

UPRT

RASG Africa

Using Flight Simulators
for UPRT

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IDT
17-18 November 2020

Take-Away Message

- UPRT focus is **Prevention** of undesired aircraft states
- Manage **Angle of Attack, Energy, Startle**
- Focus on **awareness, recognition** and recovery
- Understand **capabilities and limits** of simulator
- Provide the **UPRT-trained instructor** with relevant information
- UPRT is about **TRAINING**, not checking - it's an opportunity to learn!



ICAO

UPRT in the FSTD



Spring 2009 Flight Simulation Conference

Flight Simulation: Towards the Edge
of the Envelope

Wednesday 3 – Thursday 4 June 2009

No.4 Hamilton Place, London W1J 7BQ, UK

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THALES

Outline

- Objectives of UPRT in FSTD's
 - practical skills (application of procedures/SOP's, hands-on manual flight)
 - integration of academic knowledge
 - utilisation of type-specific information in flight deck
- Requirements
 - training dictates the minimum level of fidelity of simulator
 - always remain within valid limitations of the flight model
- Limitations
 - FSTD is a representation of the aircraft (flight model, motion, visual)
- Challenges
 - training instructors on proper use
 - creating realistic scenarios (program design)

What is Upset Prevention & Recovery Training “UPRT”?

- EASA: *“A combination of theoretical knowledge and flying training with the aim of providing flight crew with the required competencies to both **prevent** and to **recover** from situations in which an aeroplane unintentionally exceeds the parameters for line operation or training (aeroplane upsets)”*
- Upsets can include aerodynamic stall, excessive attitudes, or other undesirable situations which contradict a pilot’s intended reaction of the aircraft

EASA guidance

“Upset recovery training exercises should be mainly manoeuvre-based but may include some scenario-based training elements.

The manoeuvre-based training enables type rating applicants to apply their handling skills and recovery strategy whilst leveraging CRM principles to return the aeroplane from an upset condition to a stabilised flight path.”

Awareness Exercises, Maneuvers, Scenarios

Awareness and Prevention Exercises

- develop understanding of aircraft characteristics, flight parameters & dynamics
- reinforce prevention knowledge and skills

Maneuver-Based Exercises

- develop correct techniques for stall & upset recoveries
- return aircraft to stabilised flight path
- practice proper technical and non-technical competencies

Scenario-Based Exercises

- practice on scenarios that could lead to upsets
- enhance prevention skills
- arrest divergence from intended flight path as early as possible

The pilot must understand and manage

Angle of Attack

Aircraft Energy

Startle

General FSTD Requirements

- FAA EET requires
 - Full aerodynamic stall
 - Engine/Airframe Icing
 - Bounced landing
 - Gusty crosswind landing
 - IOS feedback
- EASA UPRT requires
 - Approach-to-Stall
 - Engine/Airframe Icing
 - IOS feedback
- Both require that model is used in its valid envelope, and that the instructor is informed of this



Prevention Training & Recovery Training

- Major portion of UPRT footprint can be covered under prevention training
- By performing prevention training first, the likelihood of exceeding the normal validation envelope may be lowered
 - integration of academics with FSTD exercises
 - Much training can be started successfully within the current validated envelope of today's FSTD's
- Recovery training closes the loop on all concepts

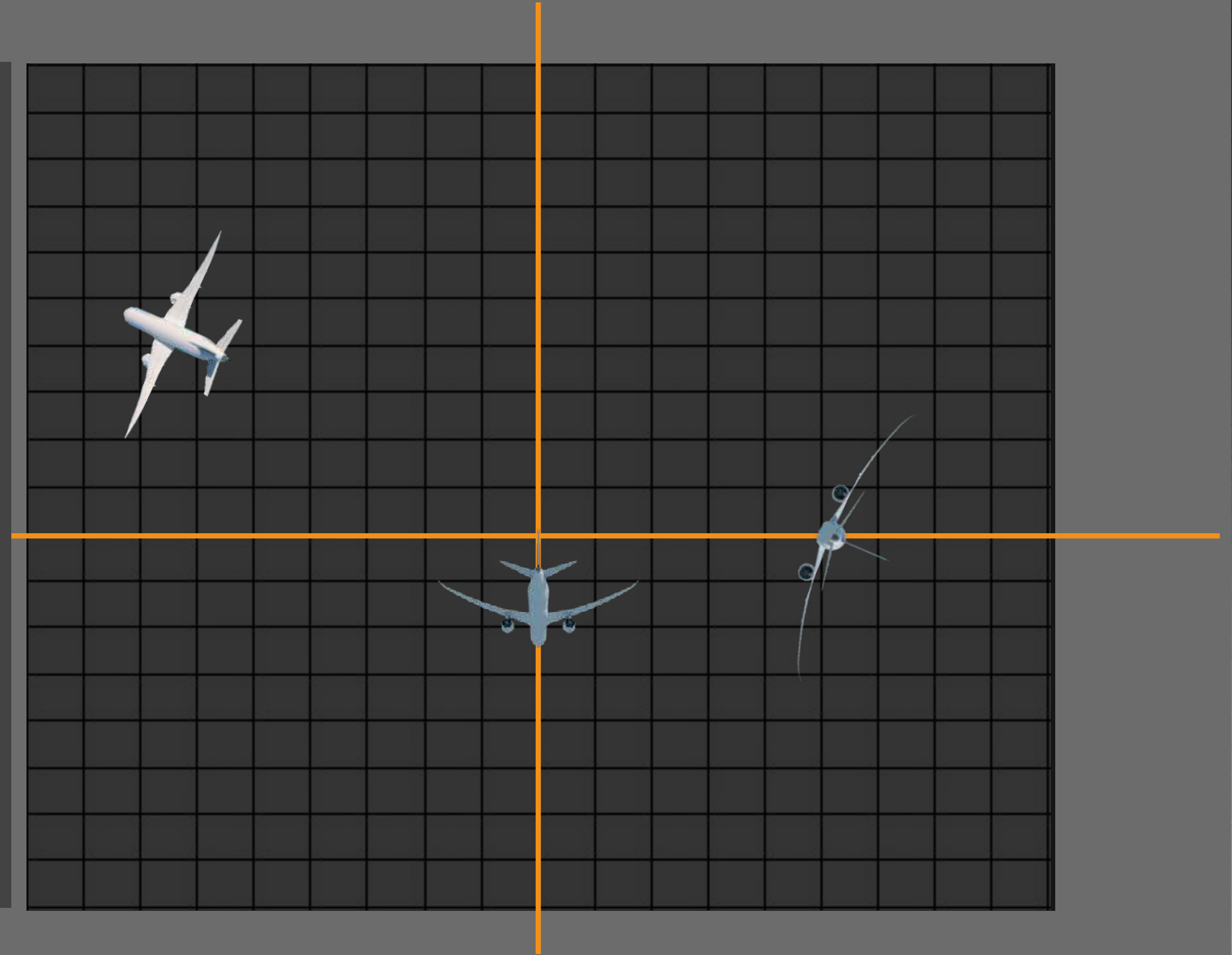
Methods of “Upset” Initiation

UPSET SCENARIO

Nose High / High Bank

Overbank Upset

Nose-Low Upset



What are we “missing” if we start here?

PREVENTION?

TEM?


CRM?

Competencies?

Airline Simulator Training - Method of Conduct

- UPRT is a learning opportunity
 - explore the capabilities and flying characteristics of the aircraft
 - connect the academics to lessons
 - develop a closer connection with a/c

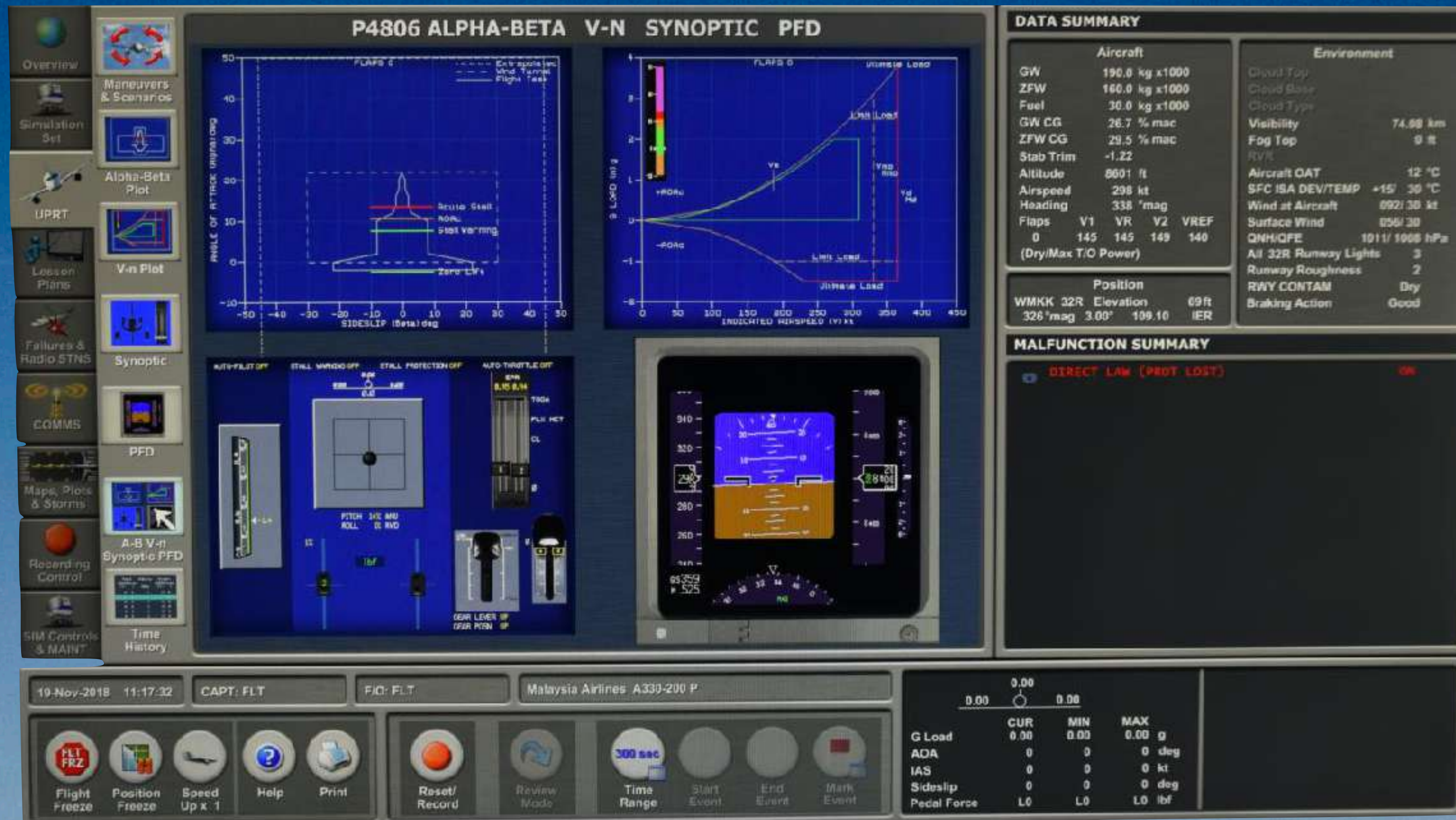


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- Instructor-led demo's
 - instructor “does”, student observes and answers questions
 - illustrates aerodynamic and display concepts
 - allow student to focus on learning rather than executing a manoeuvre

- Crew-centric training
 - awareness and recognition using basic concepts
 - application of SOP's for early intervention
 - application of scenarios through IOS
 - crew applies all applicable competencies



IOS display



- Validated Training Envelope (AoA - AoS)
- V-n diagram
- Control inputs
- Flight parameters

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Other FSTD issues

- Can I start UPRT without a simulator upgrade?
 - yes, awareness and prevention training, with proper academics & instructor training
 - no, you cannot do all upset recoveries without proper validation
- What can I do without any simulator?
 - academics
 - some on-aircraft training (connect the dots)
- Academics are available - No excuse not to be an expert!
- priorities:
- academics, core instructors, develop exercises within the envelope



Example: Effectiveness of Trim

AF447

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

IDT
International Development of Technology

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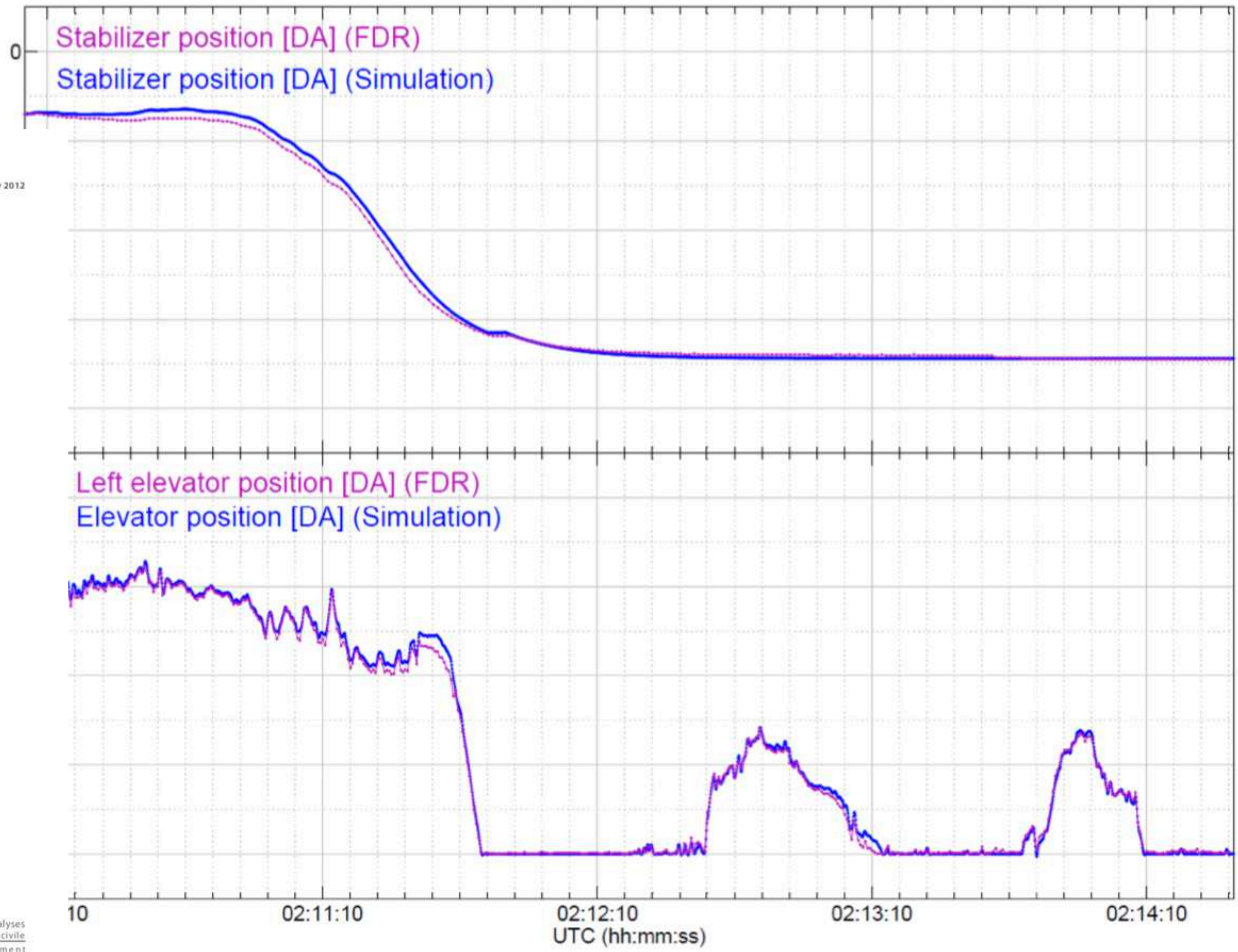
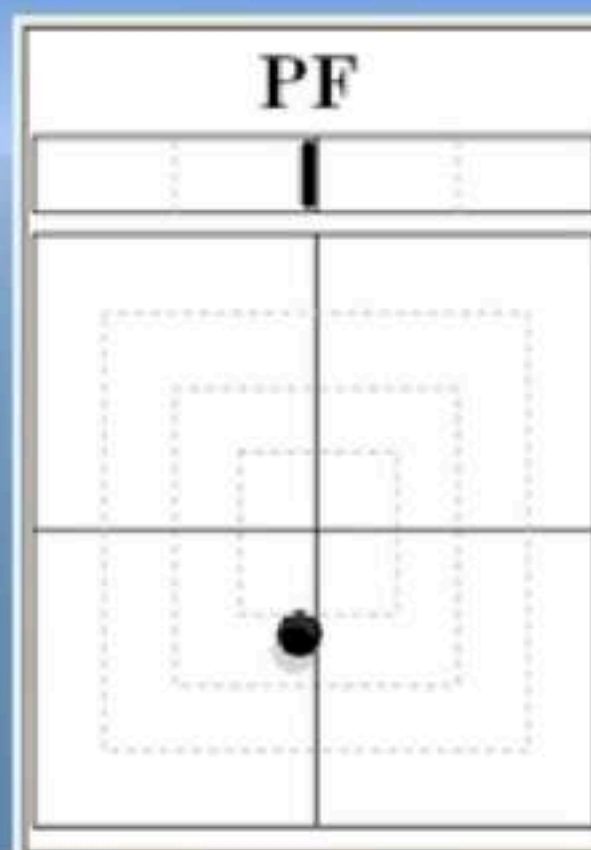
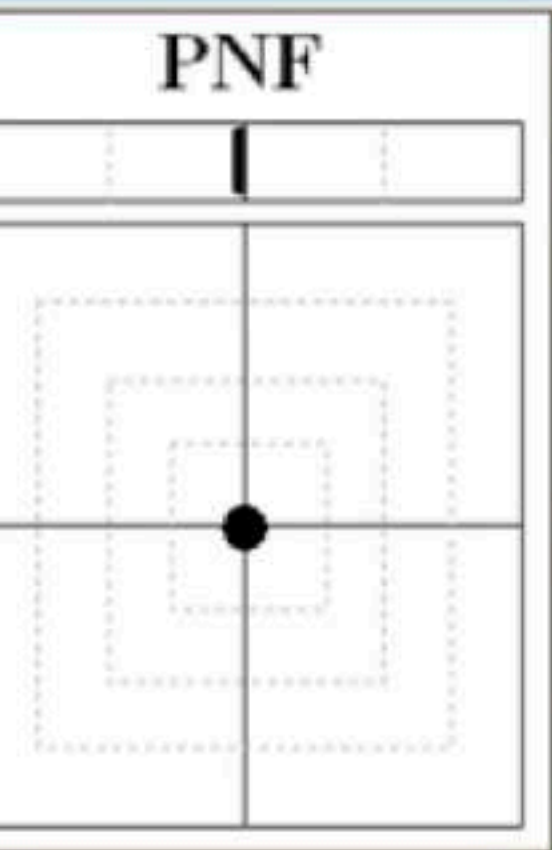
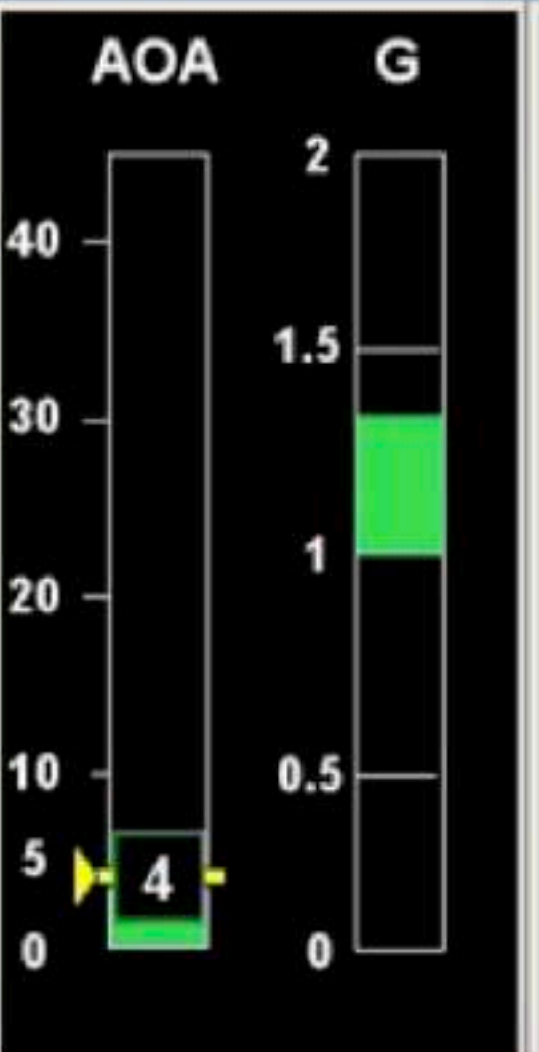
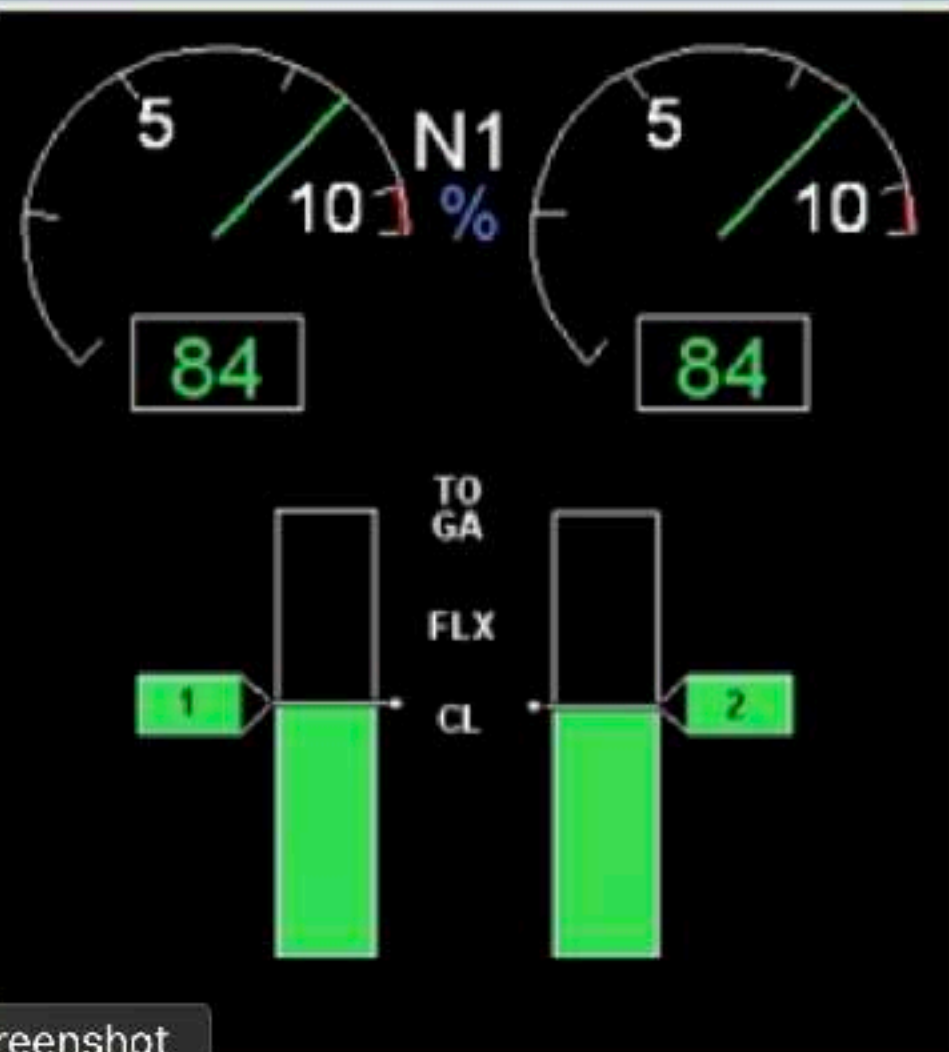
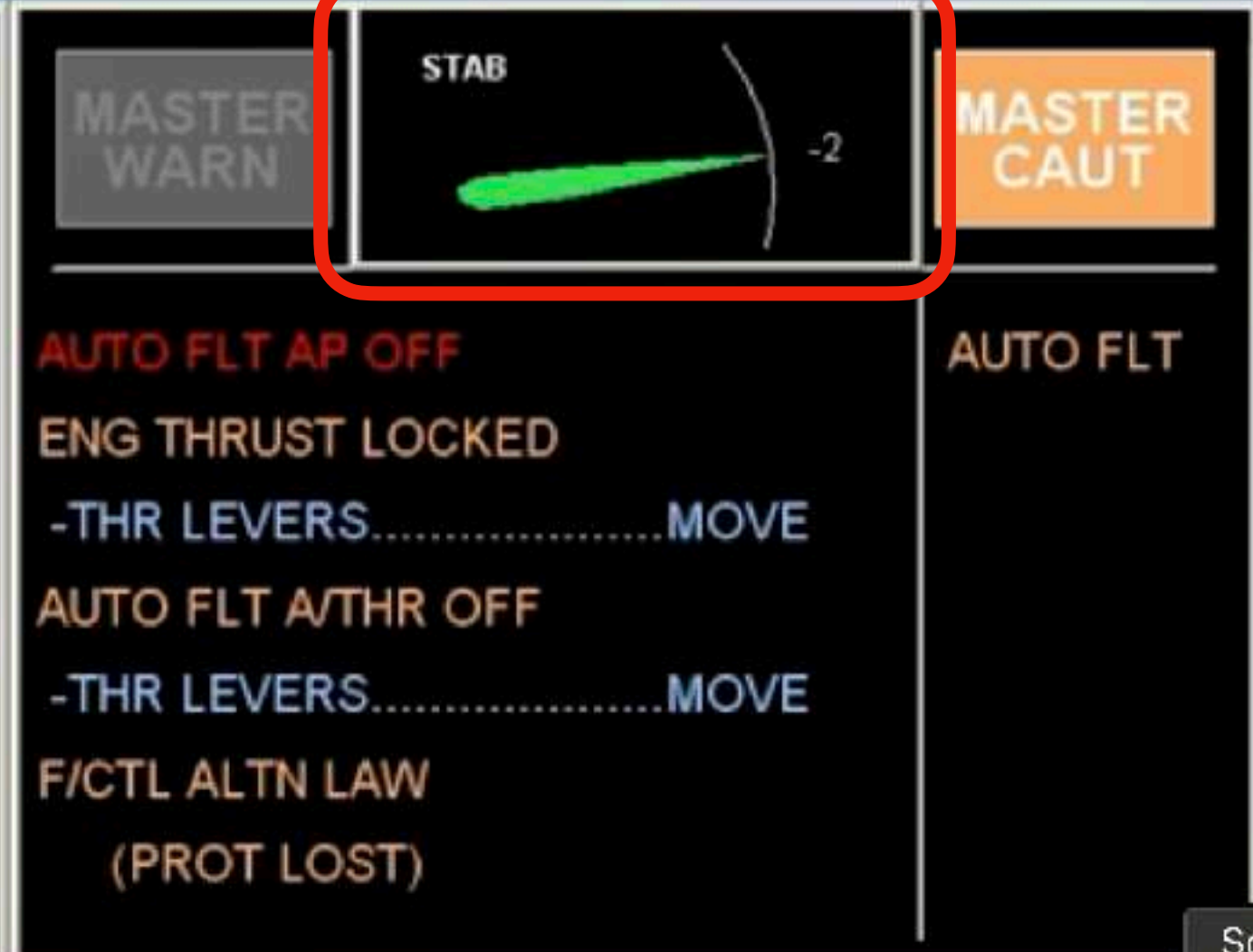
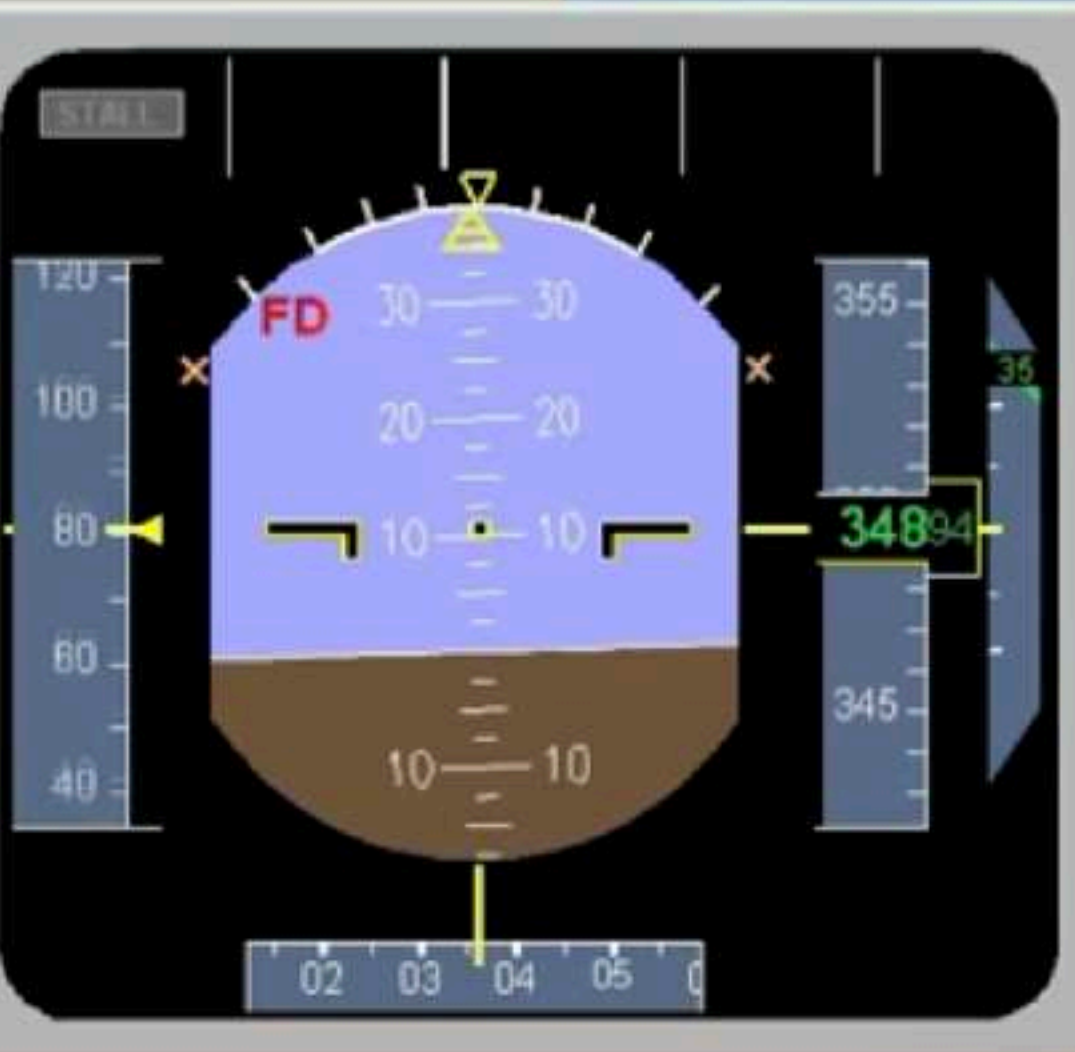


Figure 63: Comparison between the recorded positions of the elevator and THS and the simulation

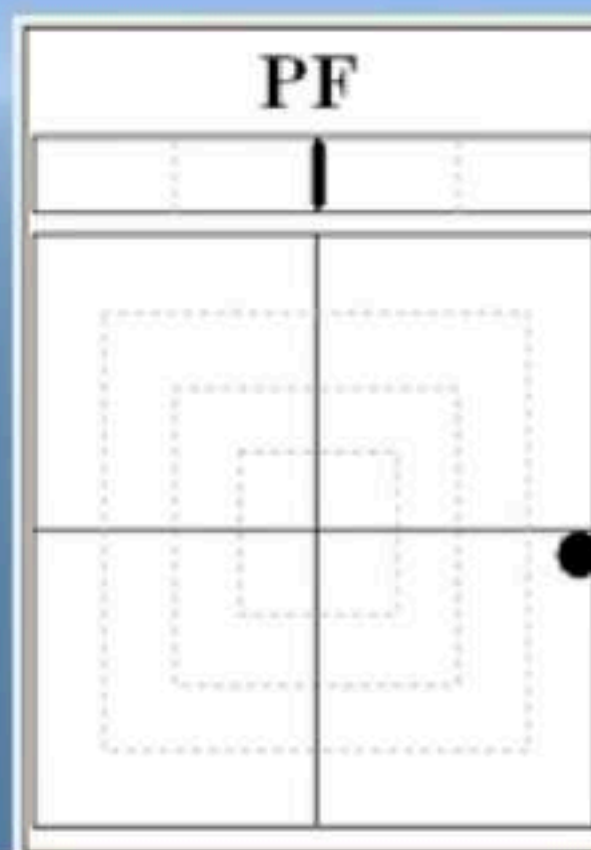
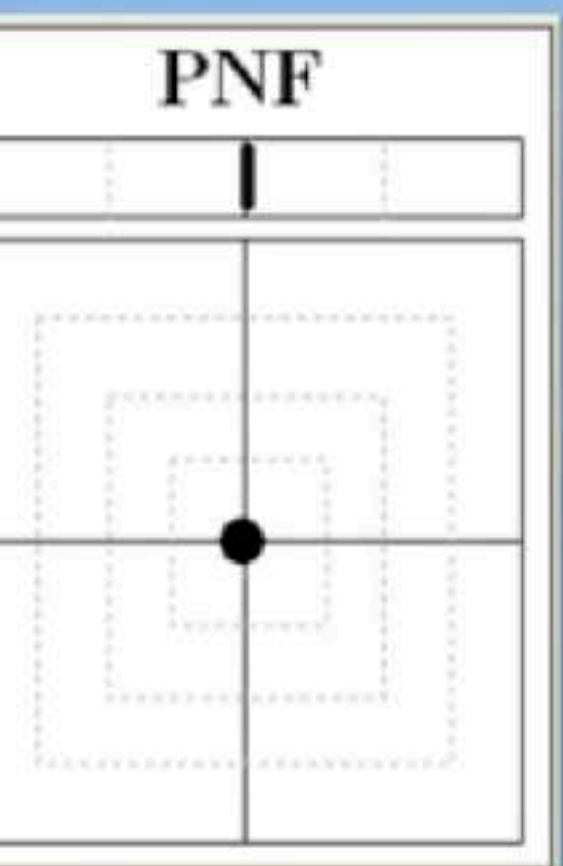


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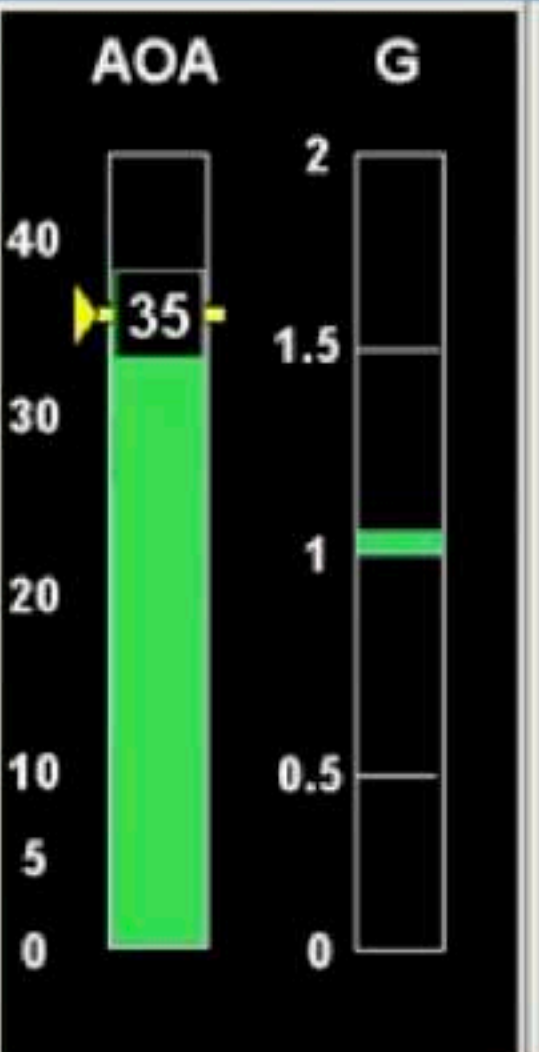
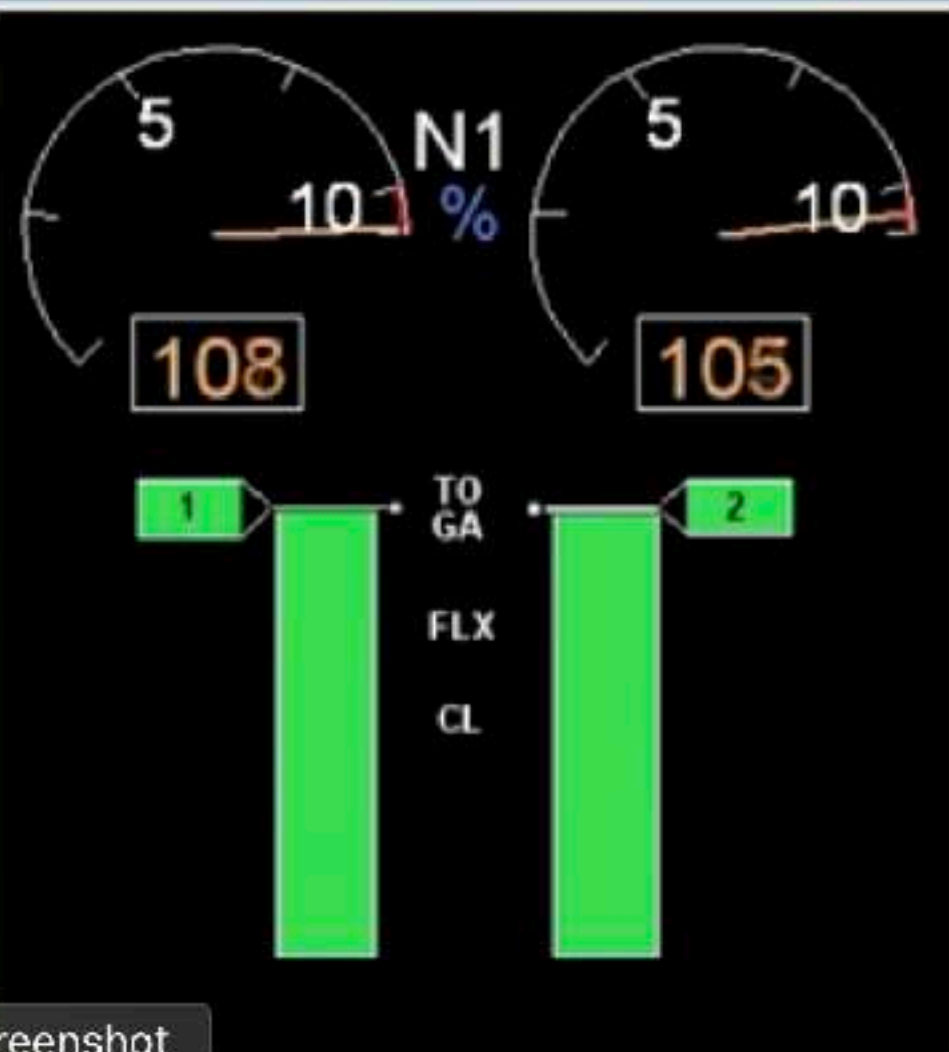
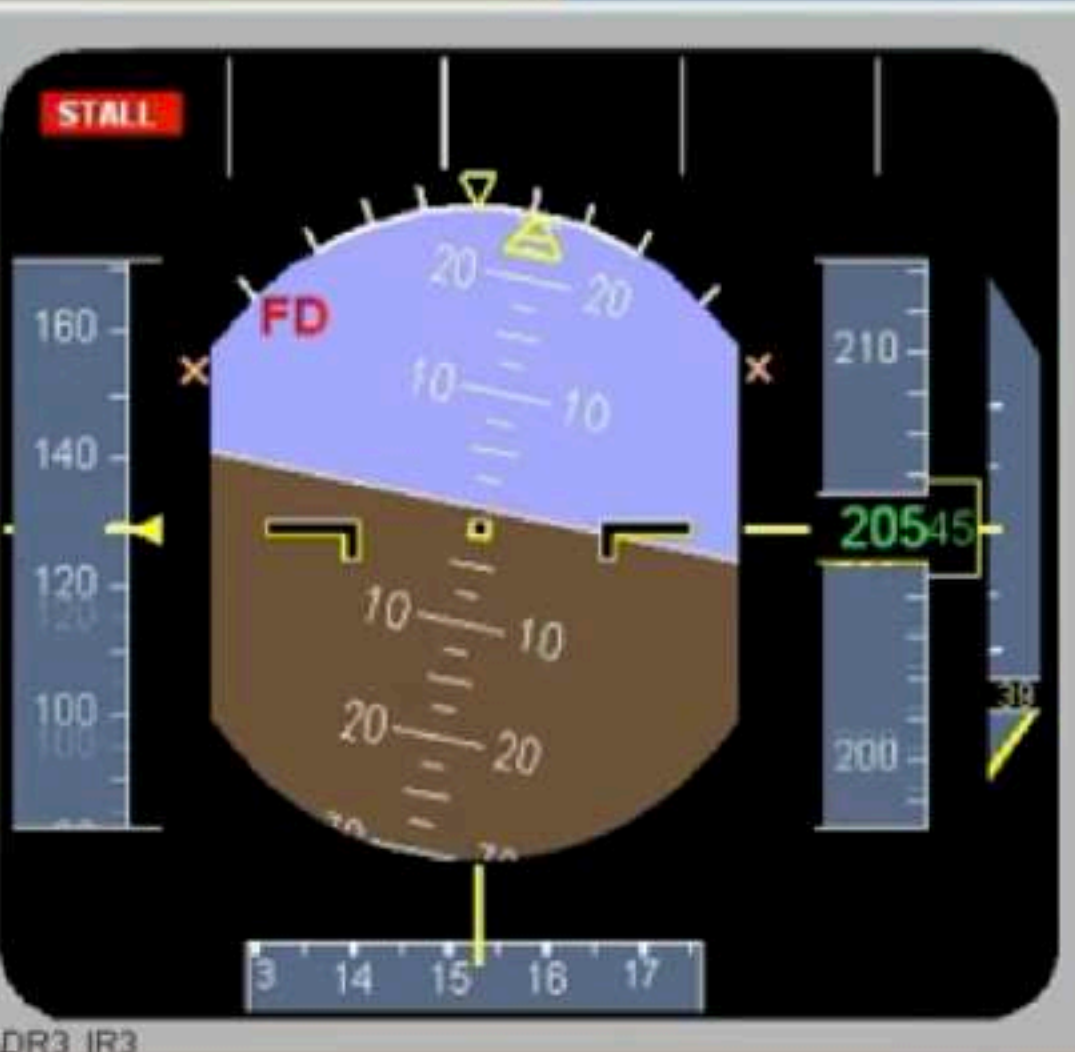
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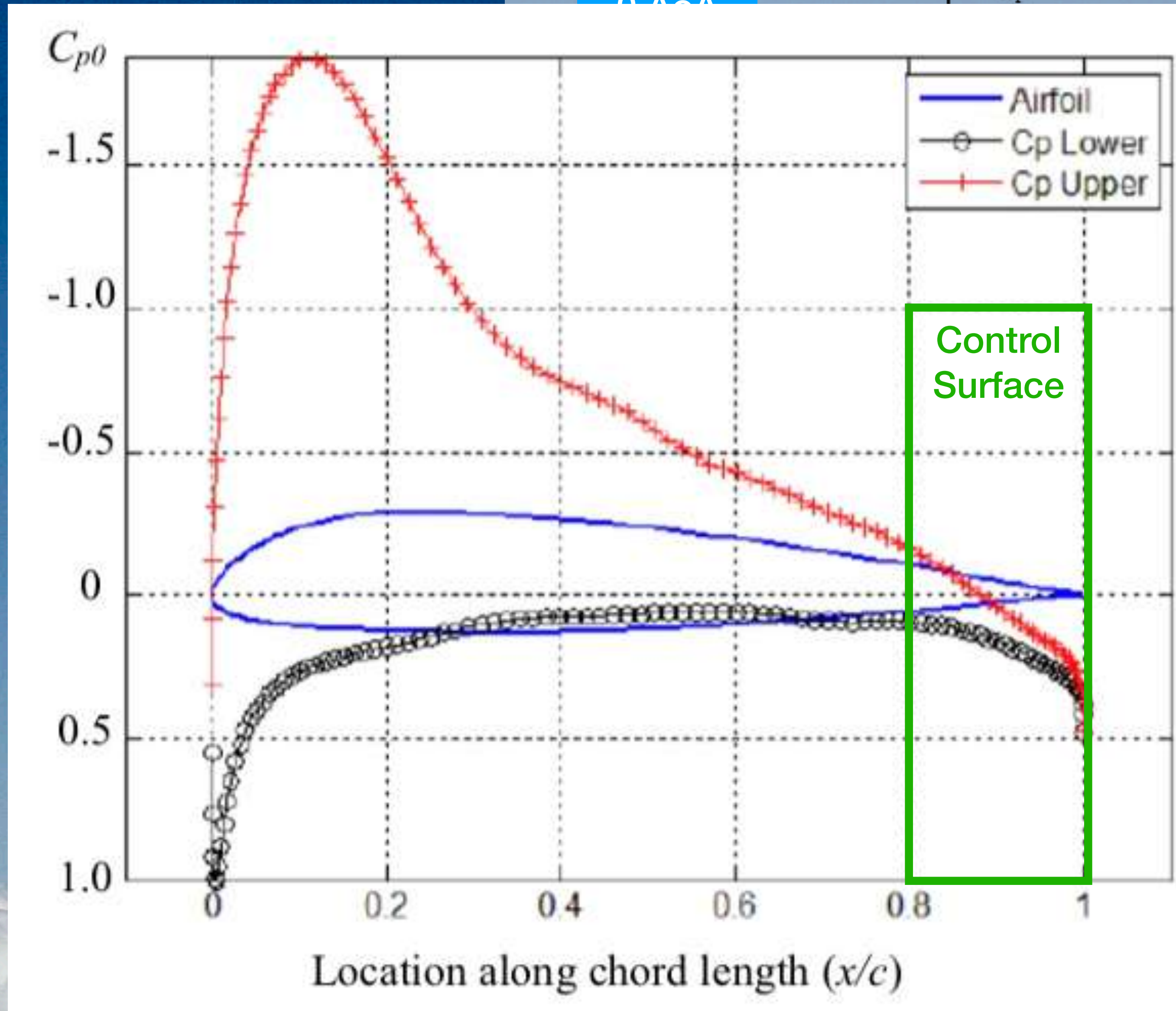
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Lift Distribution

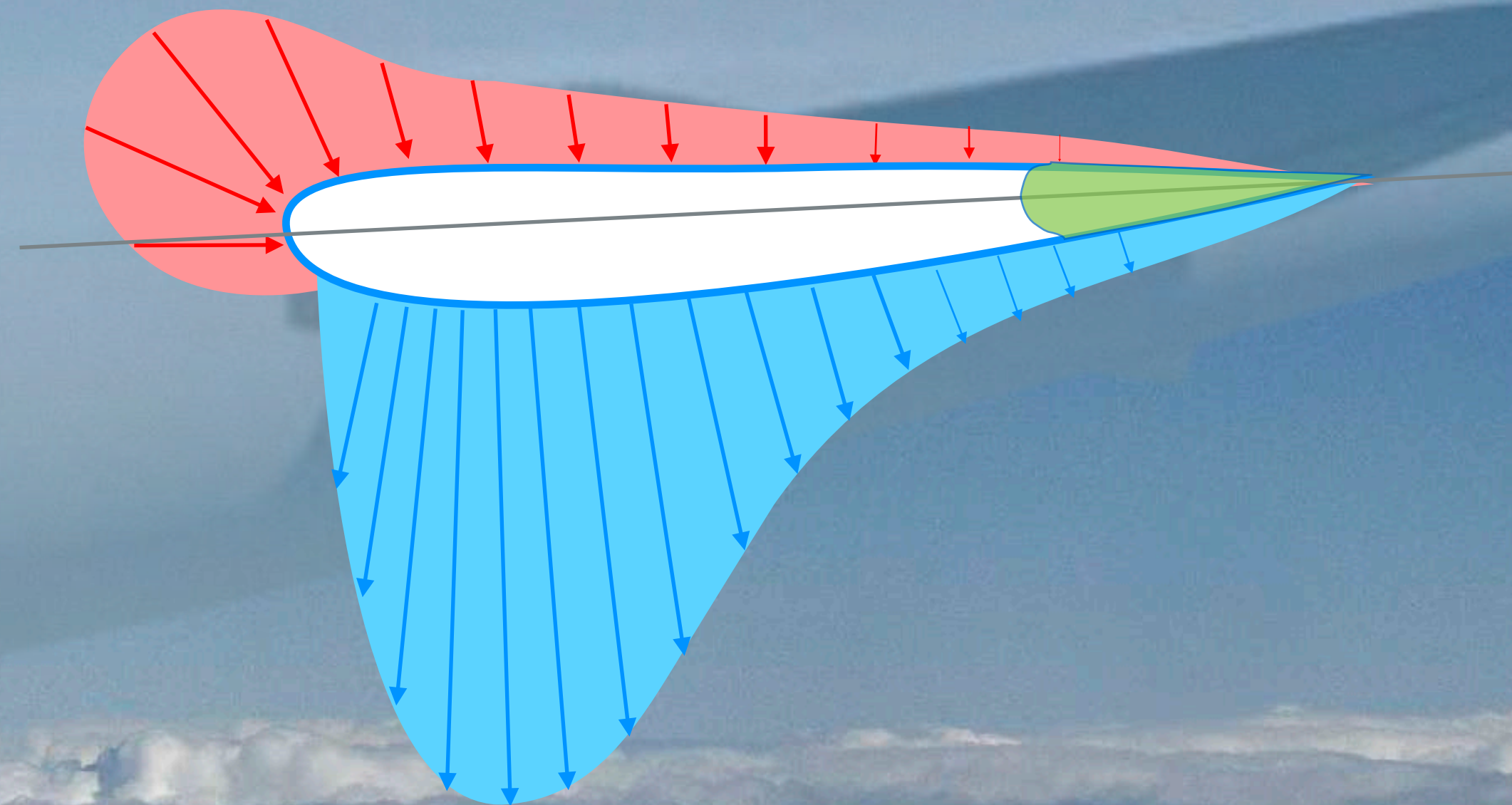


Effect of Stabilizer Trim on Pitch

Majority of lift produced occurs near leading edge

Moving the stabilizer dramatically influences forces produced

PH-IDT



AF447

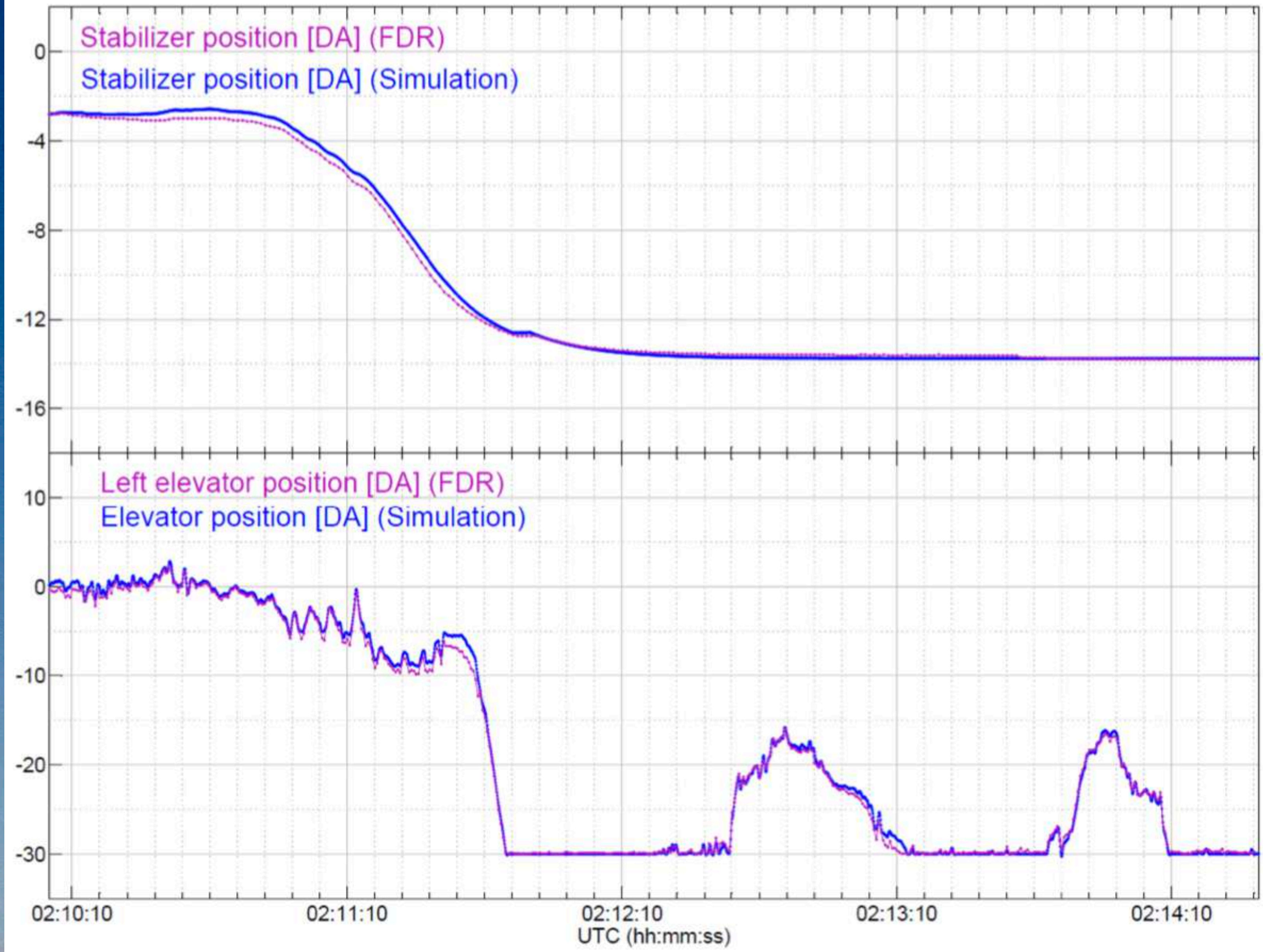


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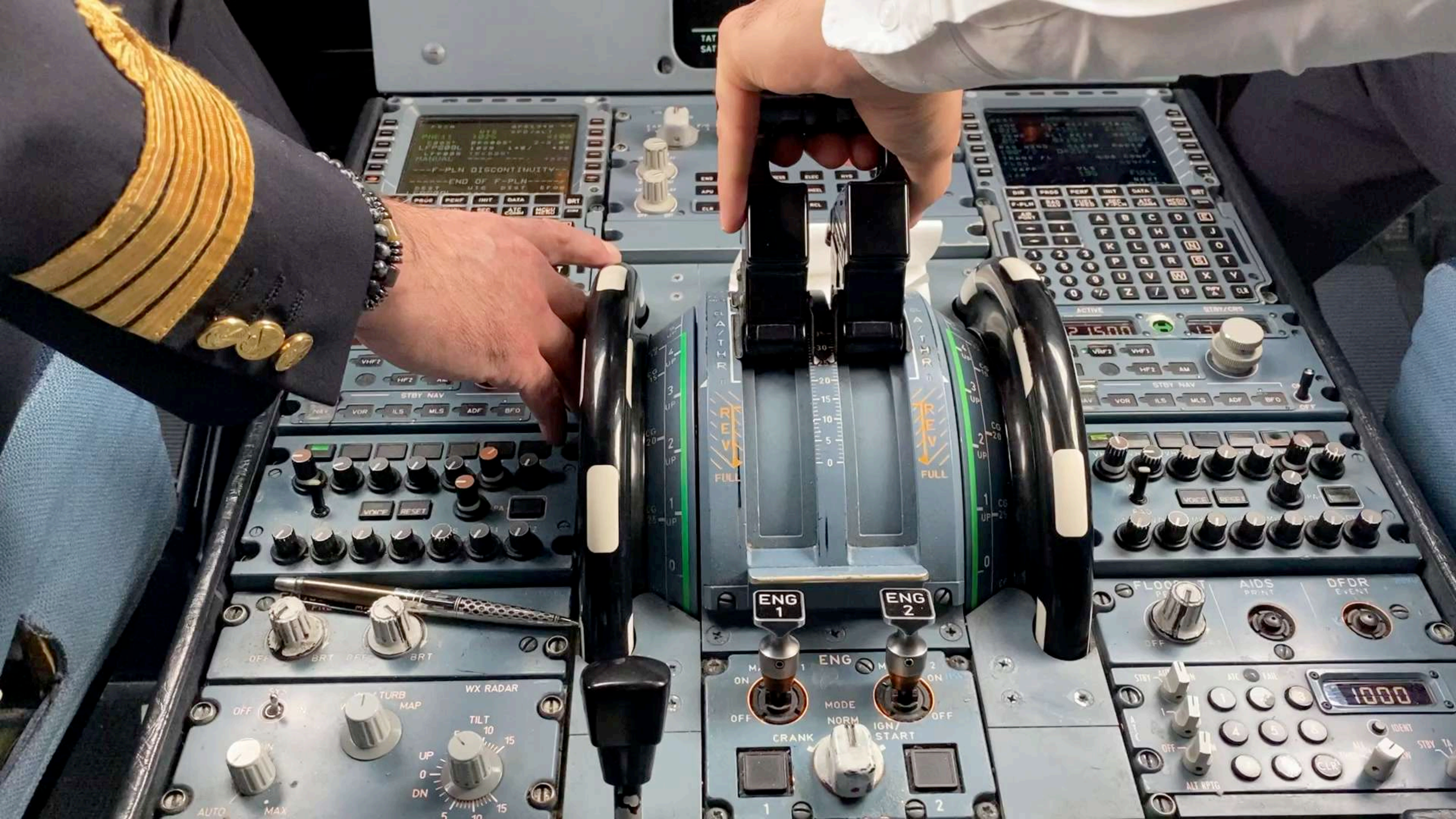


Example: Trim Exercises in UPRT Program (type-specific)

No.	Exercise	
1.5	Power of Stabilizer Trim vs Elevator (1)	
1.6	Power of Stabilizer Trim vs Elevator (2)	
1.7	Pitch-roll coupling	
1.8	Thrust-trim effect	
2.9	Out-of trim stall event (1)	TRI demo
2.10	Out-of-trim stall event (2)	TRI demo
3.1	Trim-Energy relationships	TRI demo
3.4 - 3.9	Stall events and trim	
4.4	Trim during go-around	
4.12-4.14	Trim departure	
4.16	Rudder trim event	TRI demo

**15 Trim-related exercises
Type-specific SOP's**

Only apply as relevant to the aircraft type



Basic Requirements of UPRT

- Utilize FSTD's qualified to do the task
- Remain **within the valid regions** of the FSTD:
 - g-loading
 - FSTD validation envelope
- Important:
 - how does the pilot react to the situation?
 - how smooth and reliable are the control inputs
- **MOST important: HOW WAS THE INSTRUCTOR TRAINED?**

THE PILOT MUST UNDERSTAND and MANAGE

Angle of Attack

Aircraft Energy

Startle

Take-Away Message

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