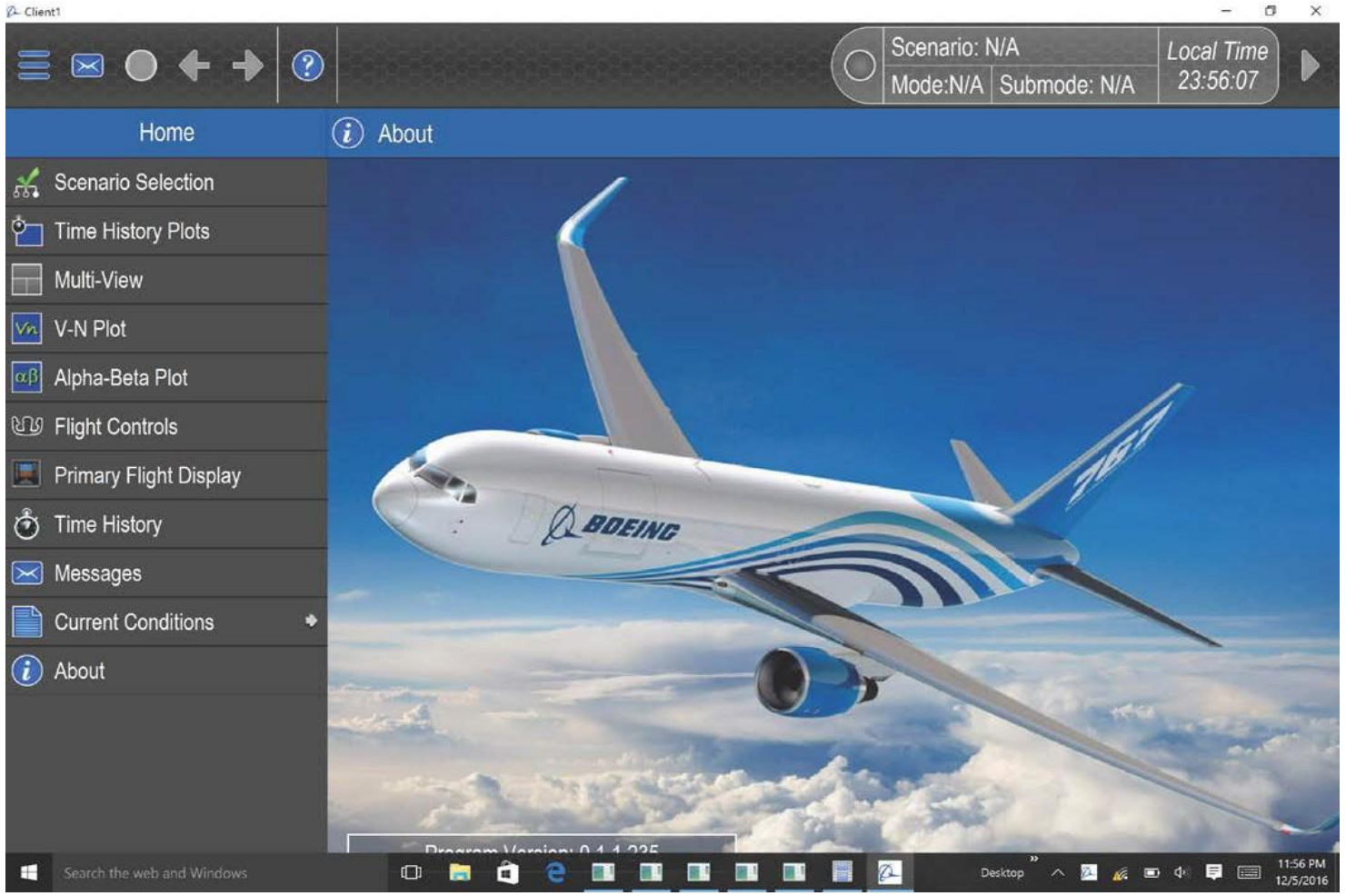
Boeing Instructor Tool



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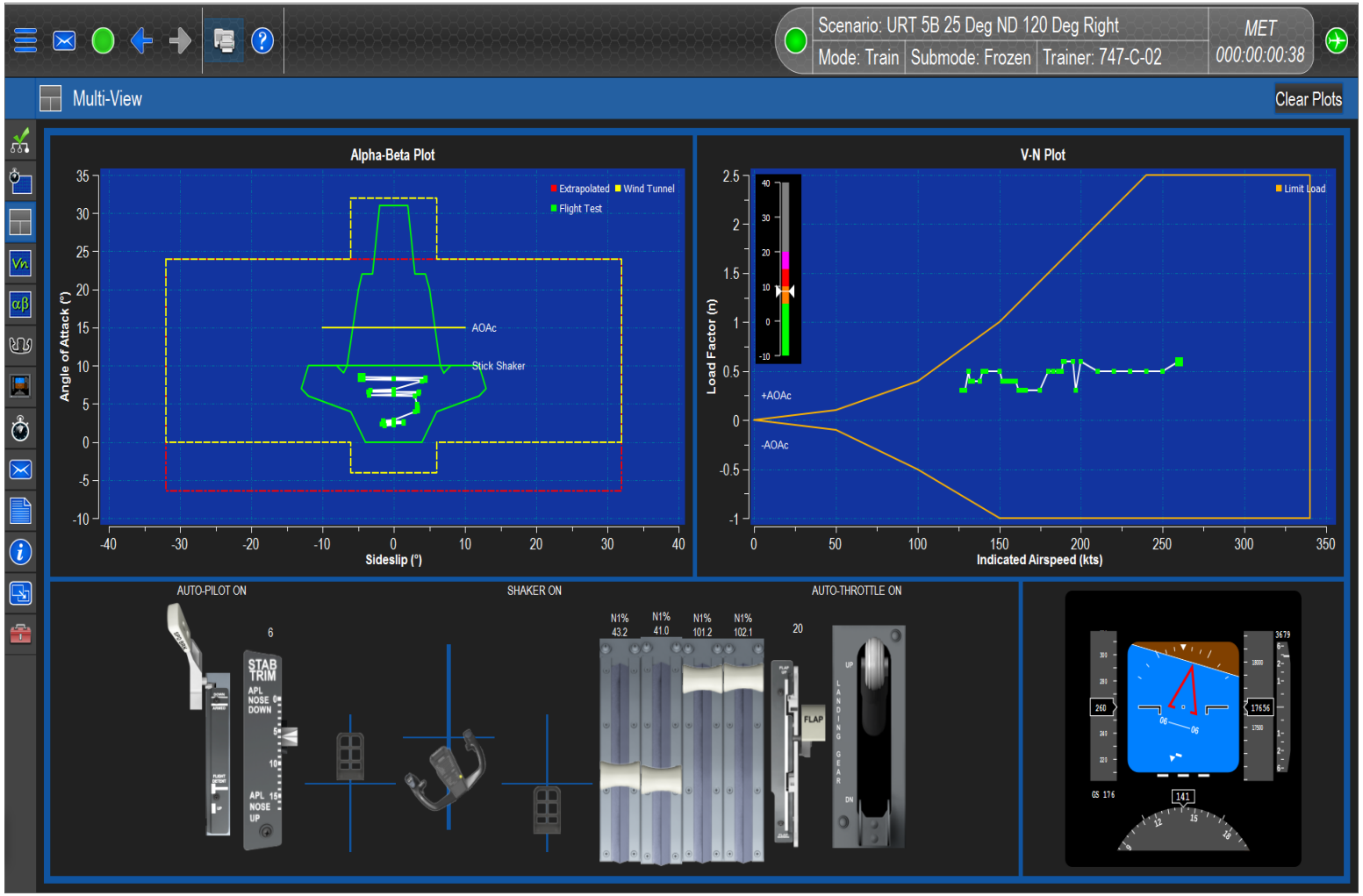
Instructor Operator Station Improvements

- Regulations require an instructor feedback mechanism
  - FSTD validation envelope
  - Flight control inputs
  - Aircraft operational limits

- Boeing has developed a tablet based solution
  - Cost effective (especially for older devices)
  - Provides instructors with an efficient and effective tool for feedback



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“UPRT – The Movie” is available on My Boeing Fleet

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Summary

- UPRT creates awareness
  - Stalls and upsets do occur
- Enhances flight training
  - Manual Flight Control Skills
  - Automation management
  - Pilot Monitoring Skills
- Prevention and Recognition
  - Flight Path Management
  - Crew Resource Management
  - Threat and Error Management
- Maneuver/Scenario Based Training
  - Increases crew competence
  - Improves confidence
  - Develops resilience

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Questions?

Thank You

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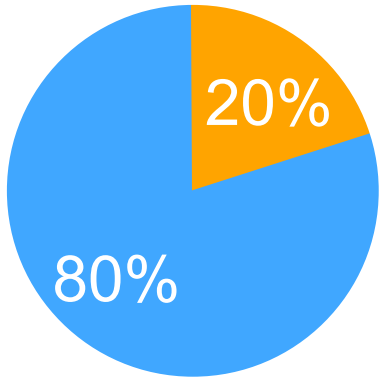
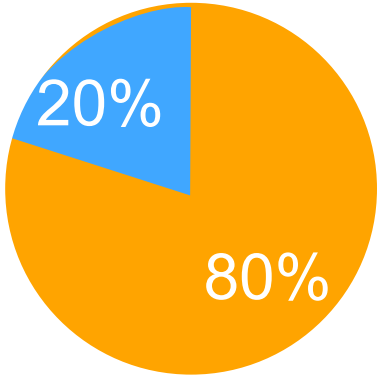
Aviation Accident Main Causes / Over 100+ Years



Early 1900s

Human Causes

Machine Causes



Recent Years

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