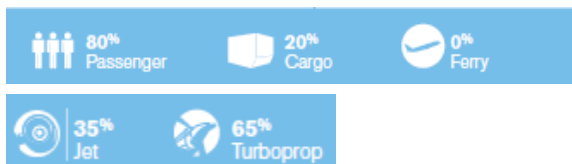
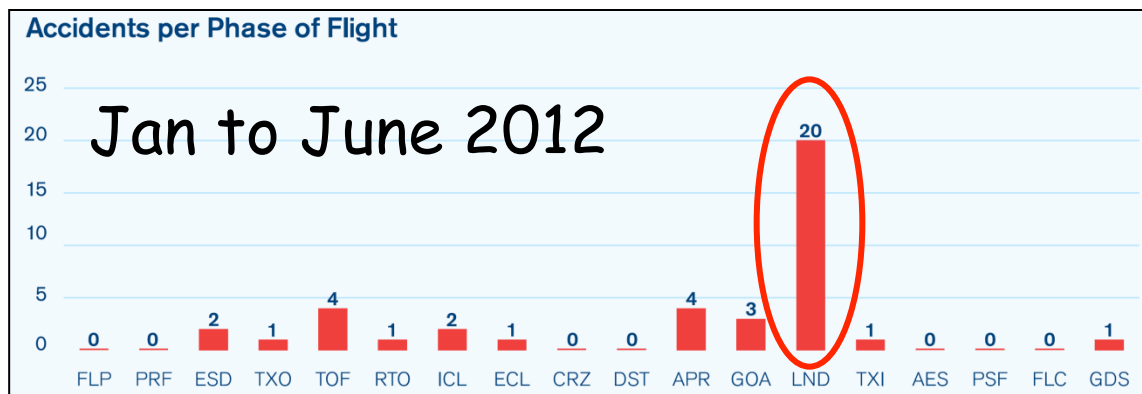
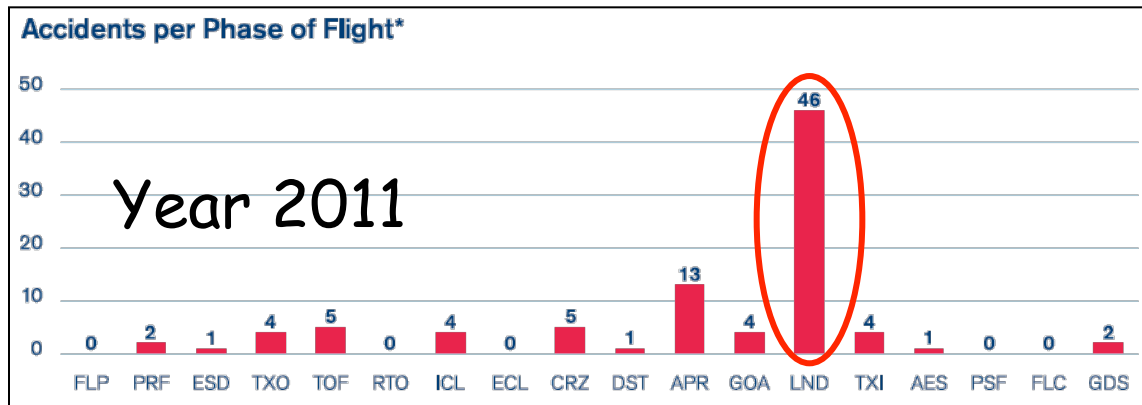
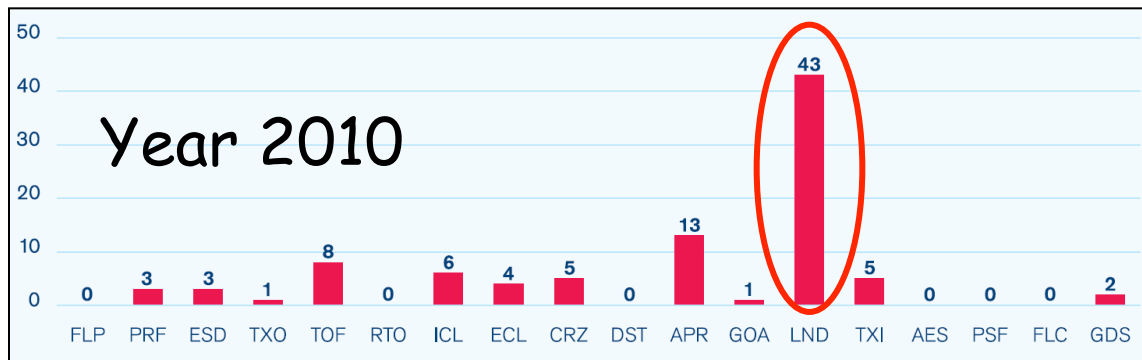


Go around manoeuvre

How to make it safer ?

Capt. Bertrand de Courville

LOC I Workshop 2012 – Salzburg



European Action Plan for the Prevention of Runway Excursions



Edition 1.0



+ IATA Tool Kit
+ FSF Initiatives
+ ICAO Worldwide Programm

The pilot and airline operator's perspective on runway excursion hazards and mitigation options

Session 2 Presentation 1

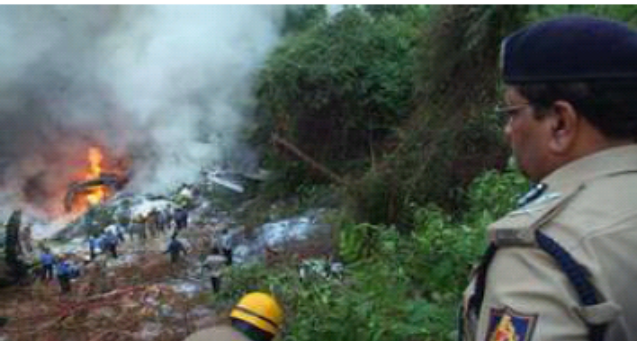
Capt Bertrand de Courville
Regional Runway Safety Seminar
Moscow - 7th November 2012



Preventing Runway Excursion ...



Most of these accidents could have been avoided
with a **better decision making** ...

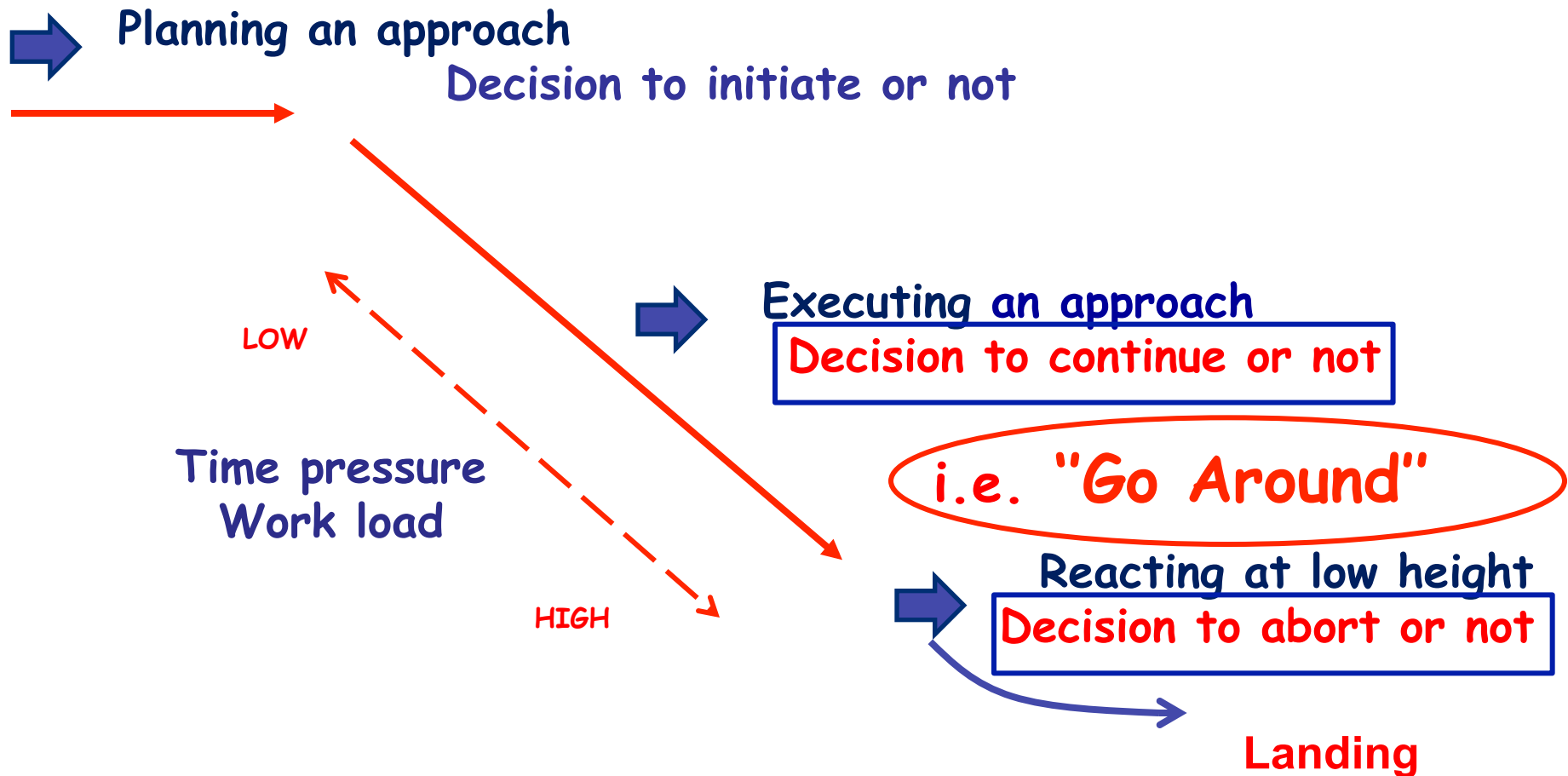


2013 ?
2014 ?
2015 ?

...

Preventing Runway Excursion Decision making

What decision ?



Go around: the maneuver



Potential accident rate reduction : 25%
No other single defense could have this impact

Yes but ...



The level off phase

Level off phase of go around, around the world

❑ **A320 Accident - 2000**

After initiating a **go around at night** over the sea, at 1000 ft the pilot flying kept a **prolonged pitch down input** resulting in a dive which was **not recovered**. The amplitude and duration of the initial reaction to a GPWS "pull up" warning was insufficient (a full back stick input was needed).

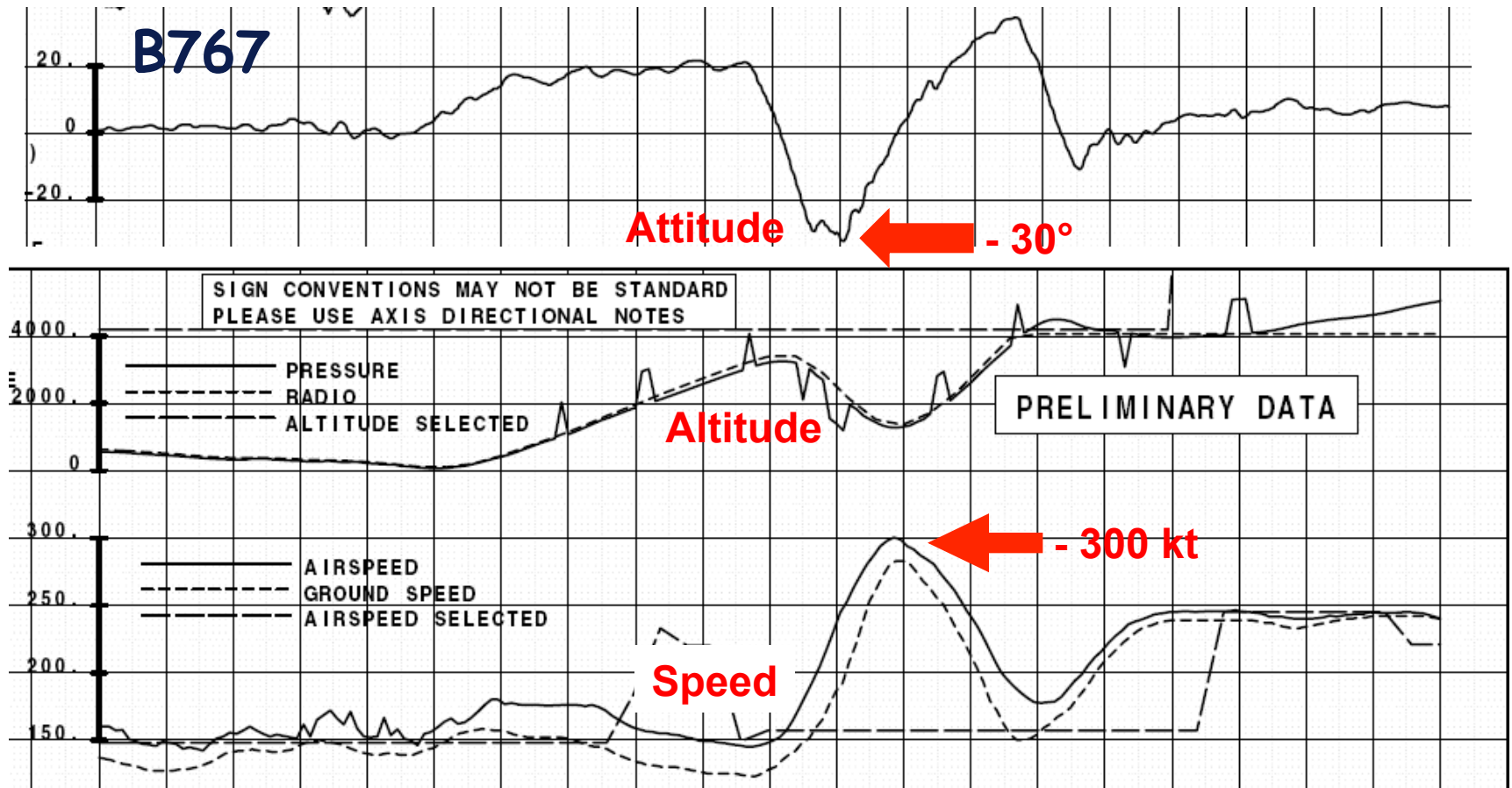
❑ **B757 Incident - 2002**

After initiating a **go around in IMC**, while reaching 2500 ft the PF kept a **prolonged pitch down input** resulting in a dive until an extreme negative attitude (-40°) which was **recovered**. "*(...) when we suddenly got the altitude capture commands from our FDS, when both of us were mindset for a go-around, we became confused and later on the unbelievable nose down pitch attitude, we became even more confused.*"

❑ **A330 Incident - 2007**

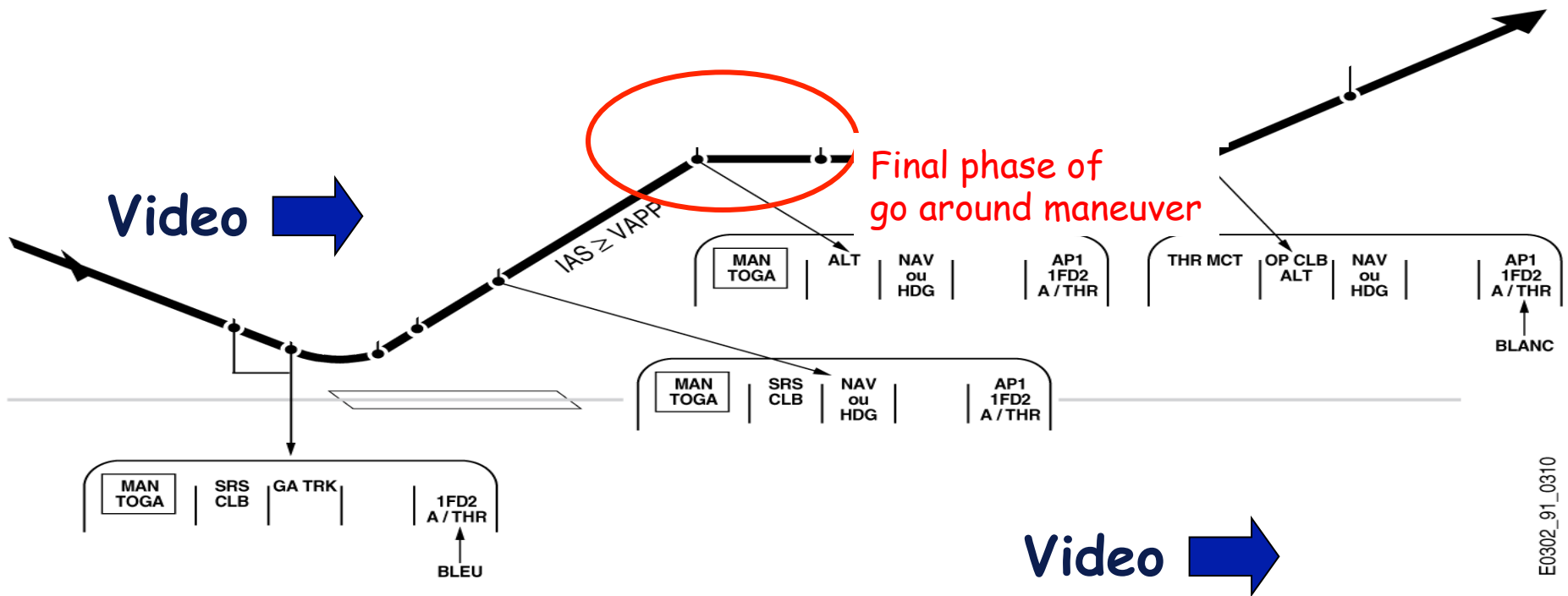
After initiating a **go around at night** over the sea, the altitude capture mode activated, the pilot flying pitched down to level off. The IAS increased towards VFE. Instead of keeping a leveled flight path, the pilot flying kept a **prolonged pitch down input**. Attitude reached -9° , vertical speed 4000ft/mn. The GPWS activated and the climb was resumed. The minimum altitude was 600 ft over the sea. The total duration: about 15 seconds

How many severe events ?



Level off phase

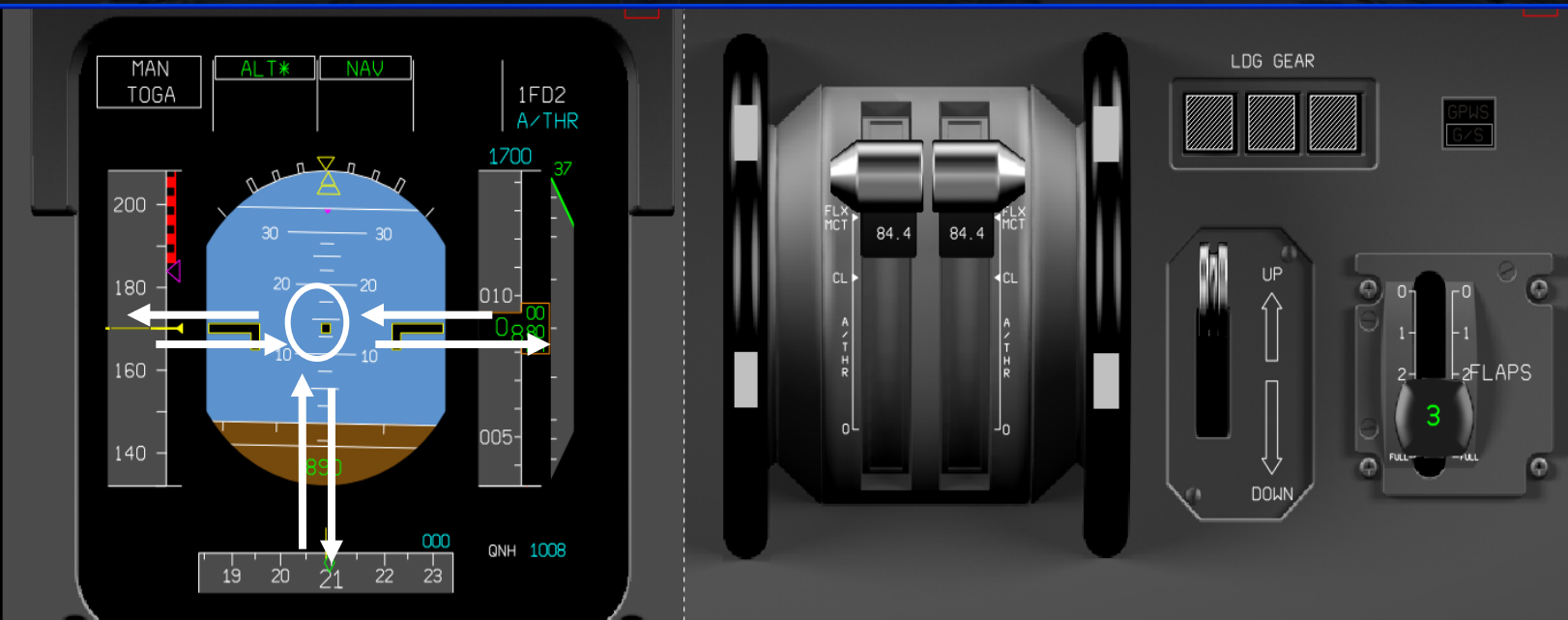
Somatogravic illusion & Spatial disorientation

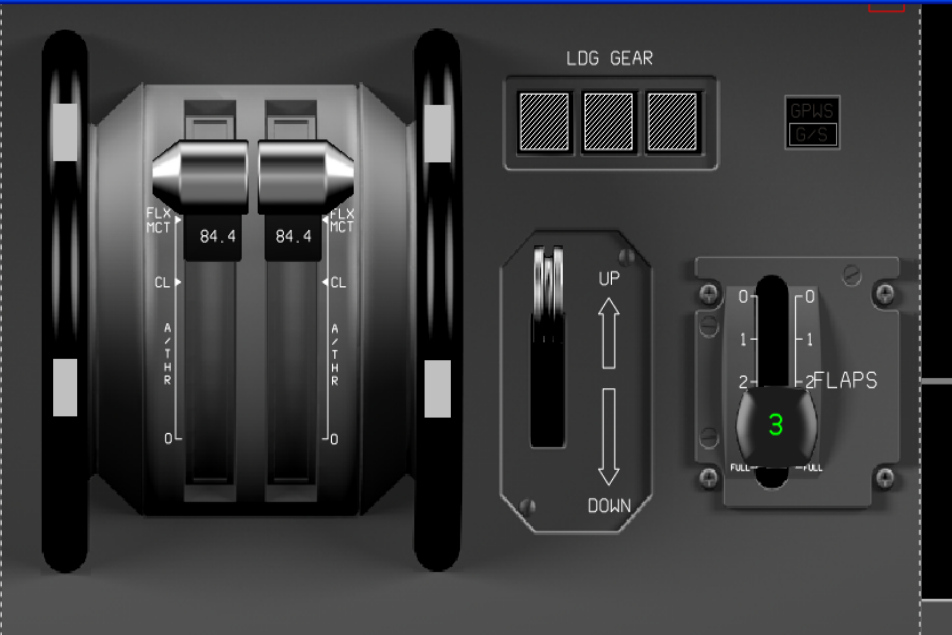
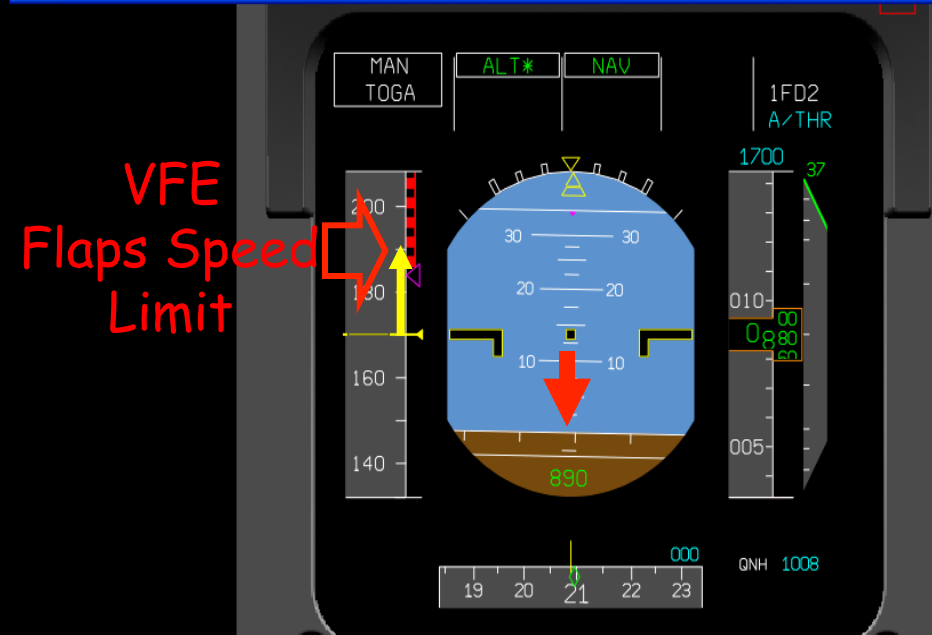


Keeping control of aircraft attitude & flight path

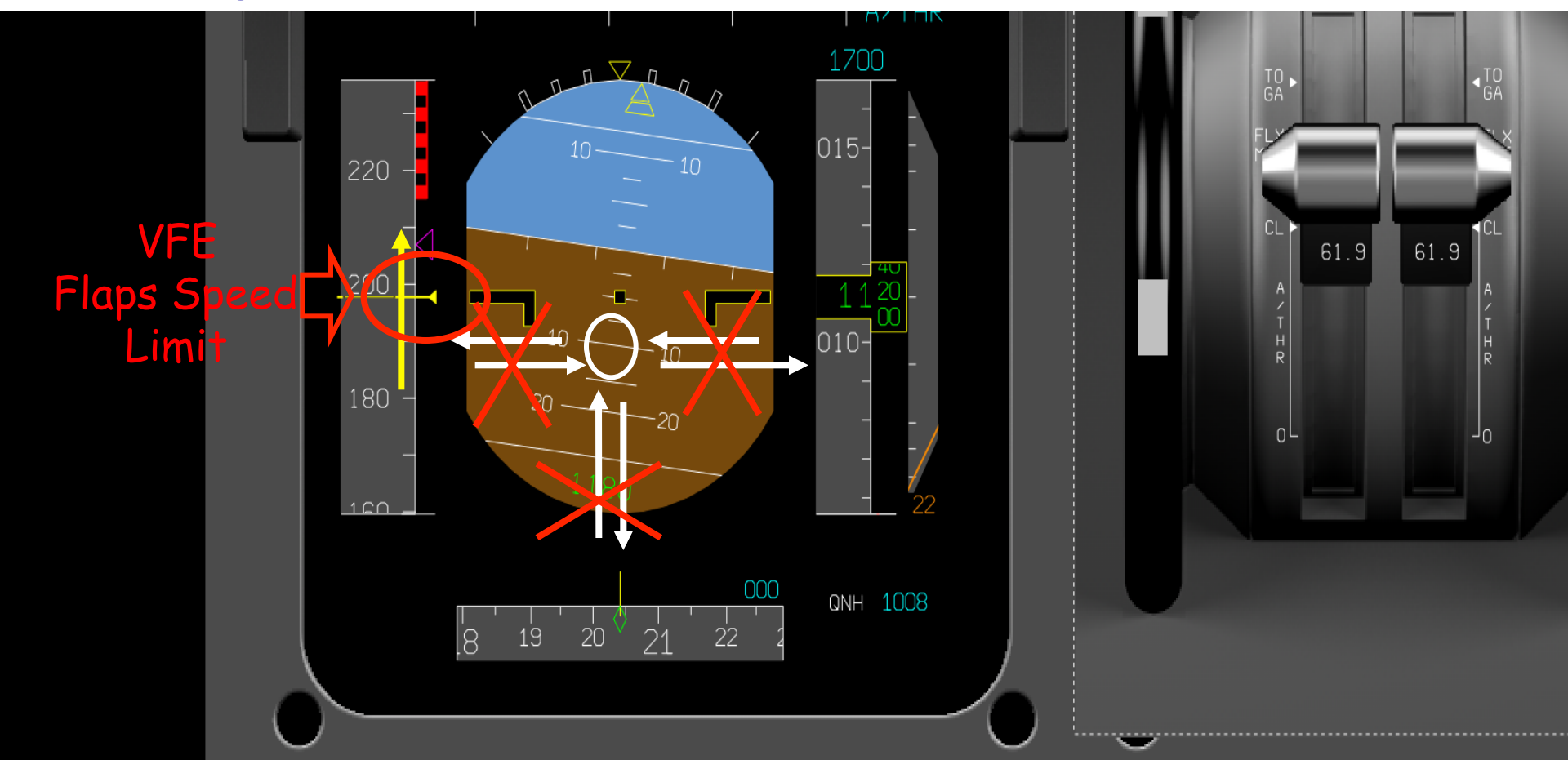
Basic IFR 'T type' instruments scan pattern

PFD design has made it easier but central vision is still needed. Eye scan pattern is still necessary.

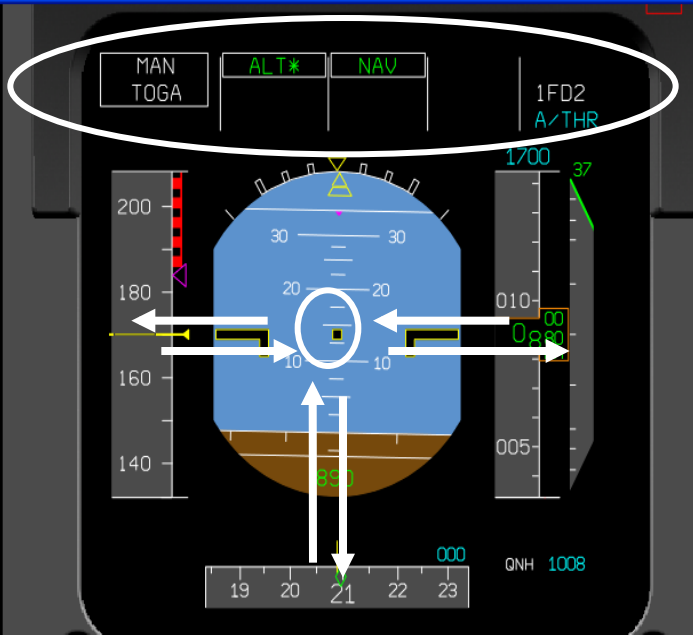




IAS increasing quickly towards VFE red band has a powerful attracting effect with very significant cognitive consequence, including a break down of the eyes scan pattern. Simultaneously, somatogravic effects due to longitudinal acceleration 'erase' the perception of the descent while maintaining the perception of a leveled flight path. Situational awareness was lost.



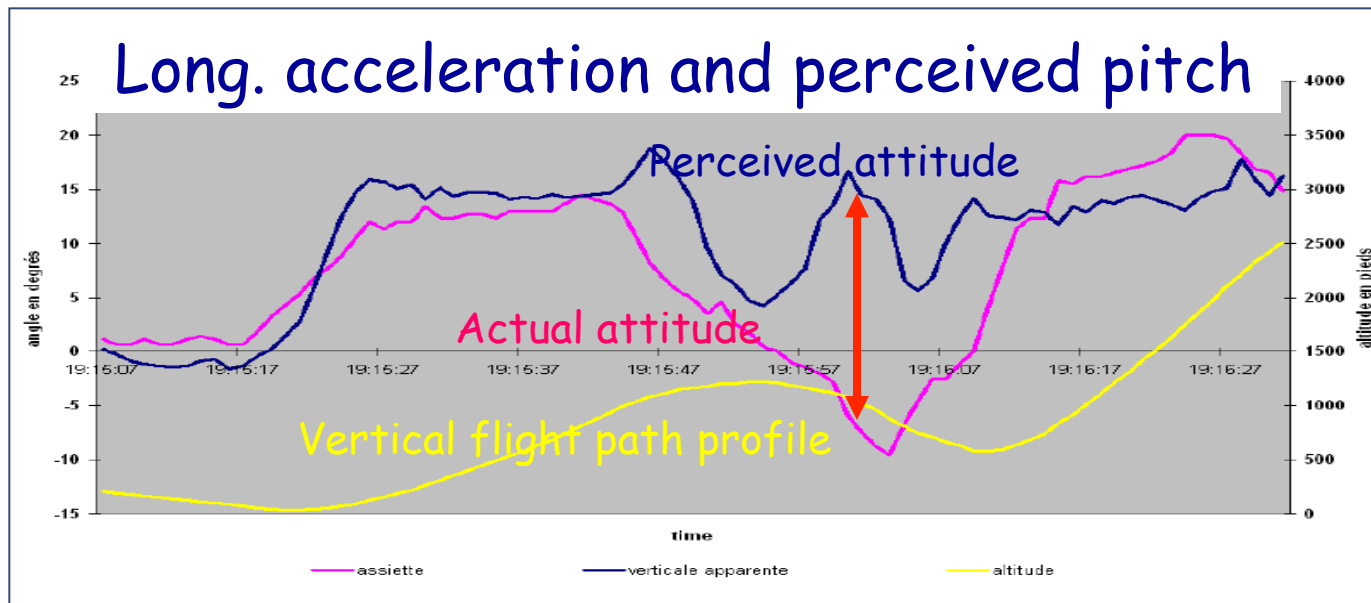
To a lesser effect, FMA reading (central vision) in a very dynamic phase has a 'cognitive cost'. While very important, it may alter the basic eyes scann pattern, flight path monitoring and control in IMC or at night ...



Go around maneuver

Spatial disorientation in IMC or at night

- ✓ Degraded instrument scanning is an opened door to “somatogravic illusion”, spatial disorientation and important pitch down input.
- ✓ Therefore the effect of somatogravic illusion should not be considered as the initial cause of this type of LOC incident/accident.
- ✓ The robustness of pilot eyes scan pattern in dynamic phase is where the safety efforts should be placed.



Go around maneuver

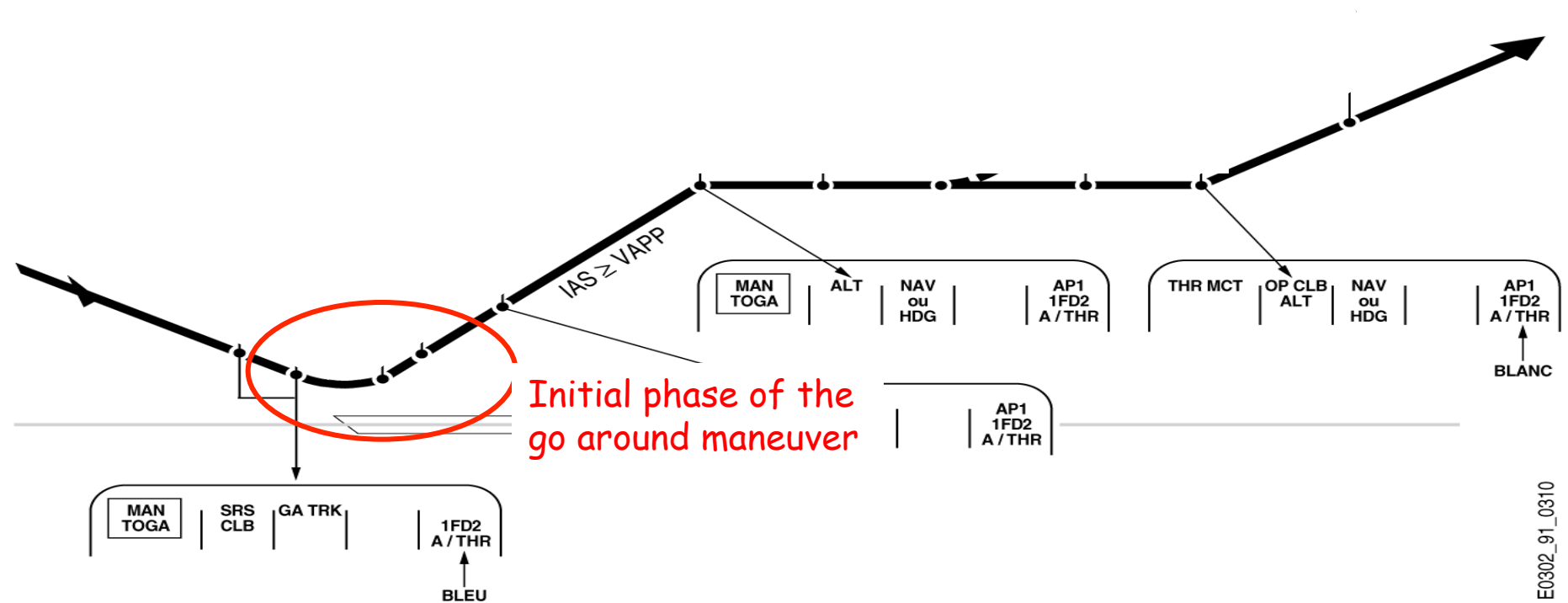
Spatial disorientation in IMC or at night

❑ Cockpit Scan and Loss of Situational Awareness *by Capt. John Ford and Cdr. Andy Bellenkes*

"This error [cockpit scan breakdown] has caused (...) spatial disorientation and numerous problems associated with loss of situation awareness .

Considering how critical an effective scan is, it is surprising that the development of a good set of scan patterns is not given high priority during training; especially since one of the most commonly cited forms of visual problems associated with mishaps is the breakdown in cockpit scan; (...)"

Initial phase of Go Around Case study



Initial go around phase occurrence

Thrust/Trim/Speed unsafe combination

See Bournemouth AAIB investigation report
 Shared issue with wing mounted engines

Nose-High, Wings-Level Recovery Techniques

- Recognize and confirm the situation
- Disengage autopilot and autothrottle



Extracts from: **Manufacturer's Upset Recovery Training Aid**

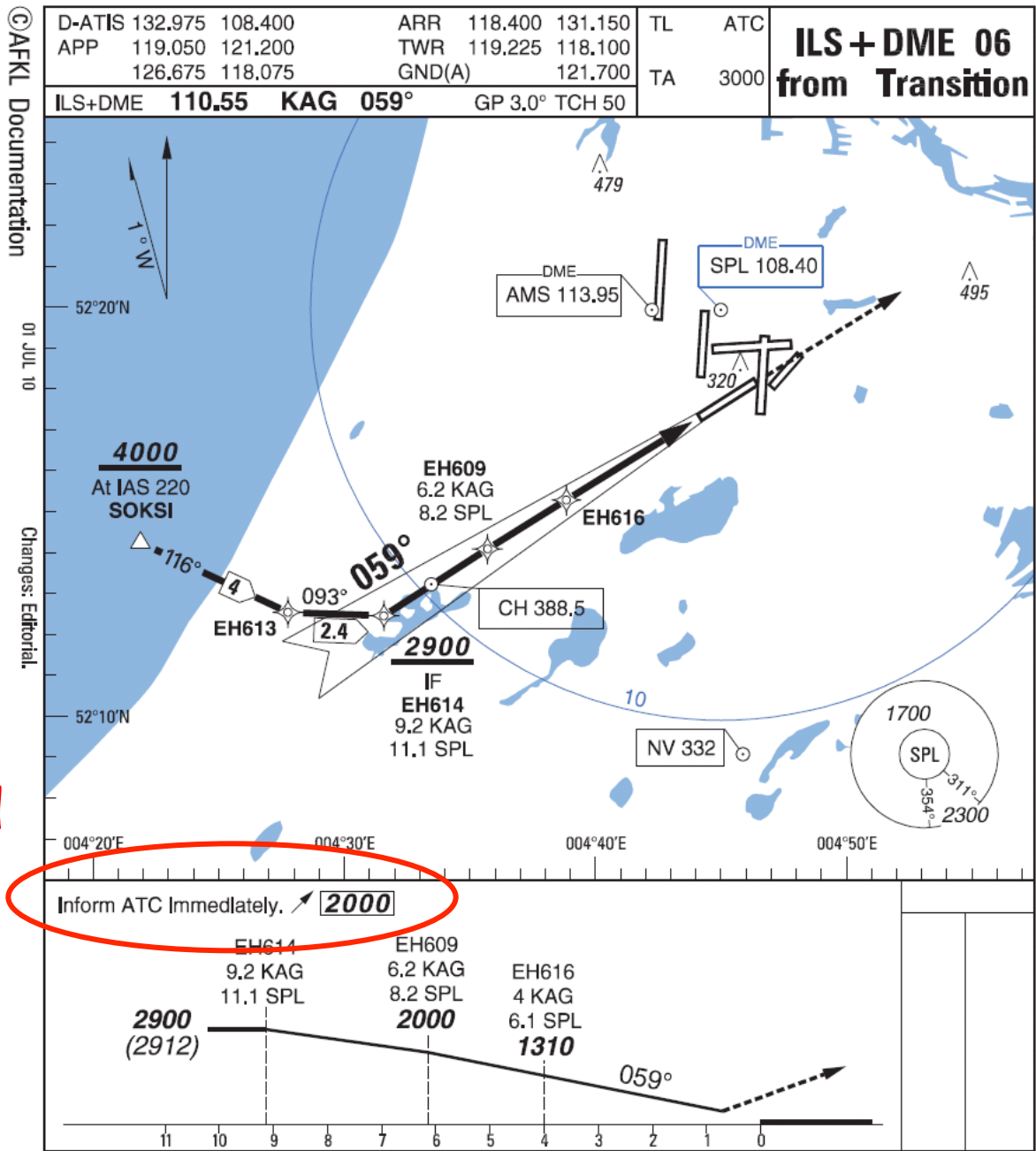
Go around manoeuvre: the context

❑ Operational aspects

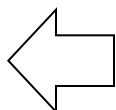
- Low altitude, low speed sometimes very close to the ground
- Reduced margin, little time to react in case of deviation
- Simultaneous changes of: attitude, thrust, flight path, aircraft configuration, trim balance, ATC clearance

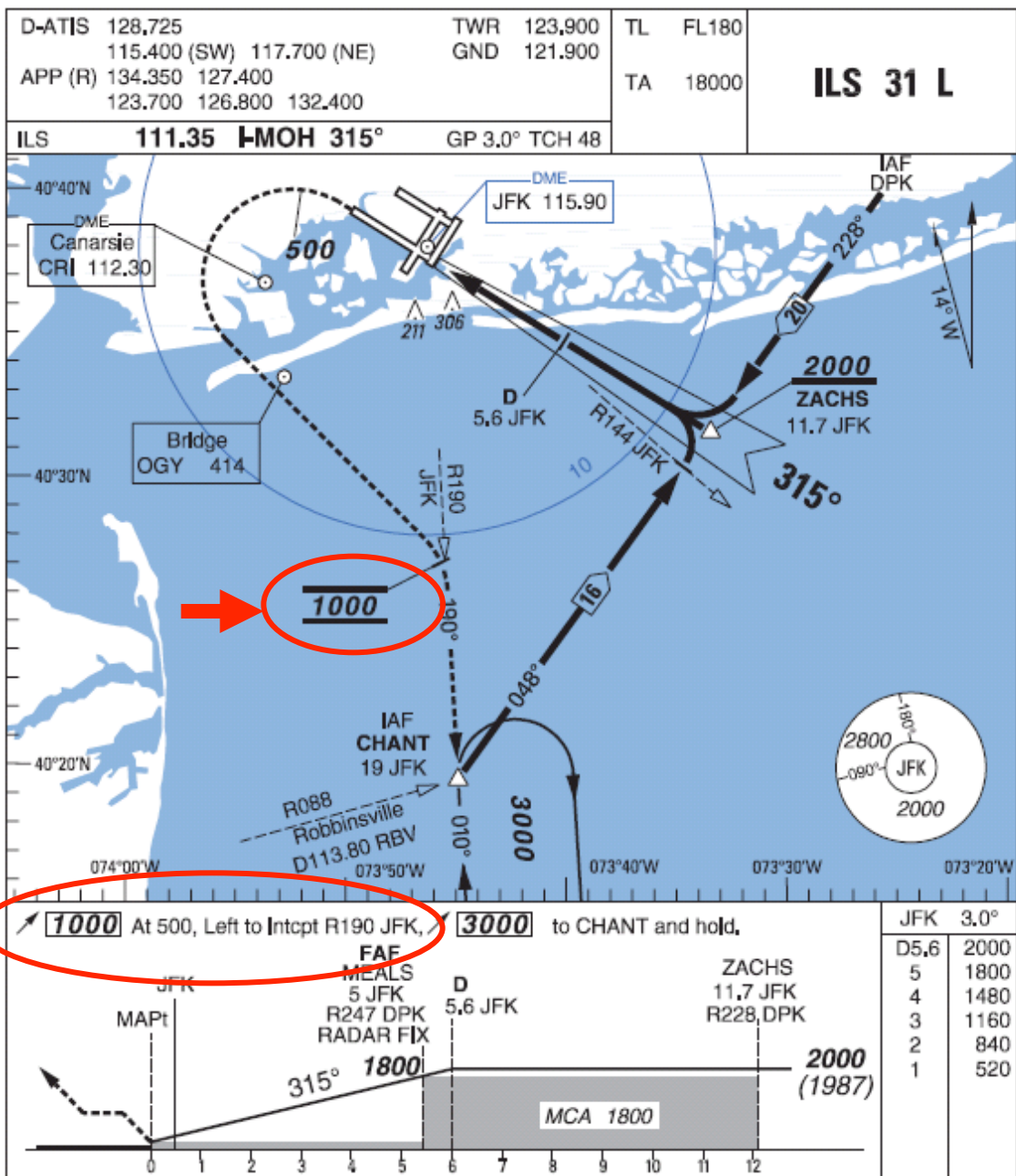
❑ Human performance aspects

- Sudden and total change of action plan
- Multiple actions to be performed, monitored and checked
- Automation mode changes to be read, checked and called
- Cockpit communication: standard call outs
- ATC expectation and intervention during GA
- Somatogravic illusions
- Passengers preception



Immediate mandatory ATC call in case of Go around

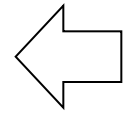




Go Around level off height at JFK ILS runway 31L

Easy to fly with a DC3. not any more with a B777 or a A380

KJFK/JFK



Go around manoeuvre

Initial phase

Pilot proficiency perspective

❑ Aircraft handling

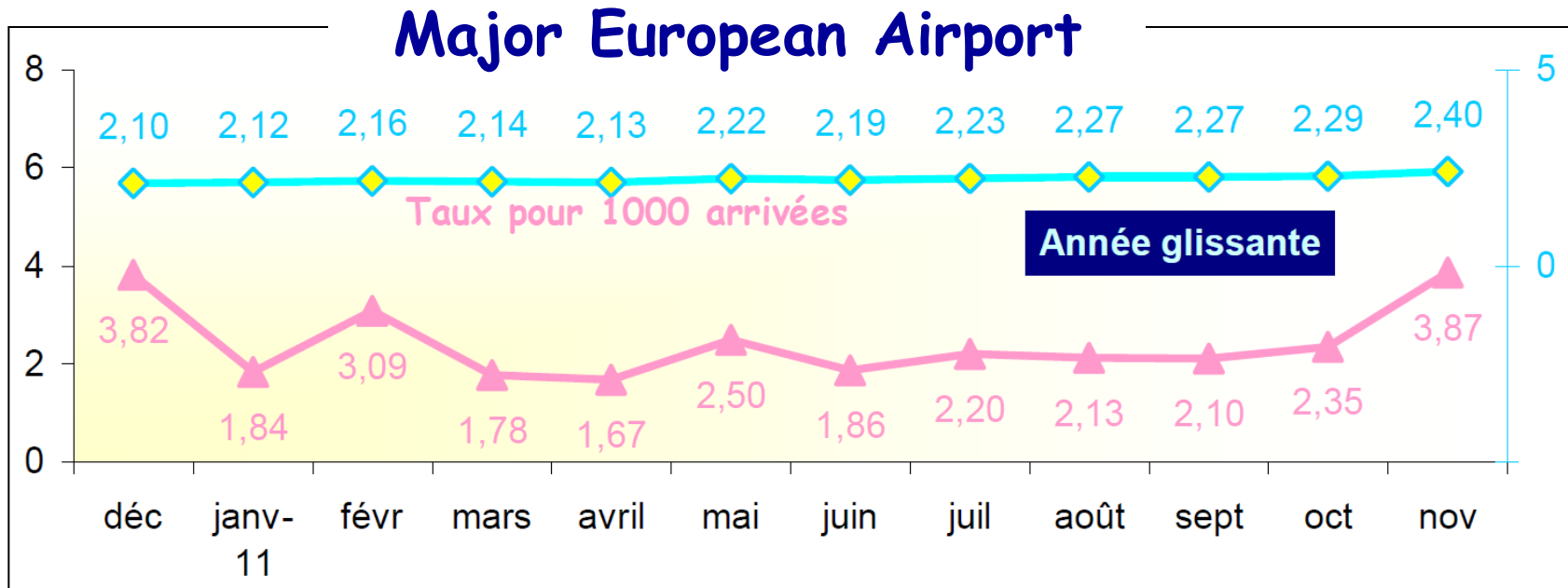
- Rarely performed in real
- Mostly trained from DA/MDA with one engine out
- Implicit pilot concern about cabin confort/perception
- Thrust/Speed/Trim combinations to be controlled

❑ Automation

- Cockpit instrument scan including **FMA reading/checking**
- Awareness of automation modes changes through central vision with high cognitive cost of reading FMA messages
- Weaker pilot cockpit instrument scan performance of today's pilots due to “Follow the FD” effect (flying the ‘FD’ iso ‘Attitude’)

Prevention perspective

Go around: facts and data



- ❑ All airports: 1 to 2 go around per 1000 arrivals
 - 1 every year for short range pilots
 - 1 every 5 to 10 years for long range pilots

Use of Flight Data Monitoring

How do we monitor Go Around maneuver ?

- Automation mismanagement (use of TOGA mode)
- Aircraft mishandling (pitch, rotation rate and vertical speed versus height)
- Soft GA** (to be prevented) whenever, for more than 10s Pitch is $< 10^\circ$, or V_z is < 1500 ft/mn regarding the height

Red Events: Soft between 50ft and 1000ft or, NoTOGA mode below 1500 ft or, Pitch $> 19^\circ$

Go around maneuver

Ways of improvement

- ❑ **Instrument scan break down**
 - ✓ Identify the source of scan breakdown
 - ✓ Set prevention strategy from the conclusions

- ❑ **Training**
 - ✓ to prevent & manage critical thrust/trim/speed combination
 - ✓ to execute go-around satisfactorily from various and power and altitude difference from altitude capture
 - ✓ to "resist" to eyes scan break down in dynamic phase

- ❑ **Operational monitoring (part of SMS related to LOC risk)**
 - ✓ FDM: are go around flown correctly in your fleet ?
 - ✓ Monitor, take action and monitor again

- ❑ **ATC/Airport/Airspace design**
 - ✓ Simplify go around profile vertical and lateral
 - ✓ Reduce ATC communication during go around



Go around manoeuvre

We can make it safer

