

1st Asia Pacific Workshop on Flying at High Altitude under Adverse Weather Conditions



Flying at High altitude under Adverse Weather Conditions – Airbus

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Organisers



Supporting Partners



**The first challenge of adverse weather conditions flying is building
Flight crew's situation awareness**

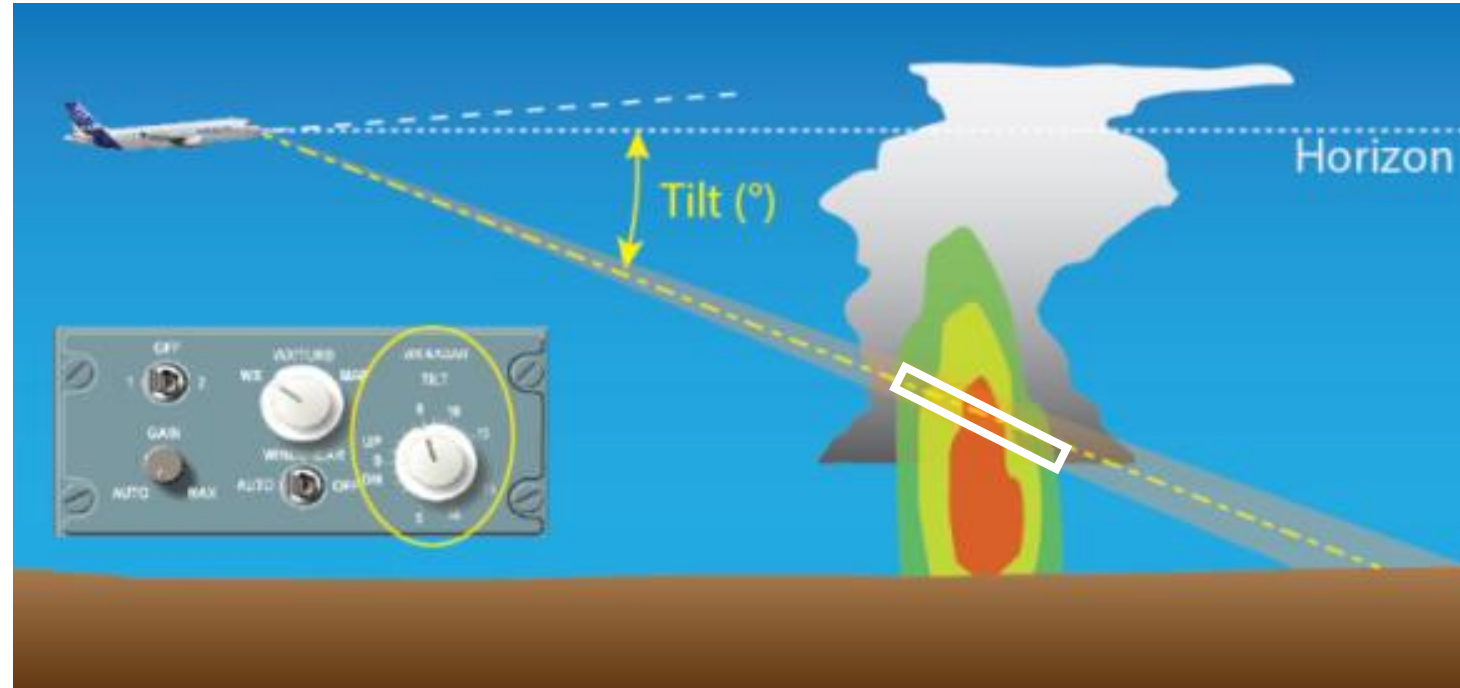
Different Types of Radars

Manual Radars



Display only a “slice” of weather for a single tilt angle:

- + Fully manual
- + No default value for the tilt
- + Beam is 3.5° wide \Rightarrow Slice increase with the distance



Different Types of Radars

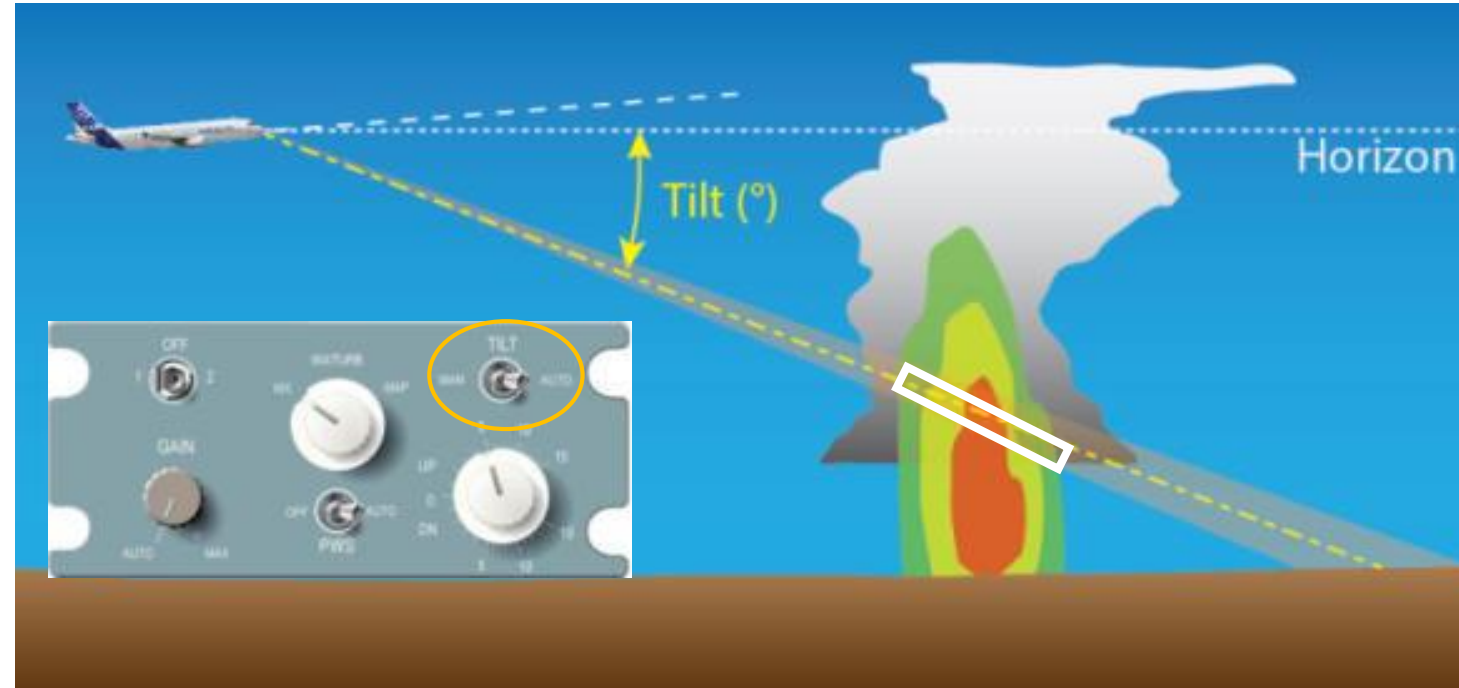
Auto-Tilt Radars



Auto-Tilt Radars display a unique “slice” of weather for a single tilt angle...

... In AUTO Mode they provide a “default” tilt value, optimized as a function of:

- + ND range
- + Aircraft Position
- + Altitude
- + Terrain Database



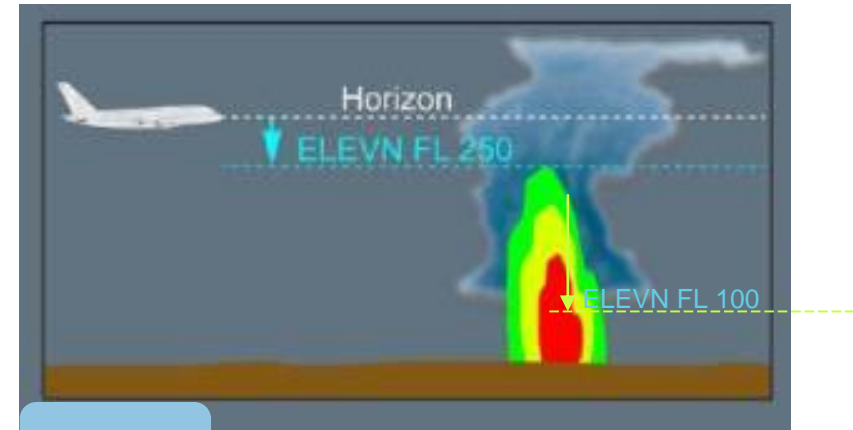
Different Types of Radars



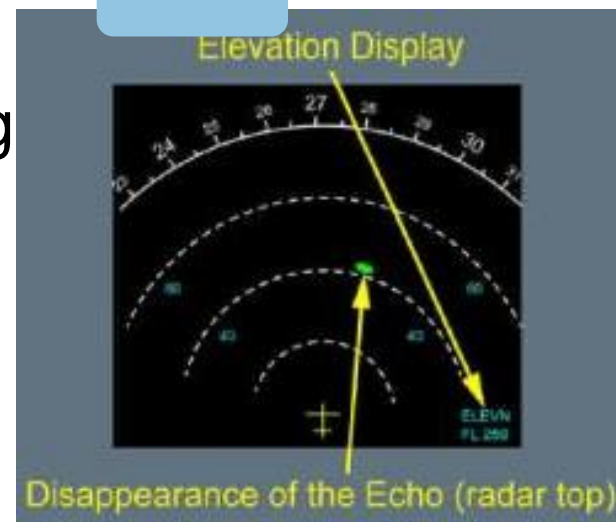
Automatic Radars: Honeywell RDR-4000 (& A380/A350 Radars)

The 3-D buffer enables the display of more weather:

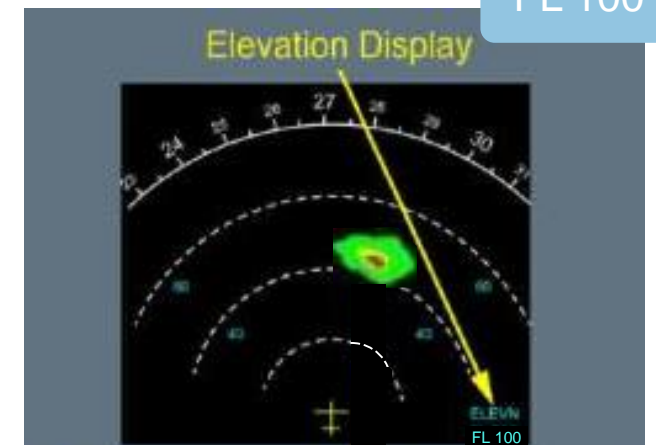
- + AUTO: Superimposition of weather for all FL
- + Use ELEVATION mode to analyze the precise vertical structure of the cell on the ND (horizontal cuts along FMS F-PLN)



FL 250



FL 100

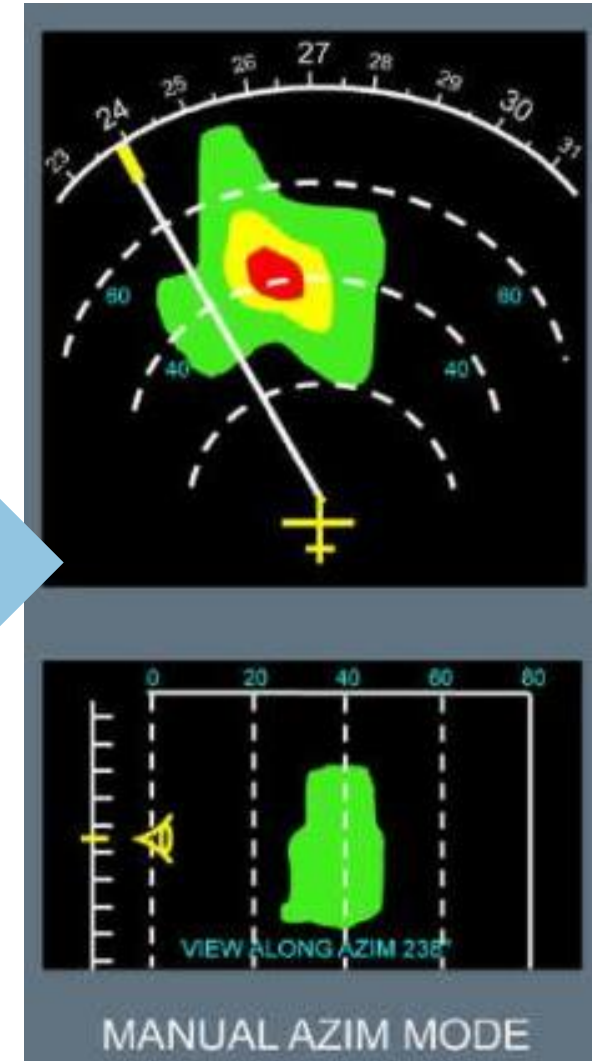
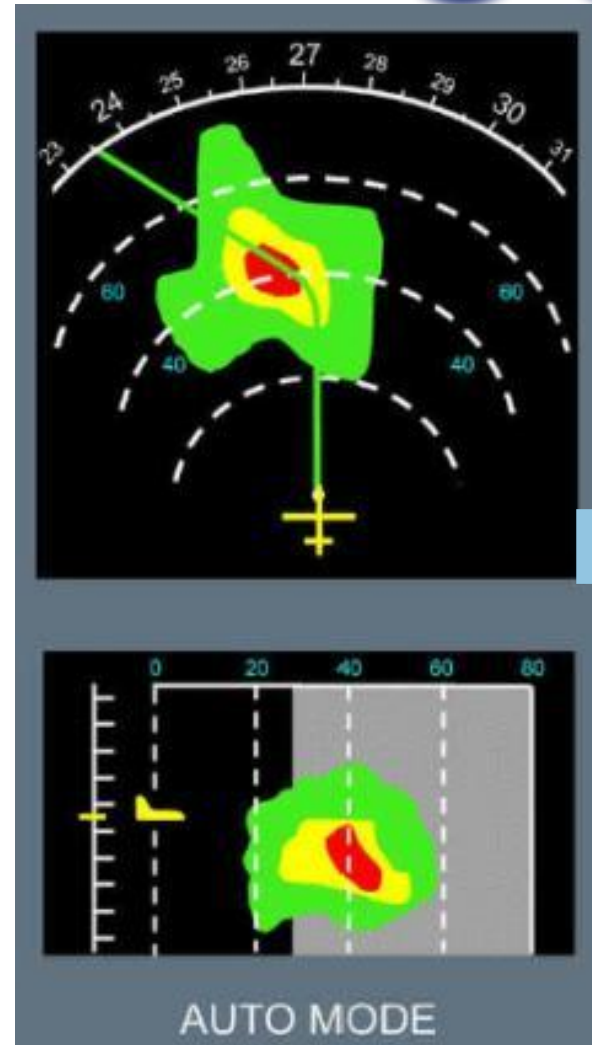


Different types of radars

Automatic Radars: Honeywell A380/A350 Radars



+AZIM mode to display a vertical cut along a specified azimuth

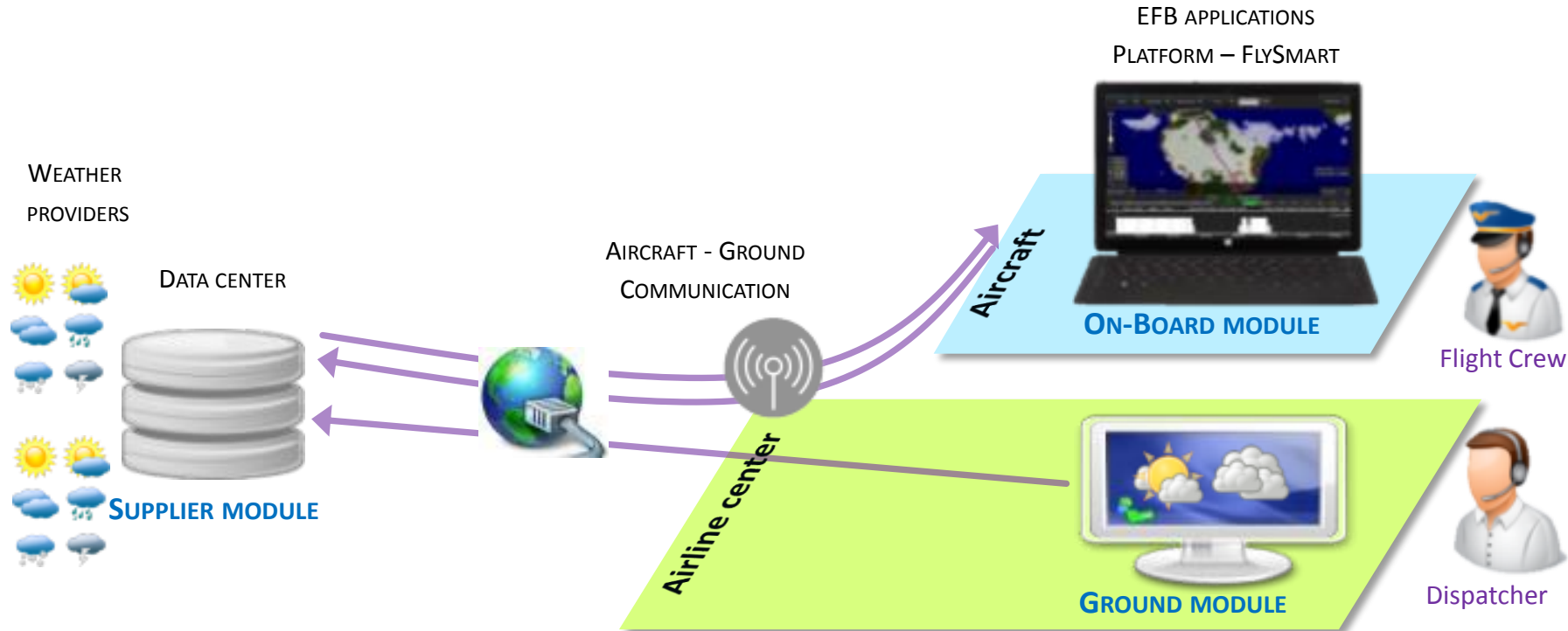


Future Airbus Projects



Weather on Board - Principle

Deployment in Progress

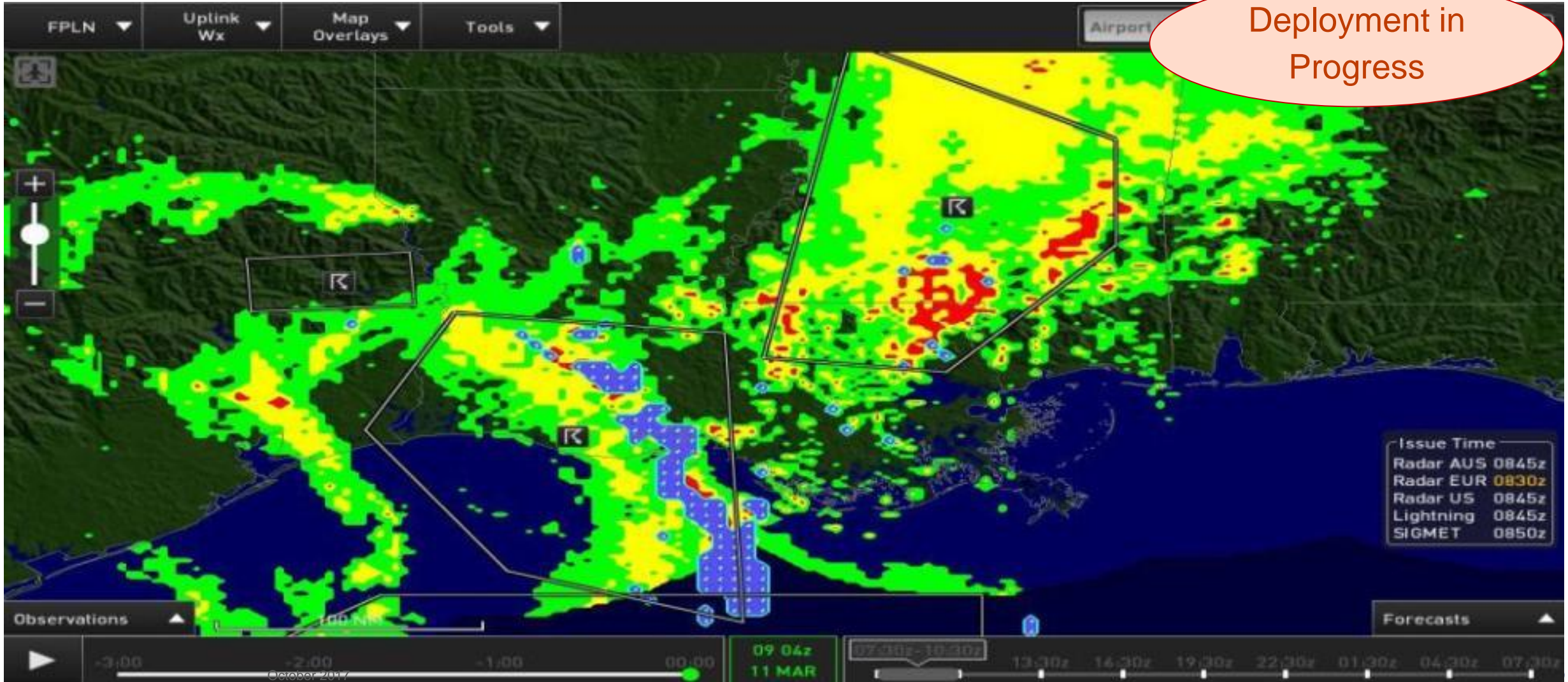


Very useful strategic tool, to anticipate before the weather radar's range

Future Airbus Projects



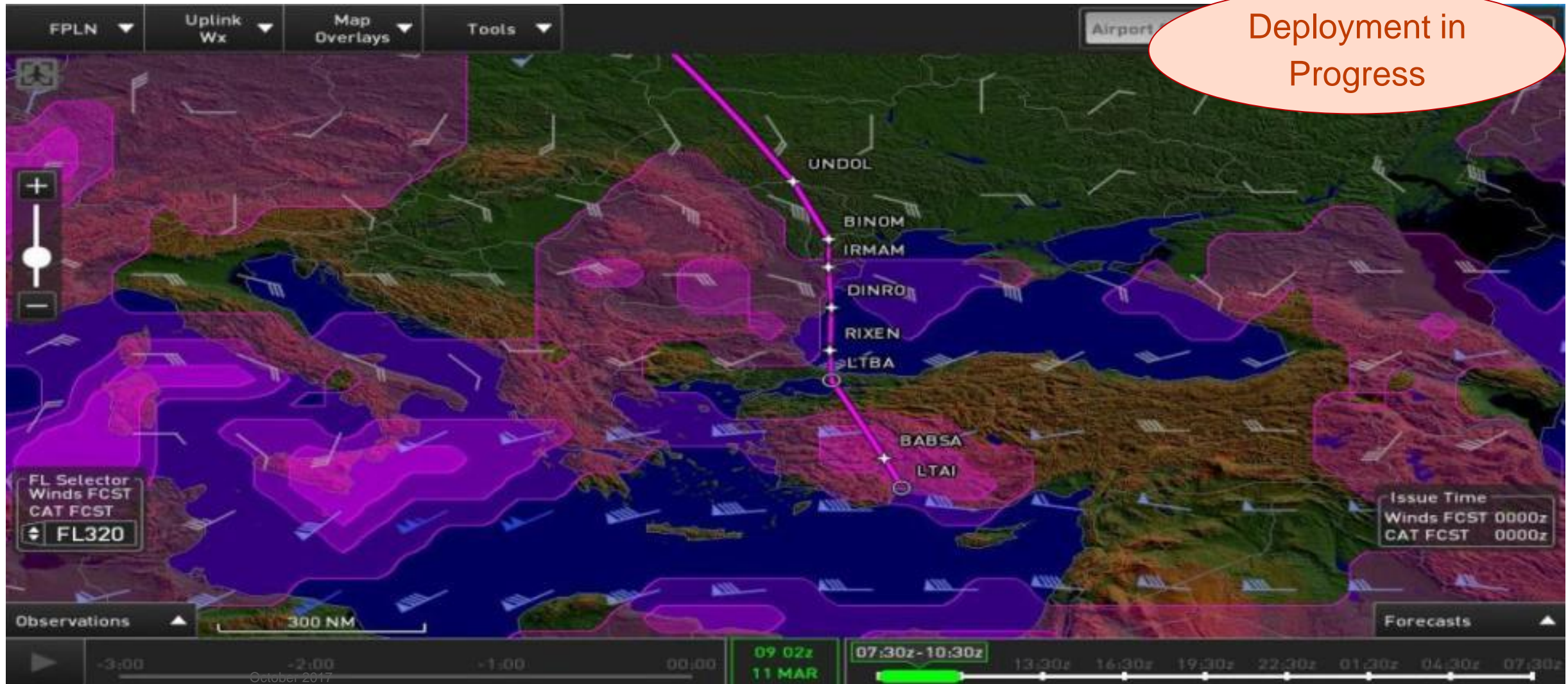
Weather on Board – Lightning Observations & SIGMET Forecasts



Future Airbus Projects



Weather on Board – Clear Air Turbulence & Winds Forecasts



Future Airbus Projects



Weather on Board – CB Tops Forecasts & Satellite Observations



Conclusion on weather awareness

Know your radar:

- + What does the display represent? (one or several slice(s) or buffer?)
- + Take advantage of available functions to better understand the situation

Apply Operational Recommendations:

- + Use your weather knowledge in addition to the radar
- + Use all clues, and not only colors: Shapes, cell dynamism, lightning, etc.
- + Use recommended avoidance margins and methods (upwind & lateral, etc.)

Talk and train by experience:

- + Encourage experience sharing within crews
- + Seminar: Training round table

Consider Weather On Board functions upgrade

Why is Flying Safe?

Flying is safe due to the combination of 4 pre-requisites:

- + Aircraft **designed** according to certification requirements
- + Aircraft **maintained** according to approved procedures
- + Aircraft operated by **skilled pilots**
- + Aircraft flown within a **safe ATM** en-route and airfield environment

➔ **These 4 pre-requisites are intrinsically linked together.**

How to Prevent Loss Of Control In flight (LOC-I)

Aircraft Design

- + Flight envelope protections
- + Enhanced alerting system
- + Enhanced automation

Flight Crew Training

- + Simulator fidelity
- + Techniques: Upset prevention and recovery, stall, etc.
- + Crew Resource Management

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graph LR; AD[Aircraft Design] --> FCP[Flight Crew Proficiency]; FCT[Flight Crew Training] --> FCP;
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Flight Crew Proficiency

Airbus OTT Following AUPRTA Revision 03

OPERATIONS TRAINING TRANSMISSION - OTT

TO: All A318,A319,A320,A321,A330,A340,A350,A380 Operators

SUBJECT: ATA 00 – Undesired Aircraft State - Training Recommendations

OUR REF.: 999.0012/17 Rev 00 dated 10-FEB-2017.

APPLICABLE AIRCRAFT: This OTT is applicable to A318, A319, A320, A321, A330, A340, A340-500, A340-600, A350, and A380.

Notice: This OTT provides Operators with recommendations on training techniques or training programs. These training recommendations aim to enhance the efficiency or safety of operations. It is each Operator's responsibility to distribute the information contained in this OTT to ensure application of the training recommendations in the Operator's own training department or any training organization where their crews are trained.



Undesired Aircraft State Training

- + Instructor-led exercises
 - Need for a “Train the trainer” instructor training
- + 3 categories of exercises:
 - Demonstration (D): Led by instructor from pilot seat
 - Maneuver (M) : Single maneuver at a time, no specific context
 - Scenario (S): Embodied in a daily operational flight





Undesired Aircraft State Training

+ Exercises:

- Manual and automatic flight (M): Normal, alternate and direct laws
- Energy/Flight path management, including unreliable airspeed (M+S)
- Unusual aircraft attitude: Detection & recovery (D+S), stall (M+S)

+ No motion beyond FSTD normal law flight envelope (no g-representative)

D = Demonstration
M= Maneuver
S = Scenario



Train (in Simulator...) To Enhance Skills

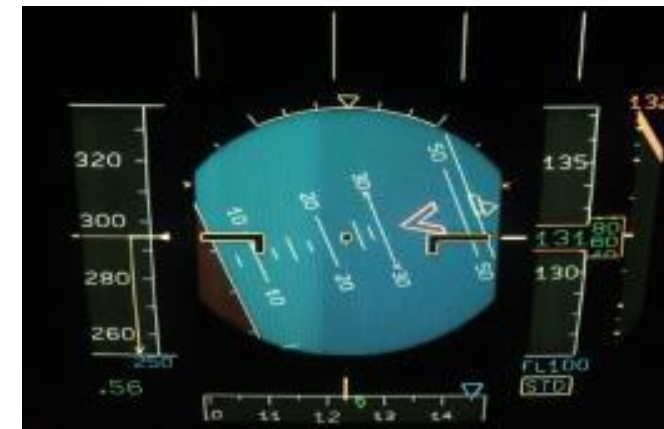
The Airbus UPRT session



Focus on skills:

- + Manual flying skills
- + Threat and error management
- + Decision making
- + Crew communication, etc.

Upset Recovery – Nose High



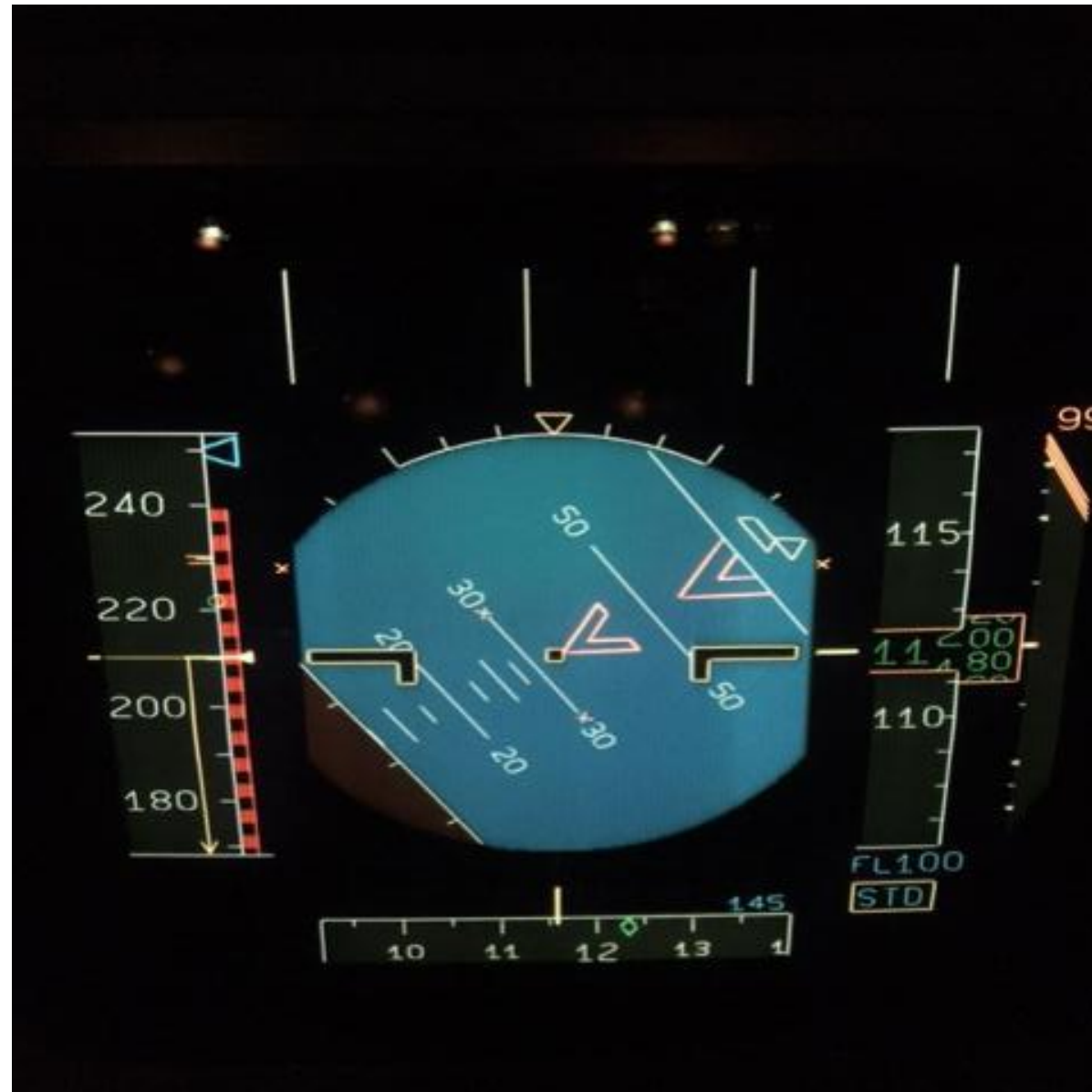
| Nose High Recovery Technique | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Recognize and confirm the developing situation. | |
| PF | PM |
| <p>AP ¹OFF (if required)</p> <p>A/THR ¹OFF (if required)</p> <p>PITCH ² APPLY NOSE-DOWN <i>Apply as much nose-down control input as required to obtain a nose-down pitch rate.</i></p> <p>THRUST..... ADJUST (If required)</p> <p>ROLL ³ ADJUST (If required) <i>Adjust bank angle not to exceed 60 degrees</i></p> <p>When Airspeed is sufficiently increasing: RECOVER TO LEVEL FLIGHT</p> | <p>Monitor Airspeed and Attitude throughout the recovery and announce any continued divergence.</p> |

Upset Recovery – Nose Low



| Nose Low Recovery Technique | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Recognize and confirm the developing situation. | |
| PF | PM |
| AP ¹OFF (if required) A/THR ¹OFF (if required) RECOVER FROM STALL (if required) ROLL ² ADJUST (If required) <i>Adjust bank angle in the shortest direction to wings level.</i> THRUST and DRAG.....ADJUST (If required) RECOVER TO LEVEL FLIGHT | Monitor Airspeed and Attitude throughout the recovery and announce any continued divergence. |

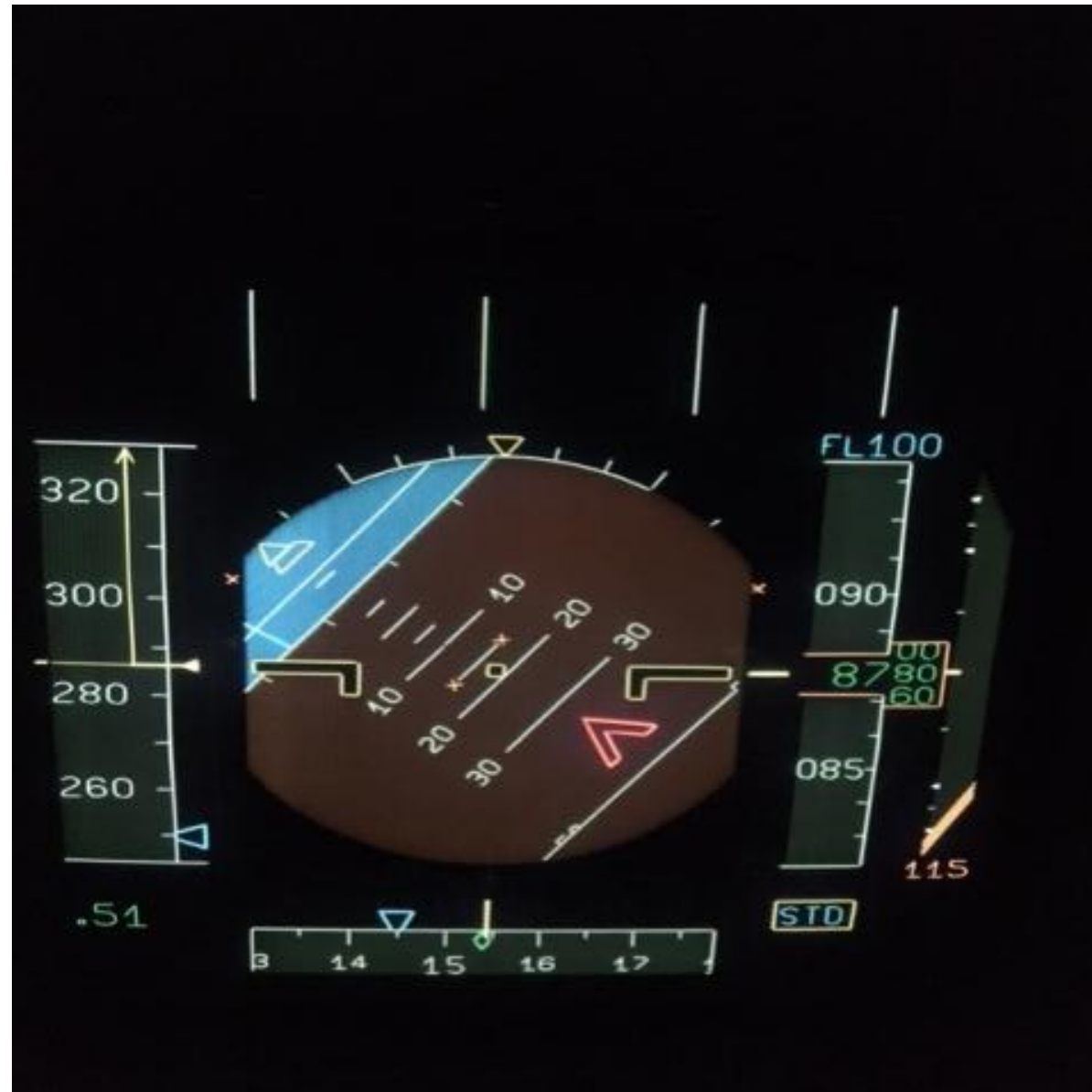
Extreme Attitude



Extreme Attitude



Extreme Attitude



Train (in Simulator...) To Enhance Skills

The Airbus UPRT session



- elements of effective monitoring
- highlight acceleration capability at low level and high level / stability - energy
- flight envelope exploration
- prevent some potential causes of UAS linked to misuse of autoflight systems
- practice pitch/thrust flying
- Practice stall recovery
- Practice upset recovery low/high altitude

