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ASAGA STUDY

Guillaume ADAM & Johan CONDETTE

guillaume.adam@bea-fr.org
johan.condette@bea-fr.org

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ASAGA stands for

Airplane State Awareness during Go-Around

➢ **25 accidents or serious incidents in 25 years worldwide (Source : ICAO Eccairs)**

➢ **Aggregation of FAA/TSB/NTSB/CAST and BEA data**

➢ **Low numbers and no big difference between the 2 main manufacturers (Boeing / Airbus)**

➢ **Upward trend recently: A330 in Tripoli - A310 in Monterrey - B777 at CDG**

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CONTEXT

➢ **Study finished in 2012. Report under publication.**

➢ **Participants :**

- ▪ **Manufacturers :Airbus and Boeing (NTSB limited participation)**
- ▪ **Airlines : XL, CRS, AF**
- ▪ **Authorities : DGAC - EASA-FAA - ICAO**
- ▪ **Research University : ISAE (Toulouse engineering school)**
- ▪ **Human Factors : Dedale and Jean Pinet (former Head of Airbus Traing Center)**

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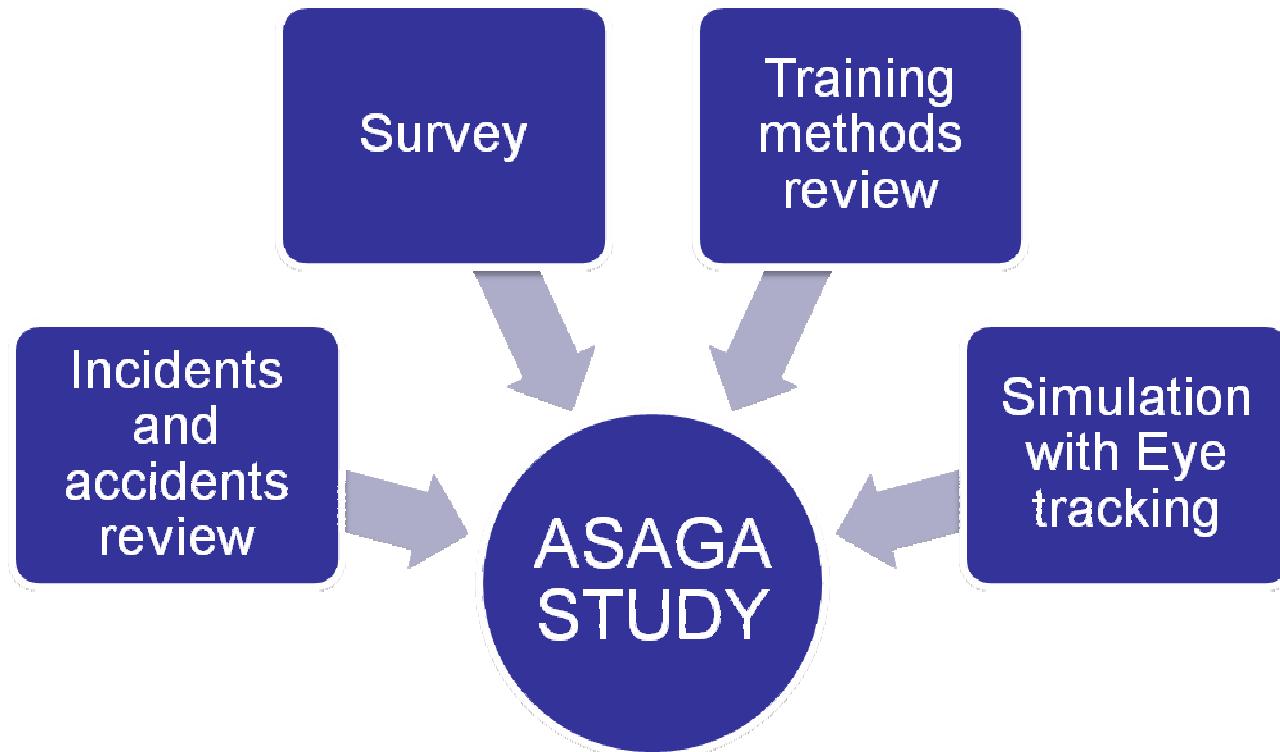
➢ **Methodology:**

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1. CONTEXT
2. INCIDENTS AND ACCIDENTS
3. TRAINING
4. SURVEY
5. EYES TRACKING

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➢ **25 accidents and serious incidents in 25 years**

  ▪ Hundreds of deaths

  ▪ "Superpowered" Twin jet Aircraft that are light because end of flight

  ▪ Always N engines. NO N-1 major events

  ▪ Mainly IMC

  ▪ THE KEY : DISTURBING EVENT / SURPRISE – STARTLE EFFECT

  ▪ ATM impact

  ▪ Issue in AP – AT/ATHR system or TRIM

  ▪ PNF/PM not monitoring

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Accidents and Incidents

➢ **Elements of typical scenarii are :**

Scenario 1: Disturbing factor (Startle effect / AP / Automatism) , Go-around , Strong/excessive thrust, somatogravic illusions , chanellized attention , No CRM anymore, abnormal Pitch/Thrust, nose down inputs, « CFIT »

Ex: Boeing 777 at CDG or Boeing 757 at Gardermoen (Norway)

Scenario 2 : Approach with speed reducing, startle effect, combination of GA , low speed and pitch Stabilizer in pitch-up position. Sole recovery is to reduce power during GA….

Ex: Boeing 737 at Bornemouth and Amsterdam

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TRAINING

➢ **ATM**

- ▪ Straight-in GA path

- ▪ ALTITUDE expressed in TIME vs Aircraft Performance

  (*ex: JFK go-around altitude – A380 serious incident*)

- ▪ Silencing ATC during GA

- ▪ ATC risk knowledge when vectoring either in HDG or ALT

➢ **Flight crew**

- ▪ Pilot selection, recurrent trainings and checkings: monitoring abilities

- ▪ MCC not connected with TR: Beech 200/B737

- ▪ Issue in HDG/altitude versus FMS trajectory during go-around

- ▪ Basics during GA : Pitch / Thrust

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TRAINING

- **Flight crew**

  - Special Attention on this so-called « Normal Procedure »

  - GA is rarely performed in real

  - Too many N-1 training at the expense of N accidents

  - During Training Introduction of unexpected disturbance

  - Risk of channelized attention (suspicion on VFE/ALT)

- **Addionnal possible improvements**

  - Unlike what is said, simulators CAN be improved

  - Standards for simulator assessment / somatogravic illusions

  - Video Recorder on Simulator and Aircraft

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SURVEY

➤ Conducted throughout France and a bit in UK

➤ Web orientated

➤ Unexpected Success : very high rate of answers/ Around 850 pilots answered. Population is CPT/FO/TRI/TRE

➤ 6 months to be assessed with 3 experts!!!

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SURVEY

Results:

- ➤ **compliants with ASAGA scenarii**
- ➤ **provide clues to suspected contributive factor highlighted during investigation and ASAGA study**

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Results:

- GA rarely performed especially on long haul aircraft. Lack of real practice

- GA : difficult to be performed by pilots expecially PM/PNF

- ATM « last minute » procedure

- High workload (mostly PM) / Signifiant time constraint

- Automation : management, conflict, FMA mode reversion and quick multiple change

- Poor CRM when messed-up

- AP - Pitch monitoring / Flaps and Gear retraction error

- GA trajectory follow-up – ATM, VFE, GA altitude capture

- Somatogravic effect

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➢ 9 Months to be prepared. 3 Months to select "virgin" crew. 2 Months to be performed

➢ 13 Simulator sessions on B 777 / A 330 ⇔ 39 unexpected GA

➢ GA always disturbed : HDG/ALT, IMC below DH, Runway occupied… Based on **REAL** scenario

➢ Significant means to assess the video

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Scenario

- BDX – LYS
- Take-off from BORDEAUX to SAU
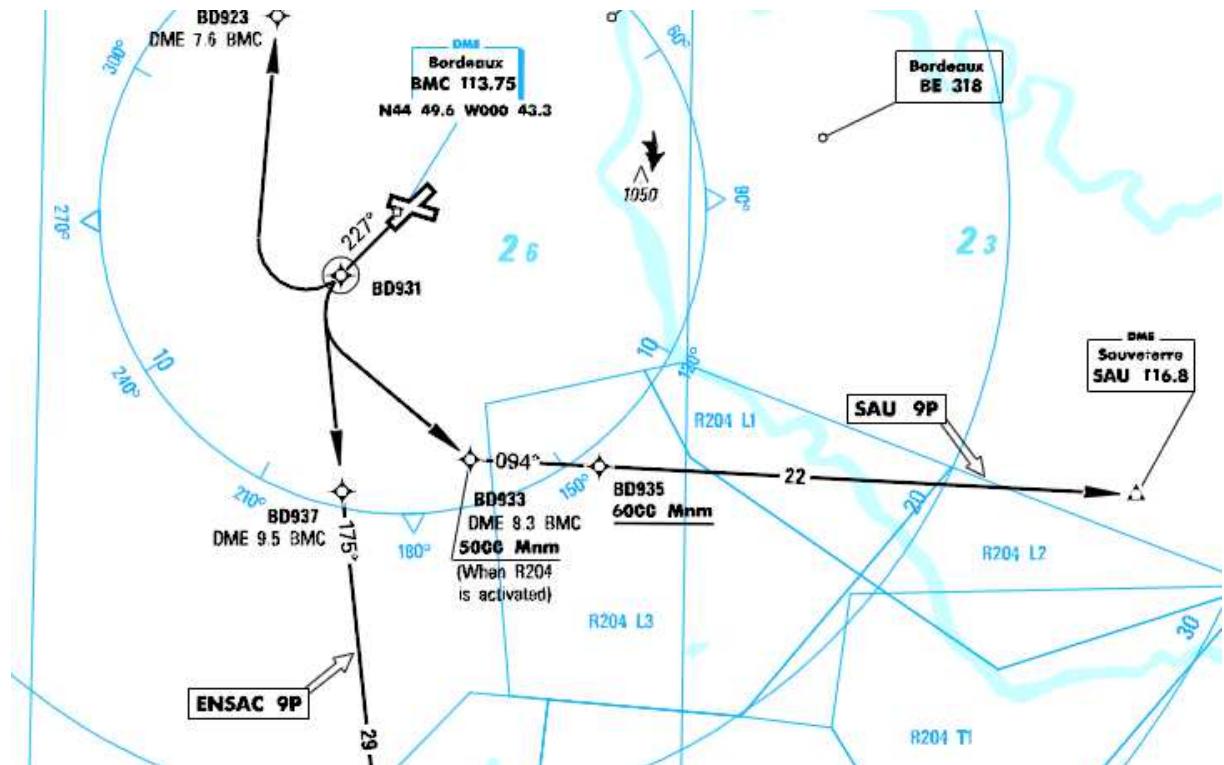
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Scenario

- BDX – LYS

- 36L ILS Lyon St Exupery approach

- Go-Around #1 :
  - Manual GA, ATC "surprise"
  - Low energy, low altitude
  - 200ft : go-around required

  - heading (340 instead of 355)
  - altitude (2500ft instead of 5000ft)

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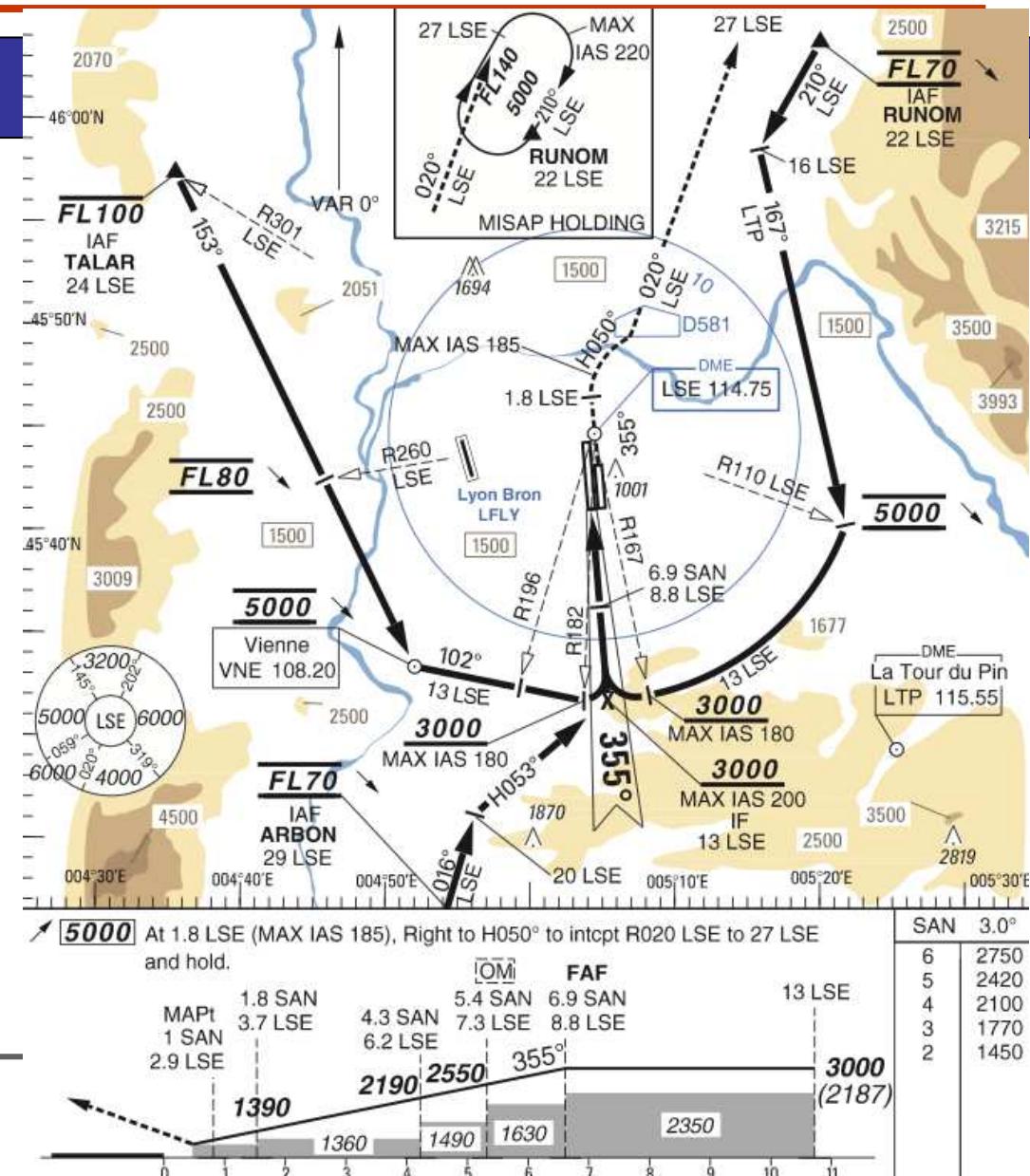
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Scenario

- **LYS - MRS**

- **Marseille 31 R ILS approach**

- **Go-Around #2:**
  - **Manual GA, crew decision**
  - **low energy, low altitude**
  - **15/20 kts gusts of wind (tail-wind)**
  - **GA on crew decision**
  - **Tail wind issue**
  - **ATC requires 2000ft (instead of 3500ft)**

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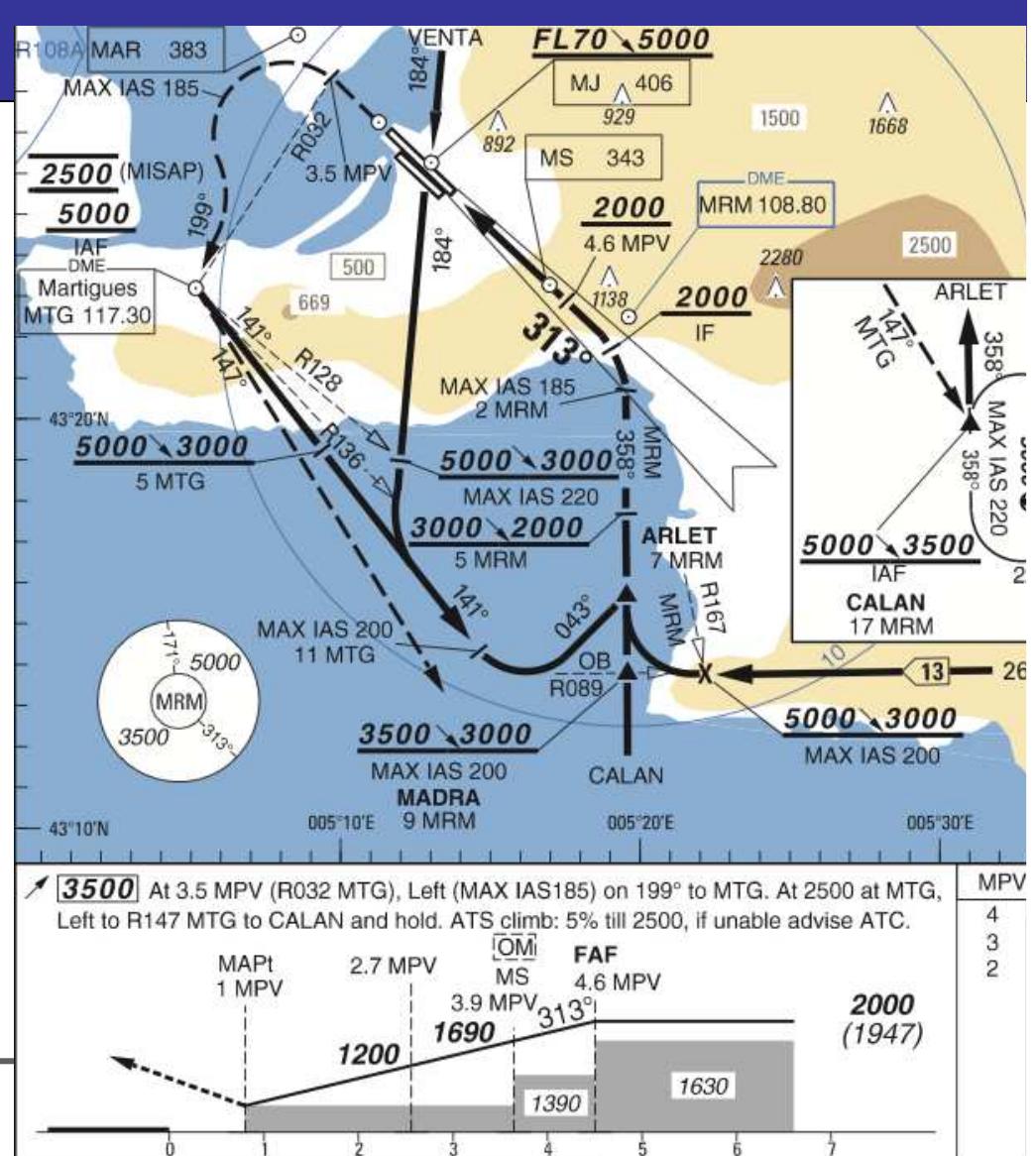
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Scenario

- **LYS - MRS**

- **Marseille LOC/DME 13L under AP**

- **Go-Around #3: AP go around,**
  - **First officer is PF**
  - **IMC**
  - **Too low visibility**
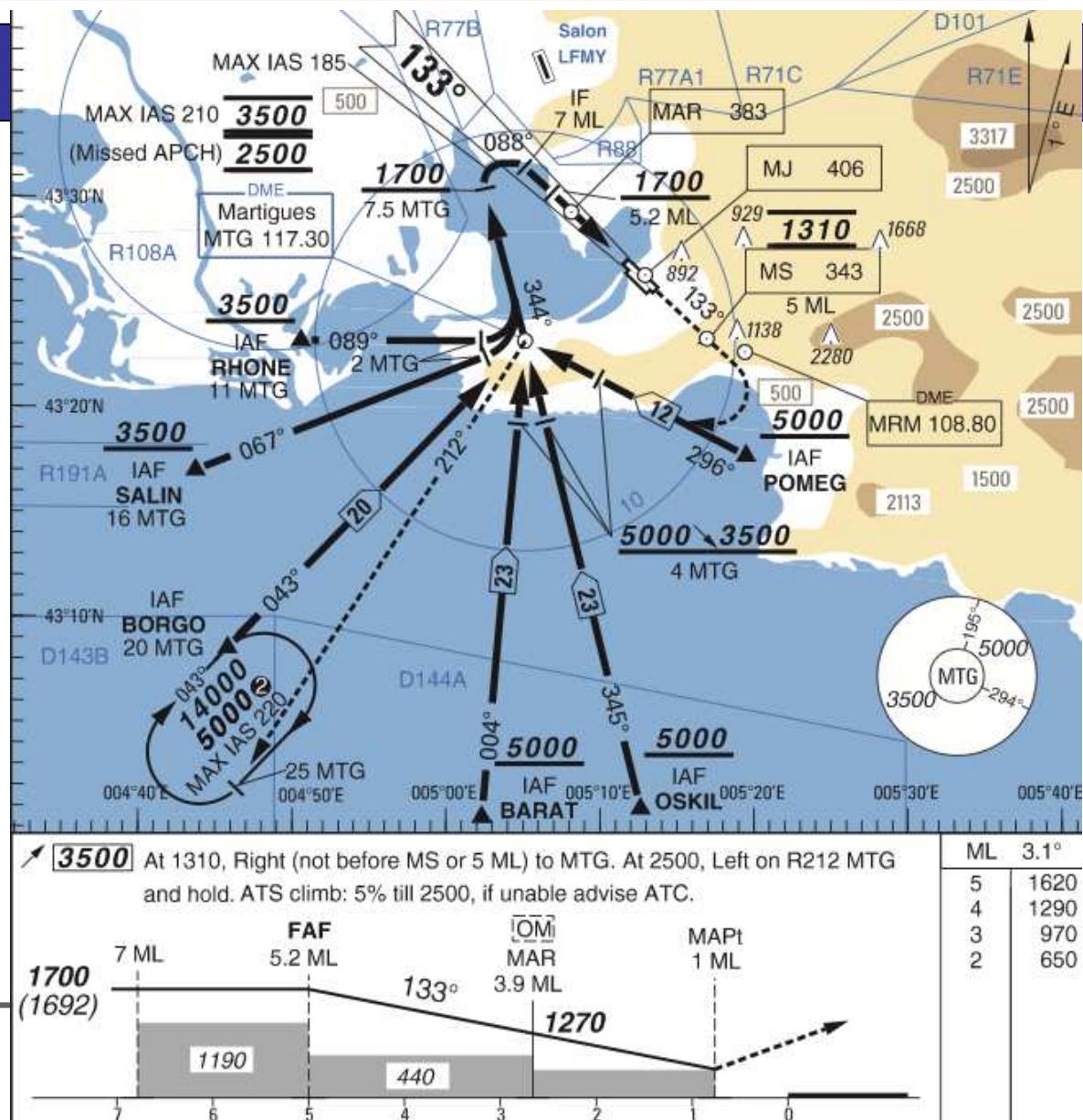
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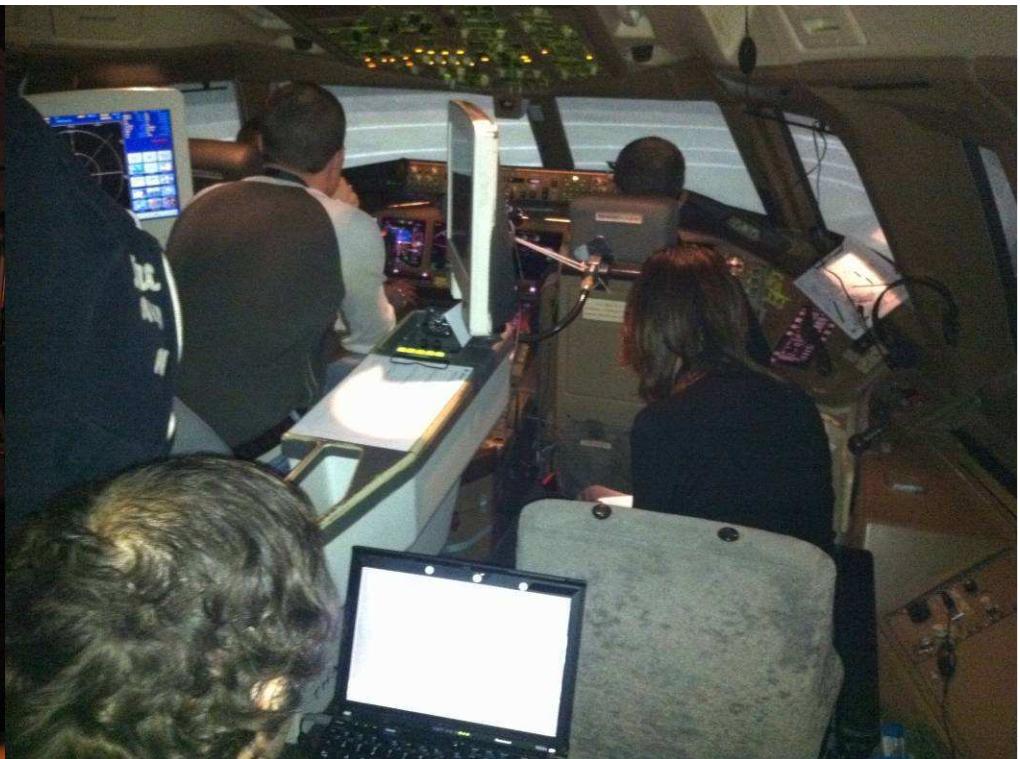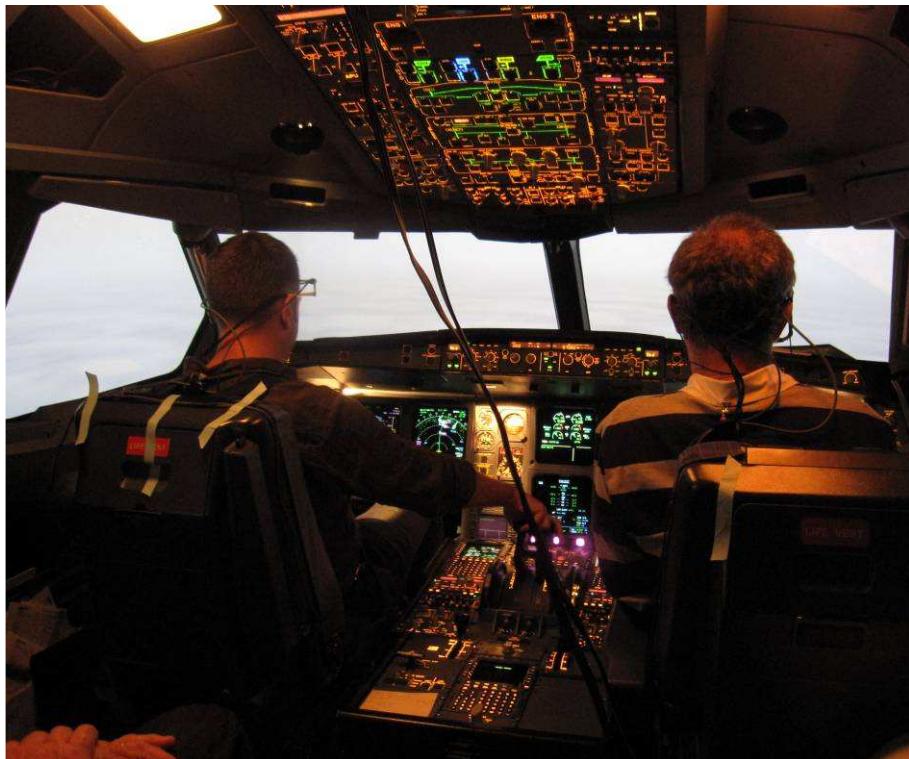
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SIMULATIONS/EYES TRACKING

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SIMULATIONS/EYES TRACKING

➢ Briefing: 15-30'

➢ Flight preparation in the cockpit + eye tracker: 40'

➢ Flight scenario: 2h15

➢ Debriefing: 1h30

Objective measurements: ***Eye tracking, video recording***
➔ ocular activity, crew's action & communication

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Areas of interest

## Typical visual circuit (*heat map*)
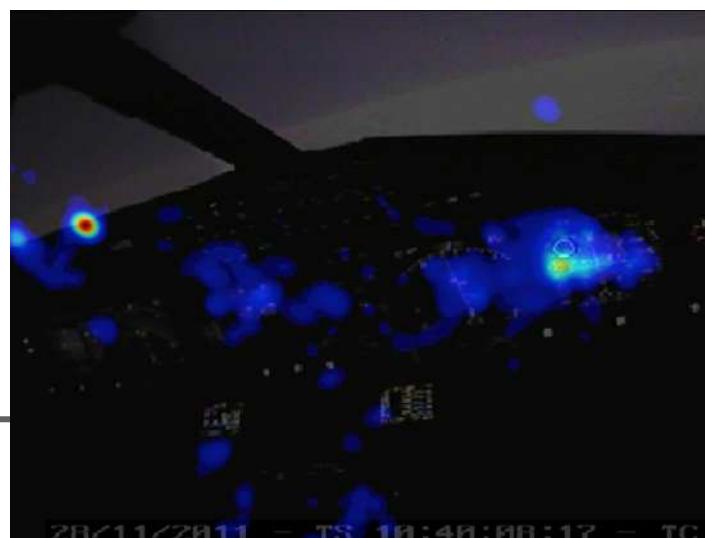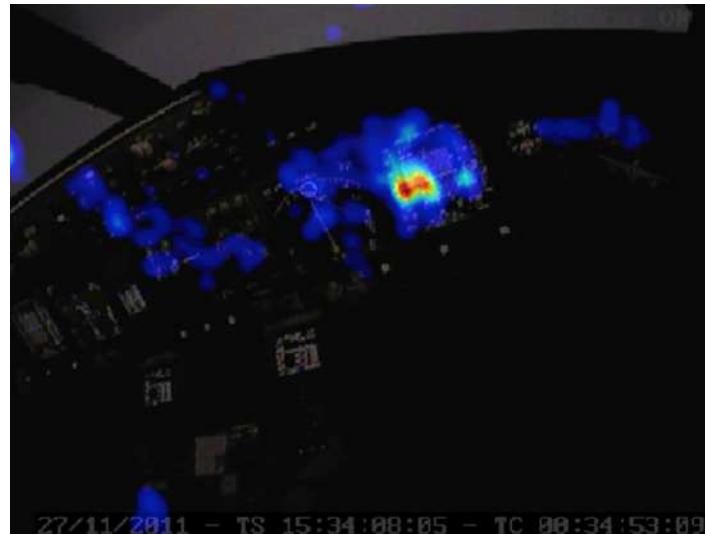
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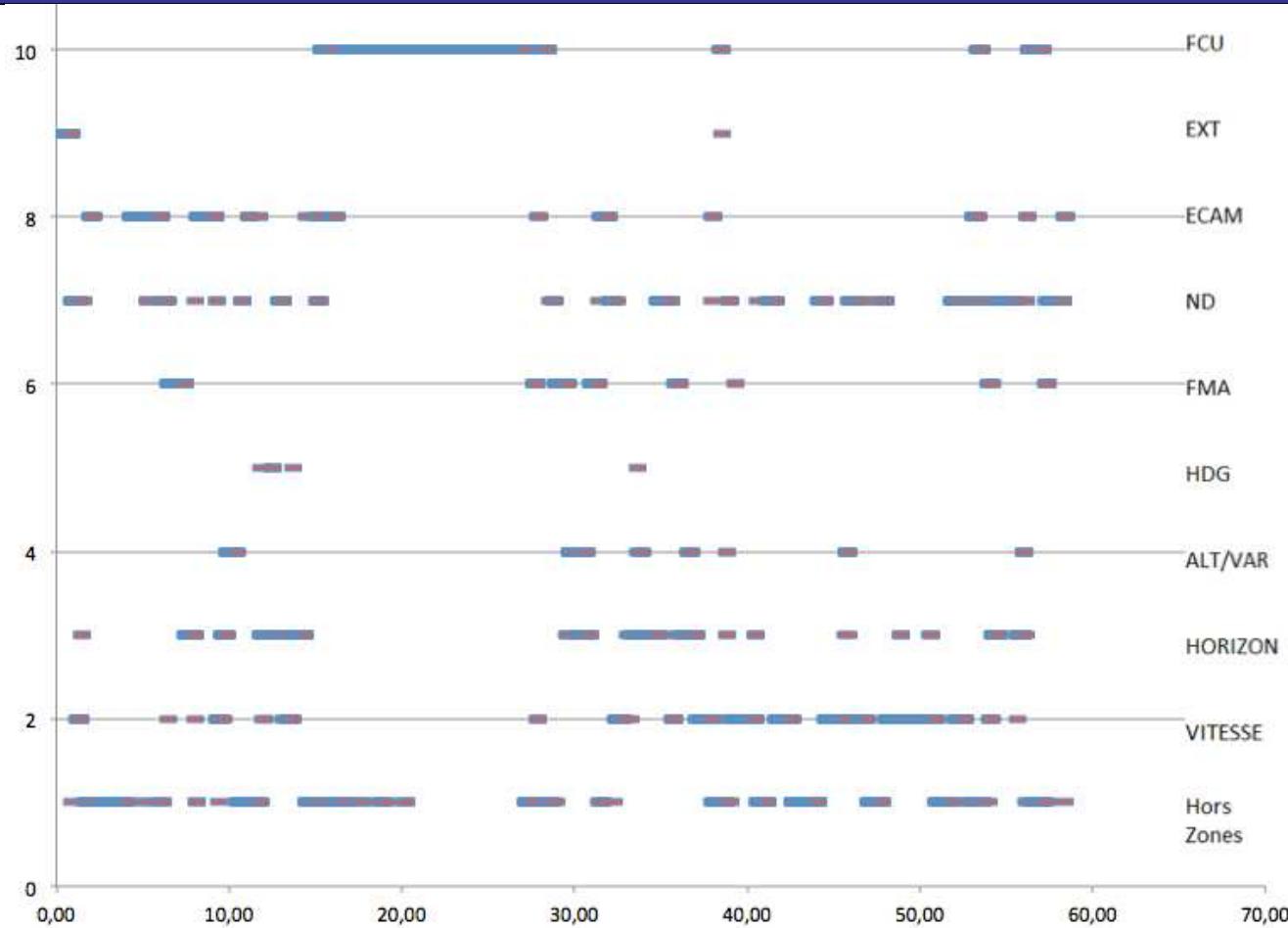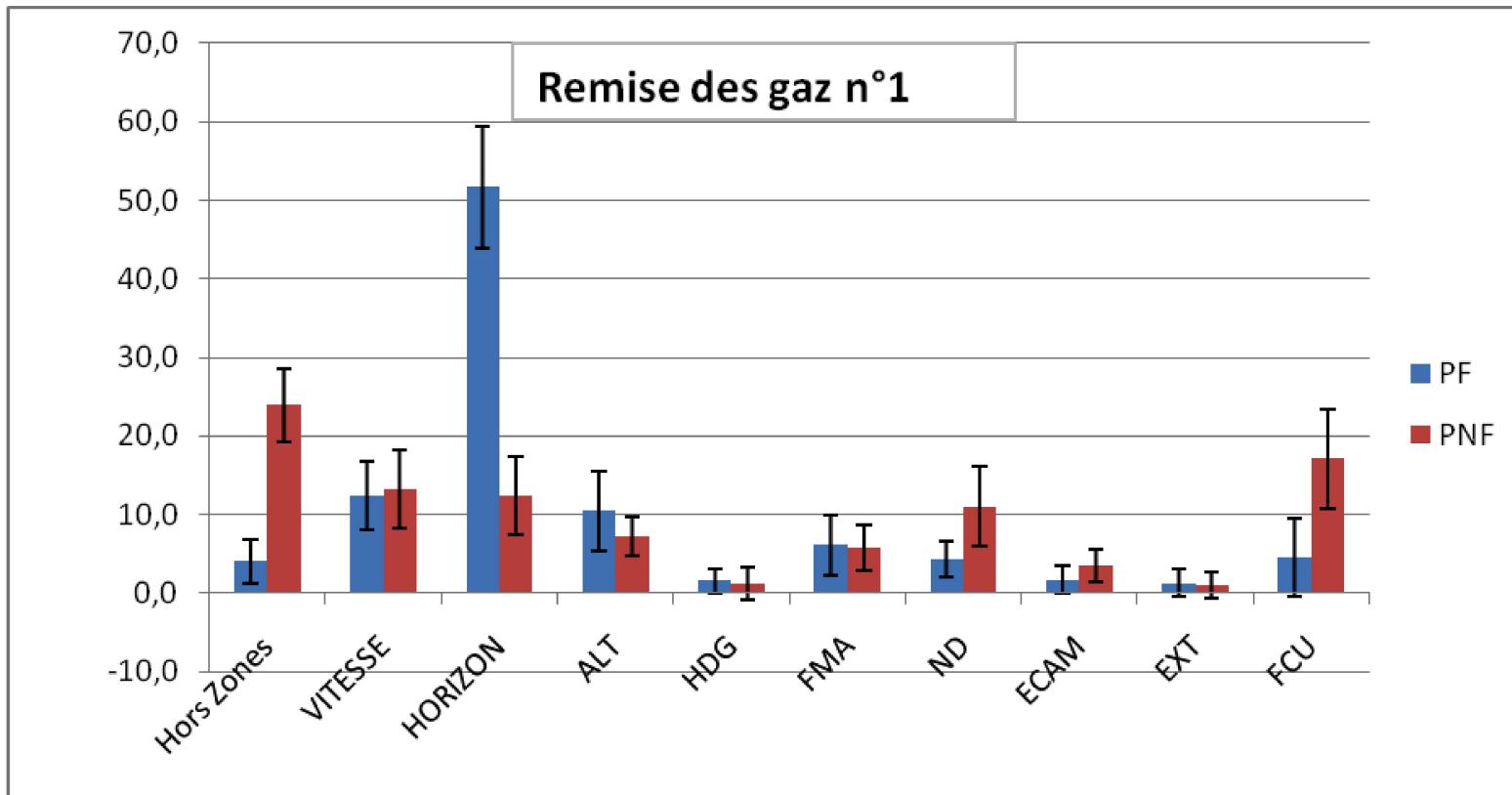
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➢ **Results :**

Remise des gaz n°1

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➢ **Results :**

Remise des gaz n°2

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➢ **Results :**

Remise des gaz n°3
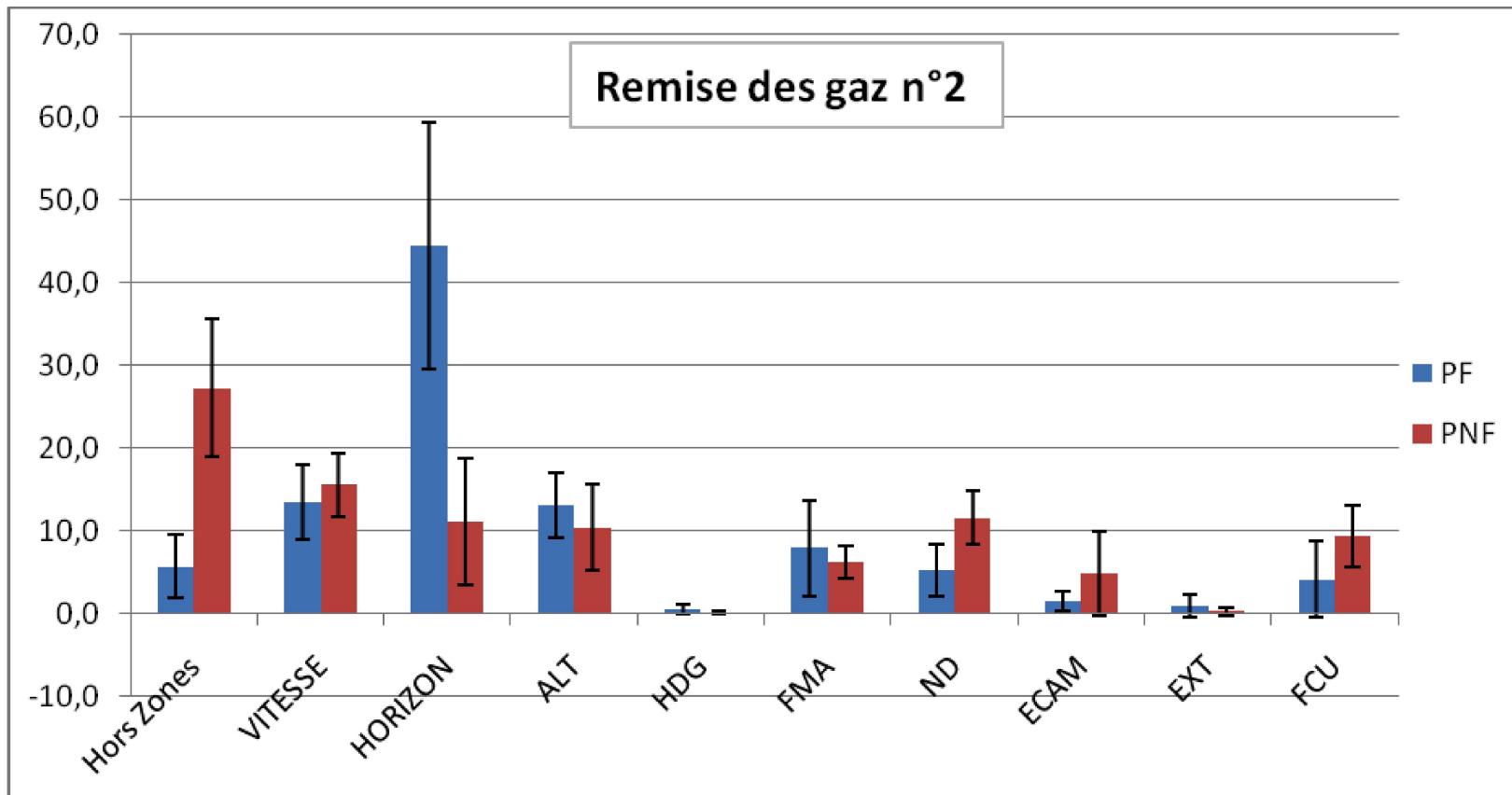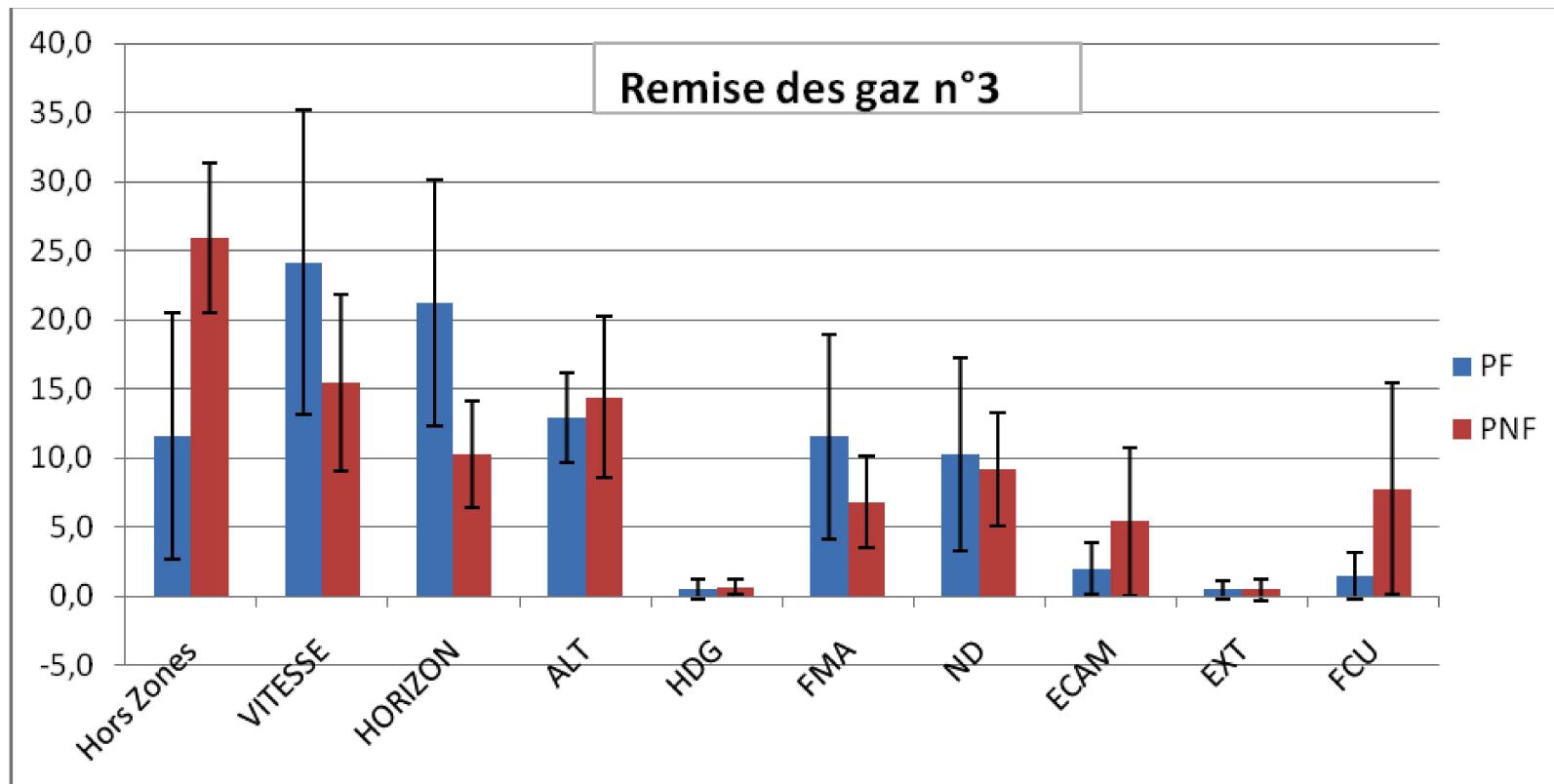
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- ✓ Go-Around #1 duration:
    - from ATC clearance untill the A/C was stabilized (Alt=2500ft, Head= 340o)
    - Mean duration: 1'07'' on Boeing - no overshoot

- ✓ Feedback from crew: "very surprised"

- ✓ No Crew performed GA maneuver as strictly defined by SOP
    - correct actions but in the wrong order
    - limited CRM (lack of communication, cross check/monitoring)

- ✓ Trajectory: 7 crews: 20-30'' to start dialing the MCP (alt, head) 3 crews: immediate actions but wrong MCP dialing

- ✓ Altitude overshoot, wrong lateral trajectory

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SIMULATIONS/EYES TRACKING

- ✓ TIME and surprise make the GA difficult to perform

- ✓ Difficuties when Full thrust/TOGA versus Time.
  - ▪ Limited Thrust help the crew

- ✓ NO PNF/PM visual circuit homogeneity
- ✓ On the contrary, PF visual circuit homogeneity

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SIMULATIONS/EYES TRACKING

✓ FCU/MCP excessive attention

  ▪ PM/PNF to pay 50% of his attention on FCU/MCP + CONF.

✓ FMA not usually read after initial reading

  ▪ Many Automation Reversion modes not fully detected

✓ Excessive focus on some items during GA : precursor of channelized attention?

✓ Downwind information on ND raise concern

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Final report – under review

Recommendations

- ➢ **ATM :** procedure / time vs performance / communication / training
- ➢ **Procedure :** classification, Pitch/Thrust oriented, validation trough visual circuit analysis
- ➢ **Training :** N vs N-1, MCC, Type Rating, flight check, PM monitoring hability, selection and training
- ➢ **Automation:** GA activation error mitigation, TRIM, Thrust limitation, FMA
- ➢ **Simulation** : improvement
- ➢ **Video Recording :** A/C and Simulators
- ➢ **Study to be launched:** CRM, tunnelling, …

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