NATS

Performance through Innovation

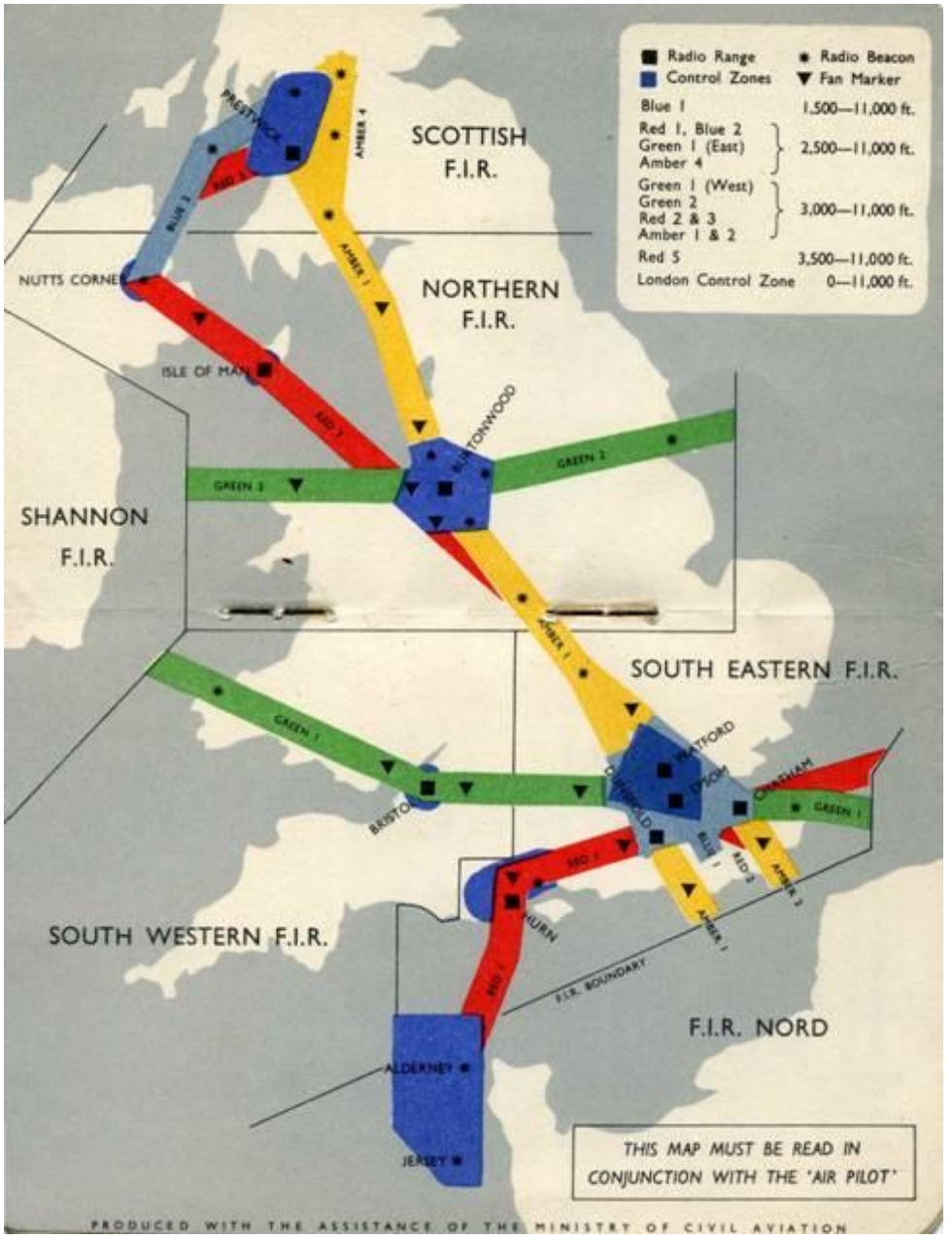
A (Very) Temporary Operating Instruction

Practical Application of a Systems Thinking Approach

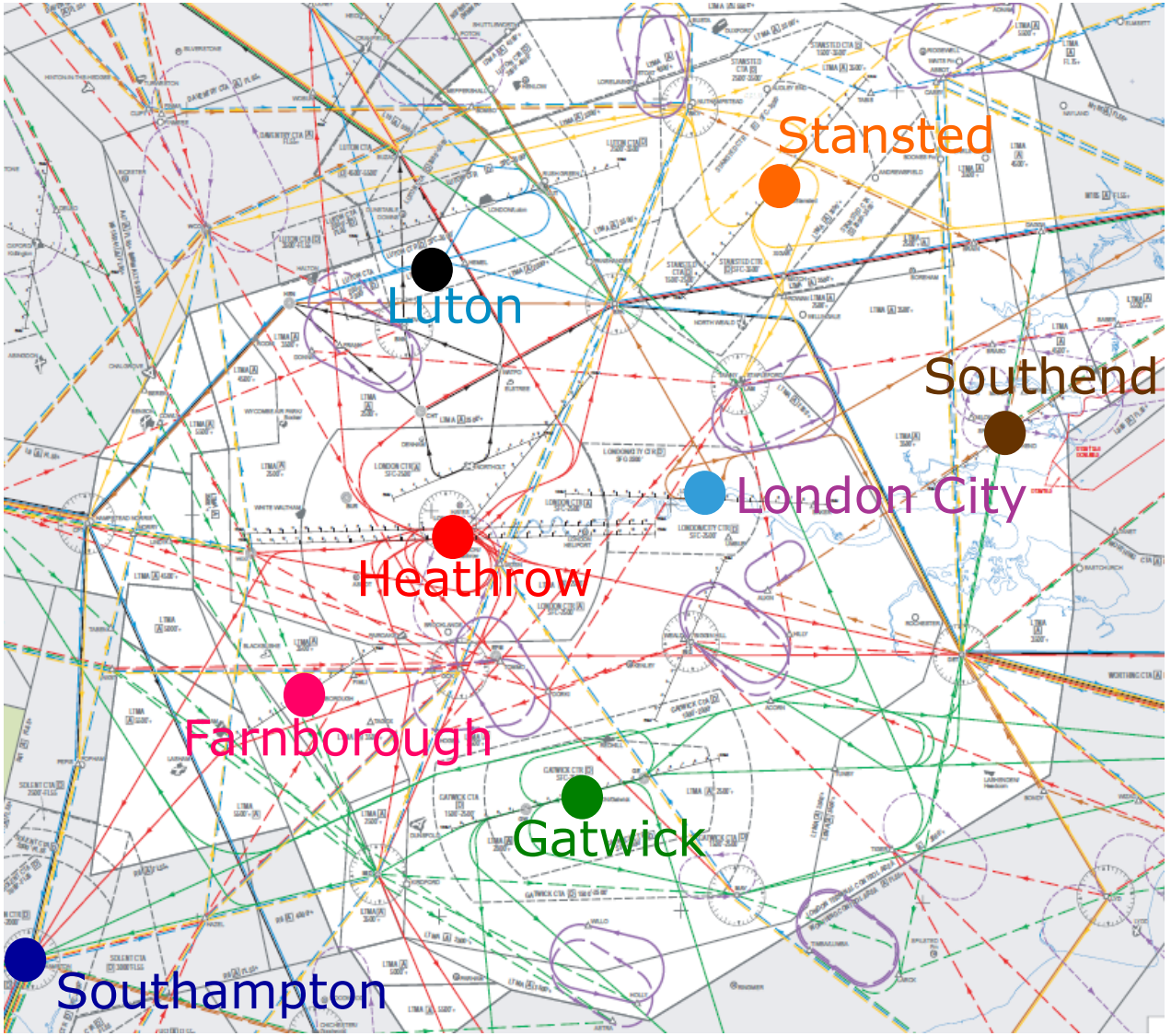
Craig Foster & Lee Boulton

Contents

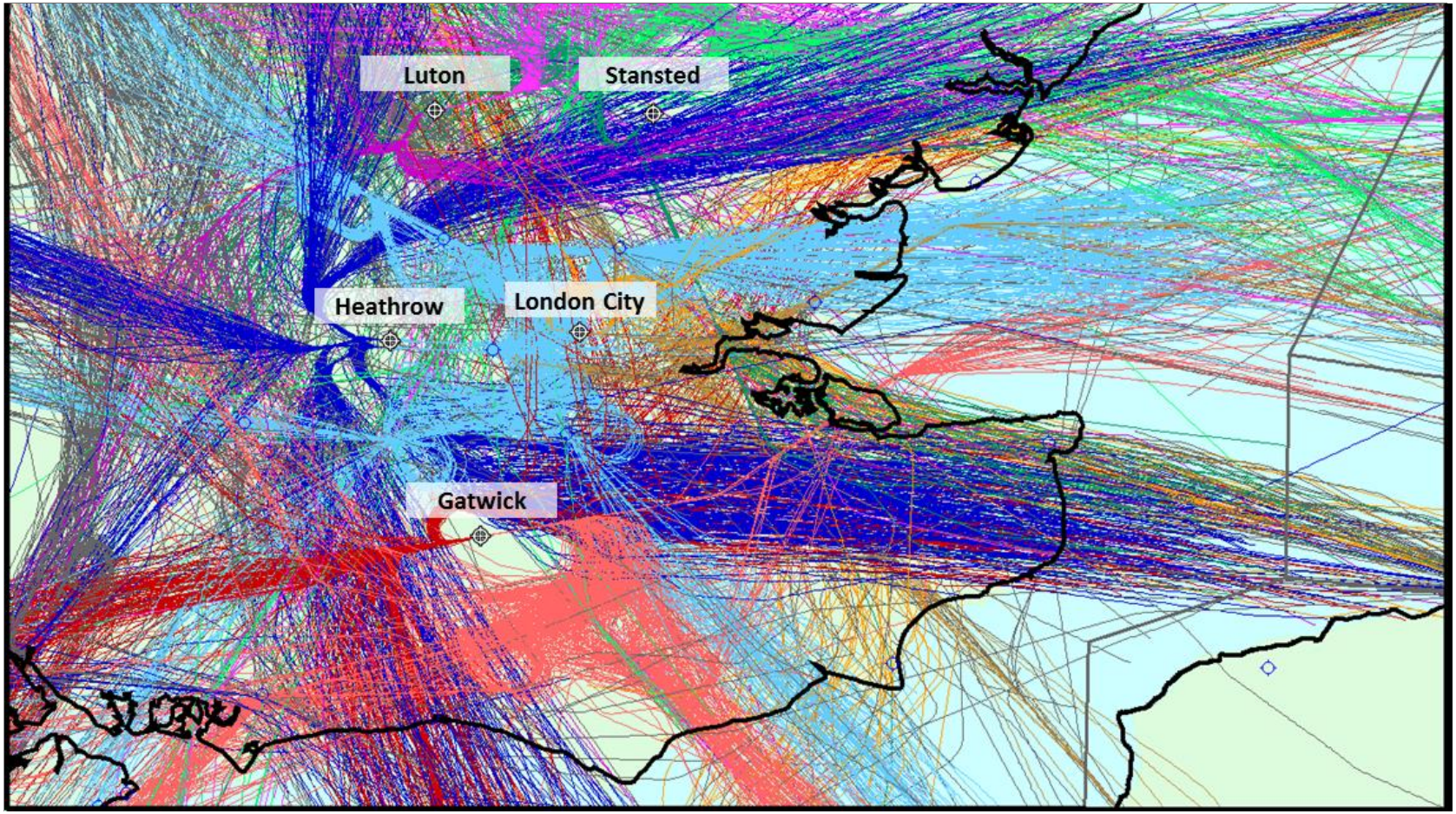
Managing the traffic



Managing the traffic



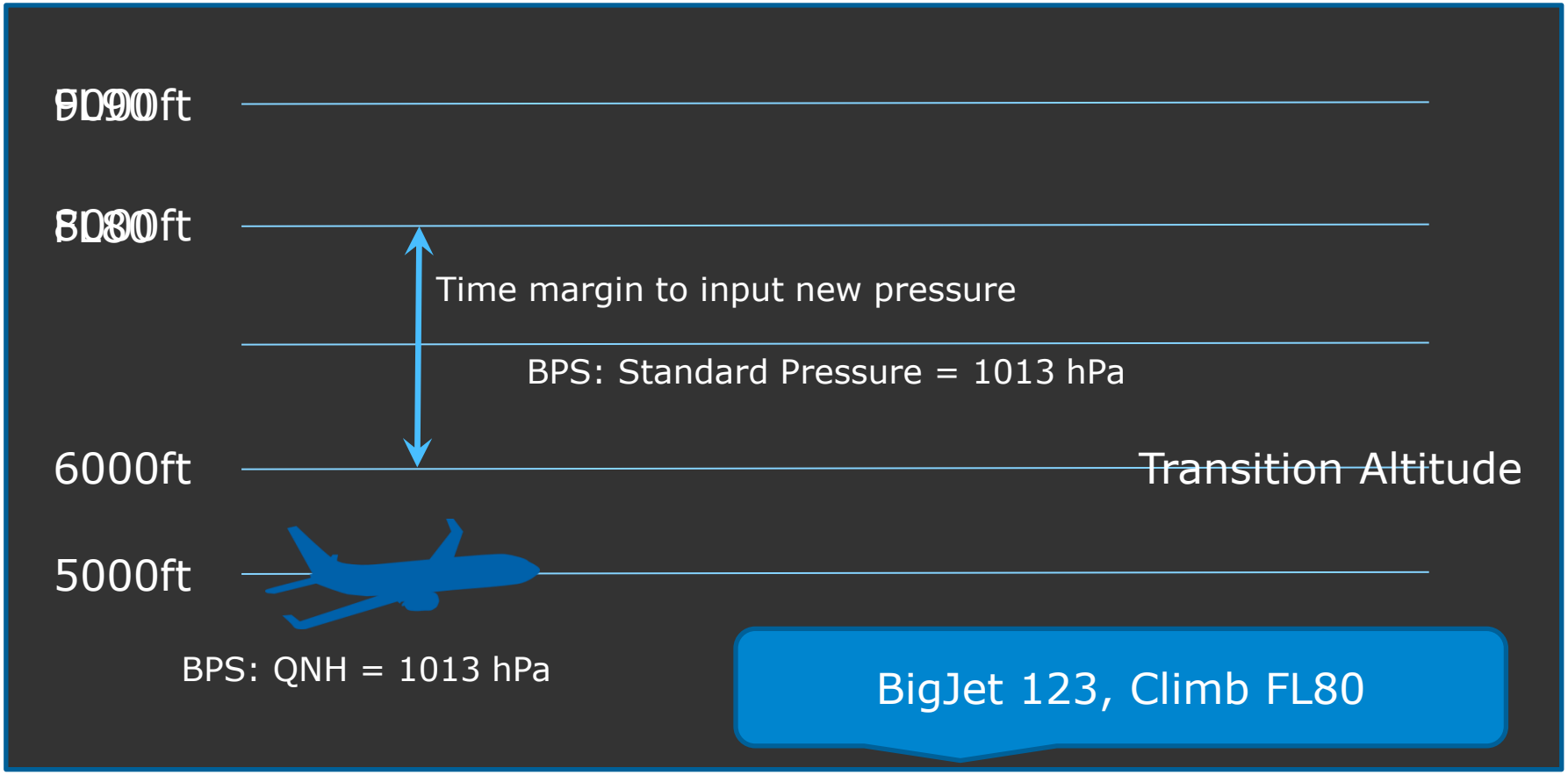
Managing the traffic



Work as done

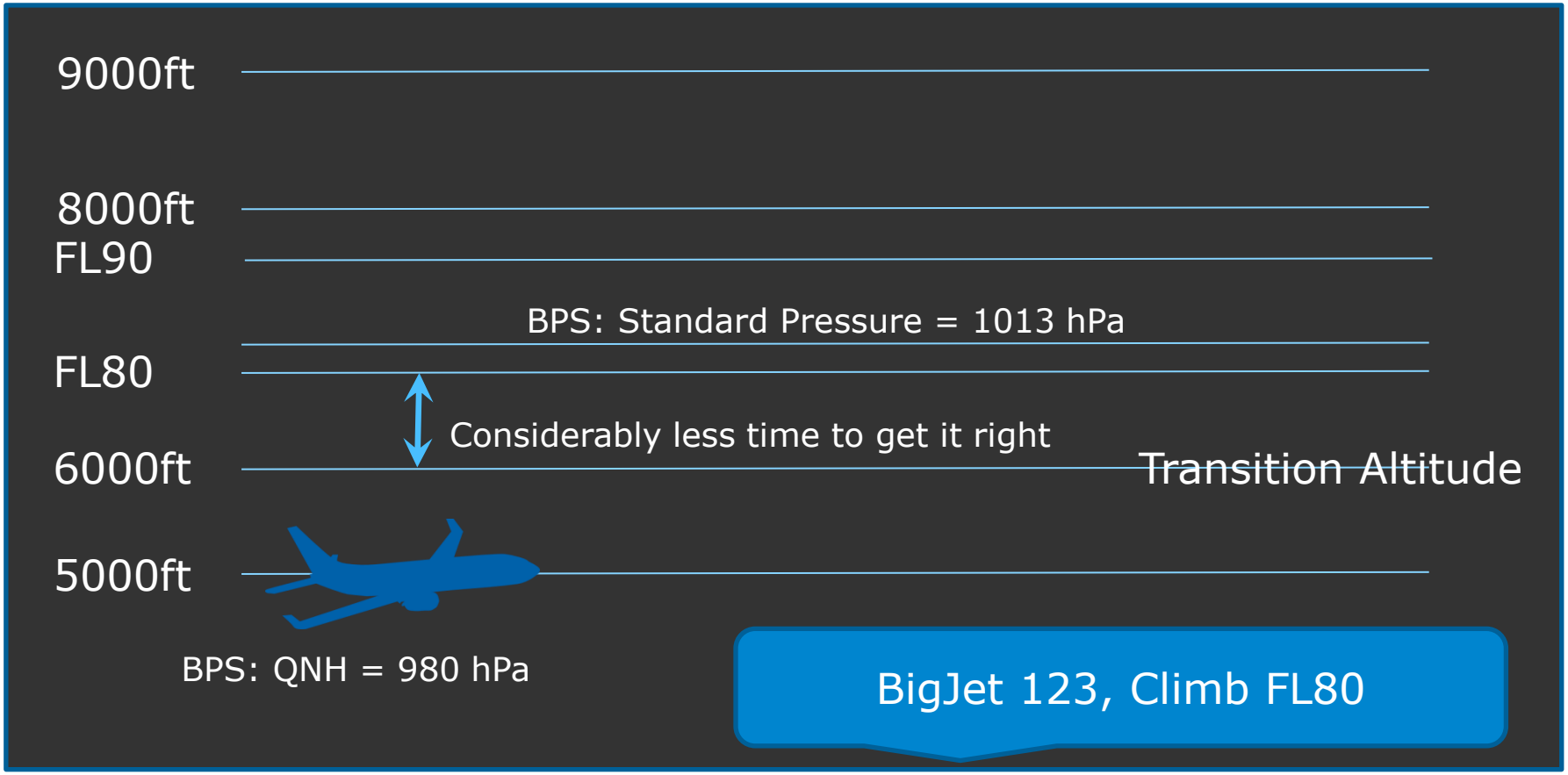
Level Bust - Altimeter Setting Error (ASE)

QNH Atmospheric Pressure = 1013 hPA
Standard Pressure



Level Bust due to ASE

QNH Atmospheric Pressure = 980 hPA
Typical Low Pressure



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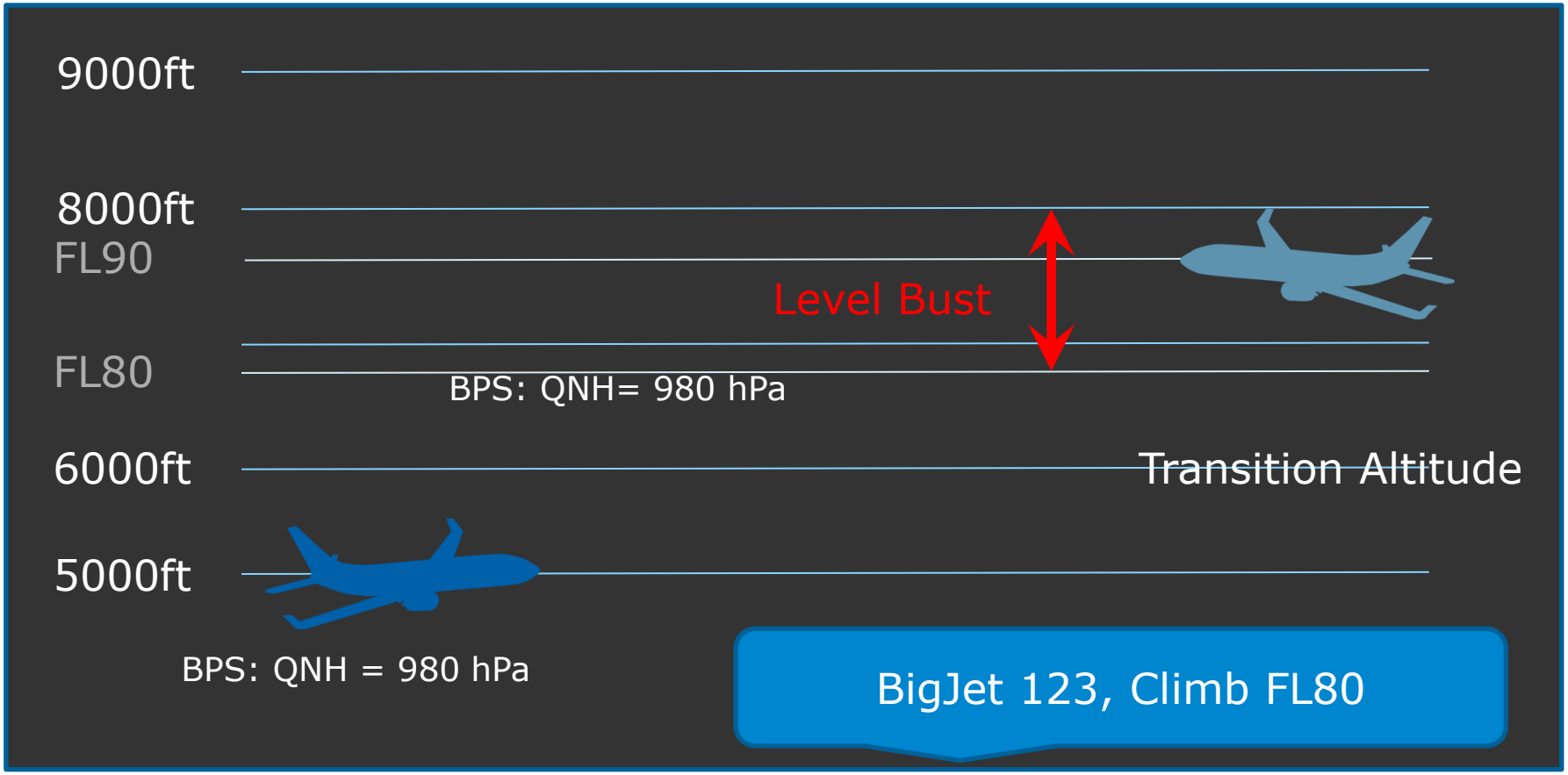
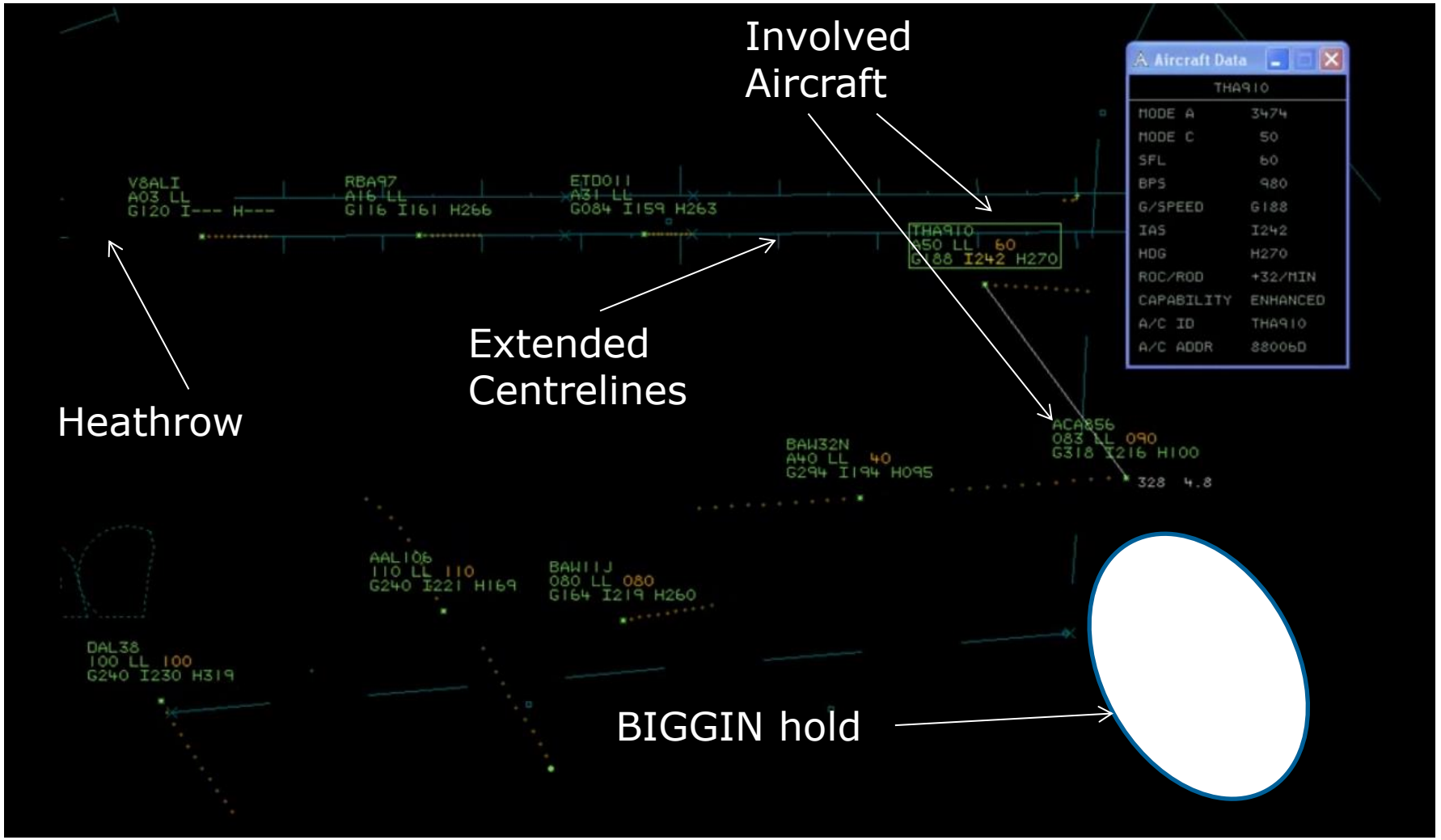


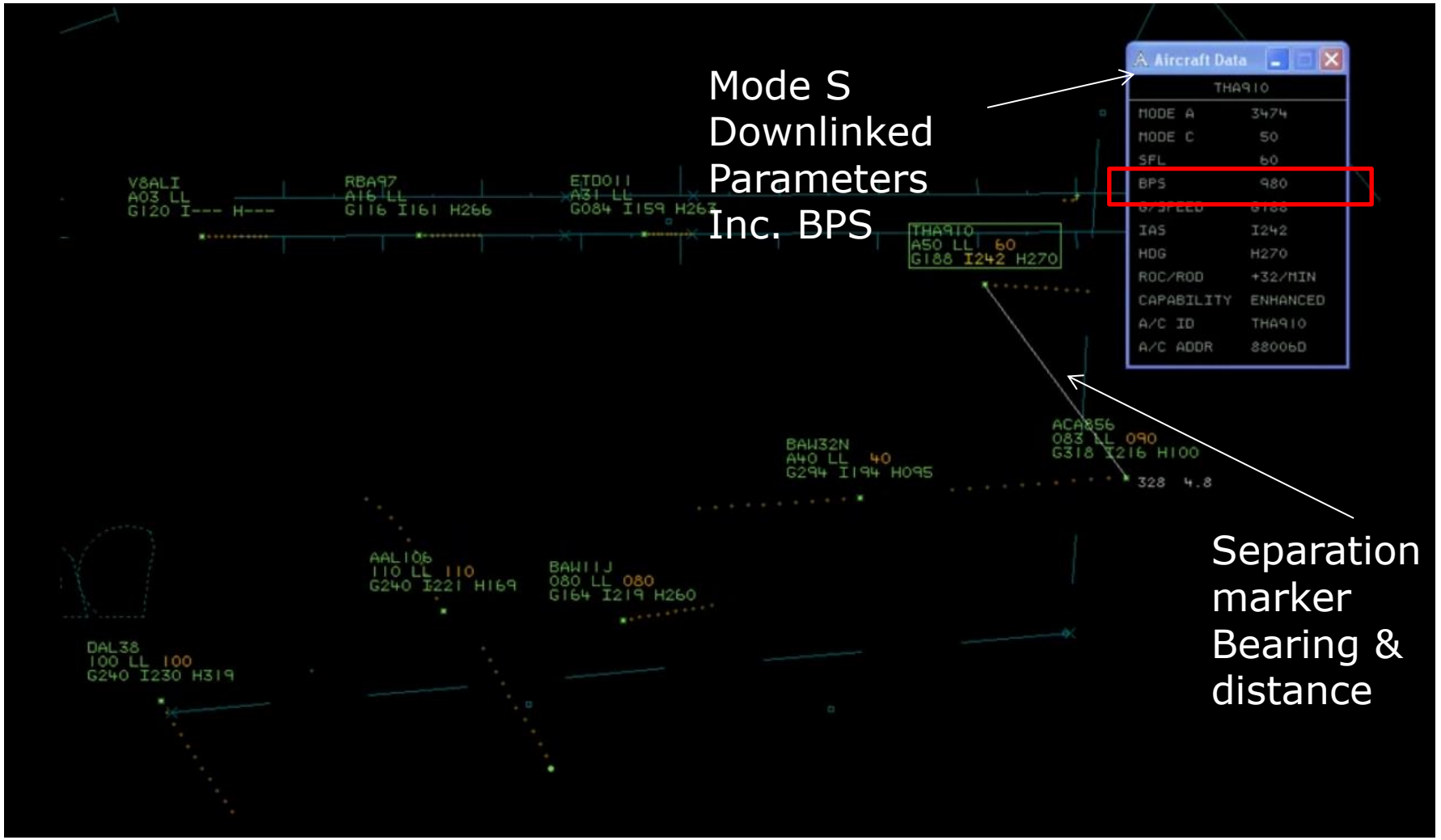
Level Busts in the London TMA - A Real Risk

- A B747 in strong headwind conditions after a long flight
- Low pressure
- Tail end of the night shift
- Morning of the storm nicknamed ‘St Jude’
- 5 go-arounds from 27L in a row
- Both aircraft had gone around within the last 5 minutes and wanted to return to the holding pattern to wait for the weather to improve
- Change of hold, extreme weather and fuel concerns contributed to high cockpit workload

Interpretation 1



Interpretation 2

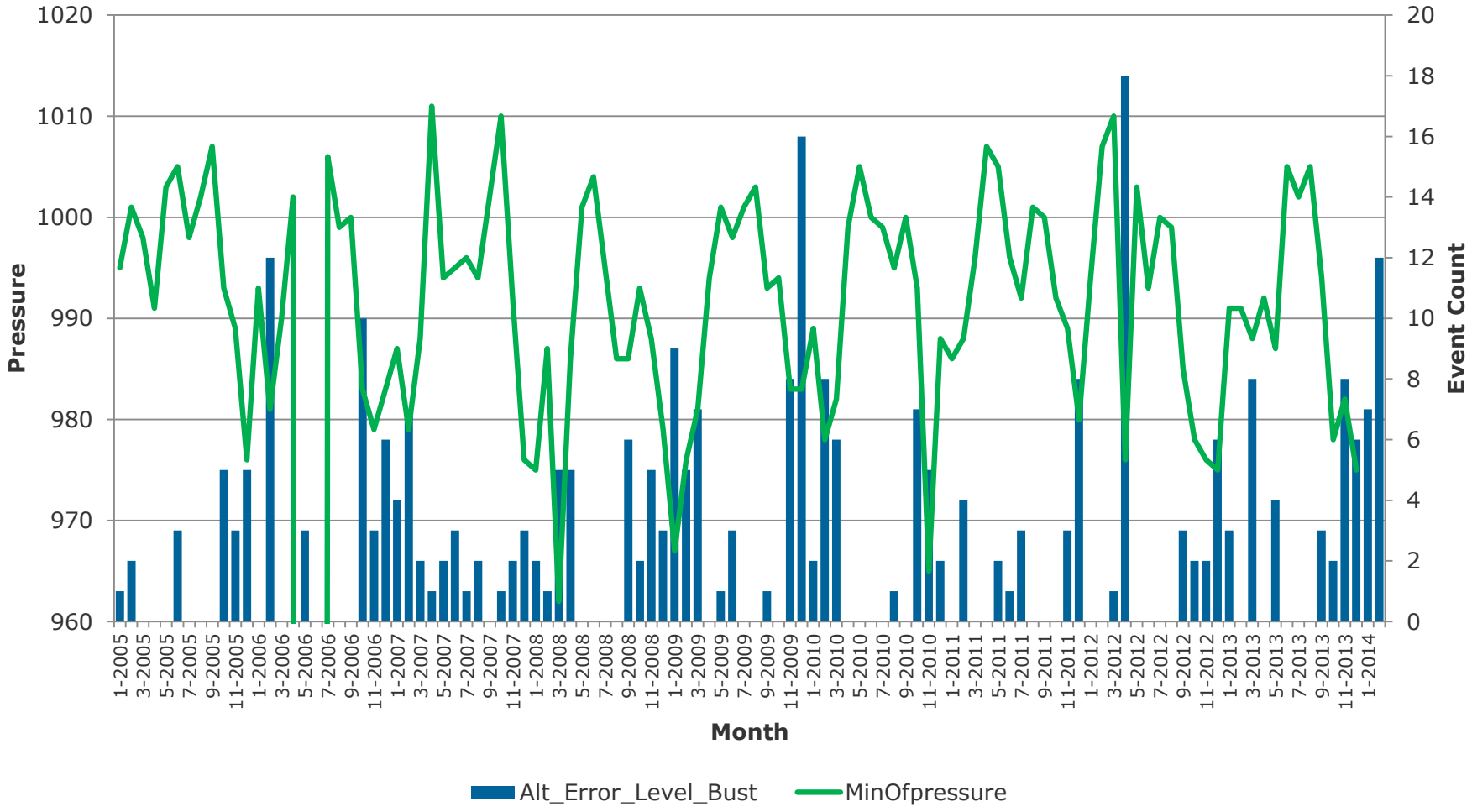


Interpretation3

Level Busts in the London TMA - Actions taken

- A key risk to the NATS operation in the London TMA
- Working with aircraft manufacturers to enable all aircraft to downlink barometric pressure settings to NATS systems
- Expand and standardise the use of Mode S downlinked parameters
- Transmit transition level on ATIS
- Conduct studies with airlines, using everyday observations on the flight deck to identify issues and improve altimeter setting procedures and recommend improved SOPs
- Longer term programmes such as…
  – redesign of the London TMA
  – raising the Transition Altitude
  … are expected to provide mitigation

The Numbers


1020
1010
1000
990
980
970
960
Pressure
20
18
16
14
12
10
8
6
4
2
0
Event Count
1-2005
3-2005
5-2005
7-2005
9-2005
11-2005
1-2006
3-2006
5-2006
7-2006
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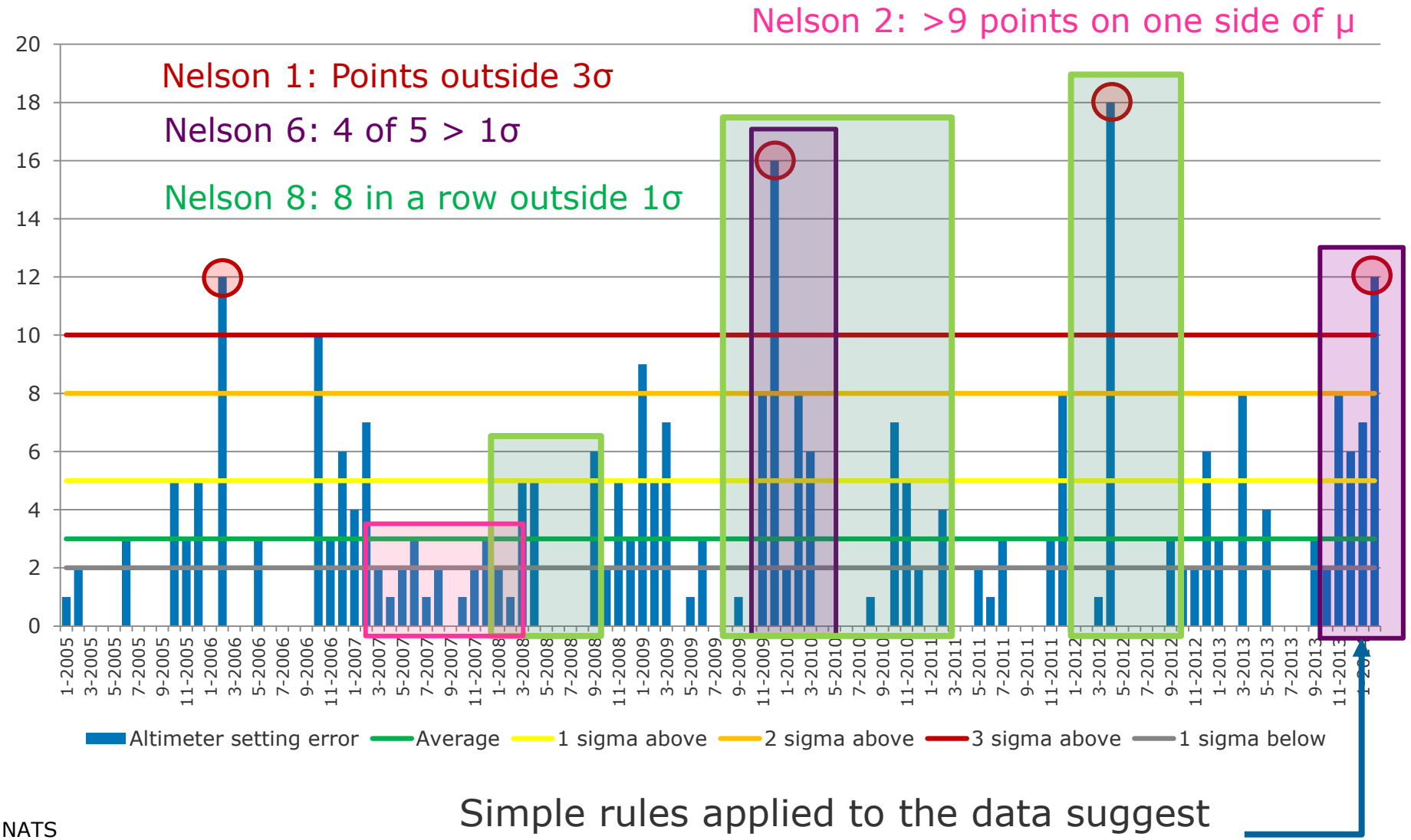
Month
Alt_Error_Level_Bust
MinOfpressure

Do we act?



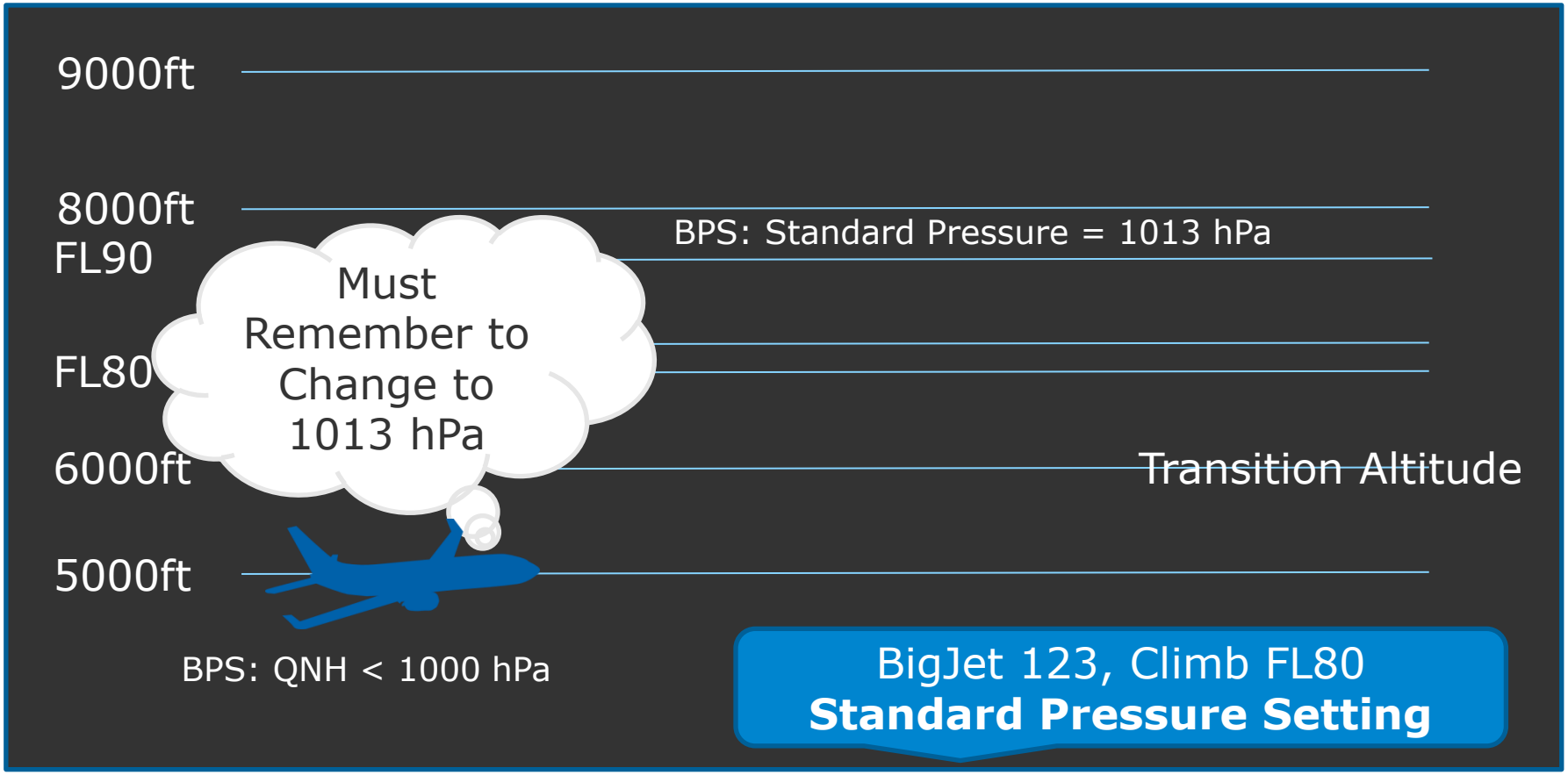
Simple rules applied to the data suggest an investigation is recommended

Temporary Operating Instruction

- In early 2014 the UK experienced a prolonged period of low atmospheric pressure
- At the same time there was a cluster of level busts at the transition altitude
- Thought to be linked to Altimeter Setting Error
- Tactical short-term response to address perceived trend issue a Temporary Operating Instruction (TOI) to controllers
- Safety accountabilities in the operation drove behaviour
  - Pressure & Culture
  - Something must be done
  - What was being done wasn't enough

Level Bust due to Altimeter Setting Error

QNH Atmospheric Pressure < 1000 hPa



Temporary Operating Instruction

TOI 017/14 LTC

Level Bust Prevention - Phraseology Trial

Effective: 20-FEB-14
Expiry Date: 20-MAY-14 Expiry Time: 23:59

ser Group(s): TC ATCO All, TC GS All

Introduction

Following recent increases in level busts in the London TMA (66 since November 2013), it was agreed following a TC Watch Safety Managers meeting to run a trial of additional phraseology to help prevent such occurrences.

When the London or Midland QNH is below 1000 hPa all initial instructions to aircraft within the relevant region that are cleared from an altitude to a Flight Level are to include the phrase "Standard Pressure Setting". It is envisaged that the pressure setting reminder will help reduce level busts due to pressure setting errors.

The Level Bust data during the 3 months previous to the trial and the actual trial itself will be compared and this will indicate whether the trial procedure has made any impact and reduced the number of levels busts occurring.

The trial will be effective until **20th May 2014** and then after this time it will either be extended to cover the summer months or if it is found to be successful it will become a permanent procedure and integrated into the MATS Part 2 subject to consultation with the SARG (CAA).

All feedback should be directed to your WSM.

Procedure

Phraseology

When the relevant sector QNH (e.g: London or Midland) is below 1000 hPa all controllers shall, when issuing the initial climb instruction to an aircraft from an altitude to a flight level, include the phrase "Standard Pressure Setting" e.g.

"Bigjet123, Climb Now FL80, Standard Pressure Setting"

Controllers are reminded that pressure setting instructions are a mandatory read-back item.

Management of the Trial

TC GS Airports shall inform TC GS South, GS North and all TC Approach positions on commencement of the Trial when the LON QNH reduces below 1000hPA.

TC GS North shall inform all TC North positions on commencement of the Trial.

TC GS South shall inform all TC South and TC East positions on commencement of the Trial when the MID QNH reduces below 1000hPA.

TC GS North shall inform TC Midlands on commencement of the Trial when the MID QNH reduces below 1000hPA.

Consideration should be given to splitting sectors where numerous climbs to Flight levels are expected i.e TC SE, NE. The workload on all sectors should be closely monitored and departure restrictions considered.

A NOTAM has been issued to all pilots detailing this evaluation trial.

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TOI 017/14 LTC
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- Hoped the introduction of the phraseology would serve as a reminder to the pilot to set standard pressure setting (1013 hPa) and so reduce level busts due to ASE.
- Subject to normal hazard assessment process for a procedural change
- Implemented on 20 Feb 2014 on a trial basis with planned end date 20 May 2014
- Change also detailed in NOTAM

Unexpected Consequences

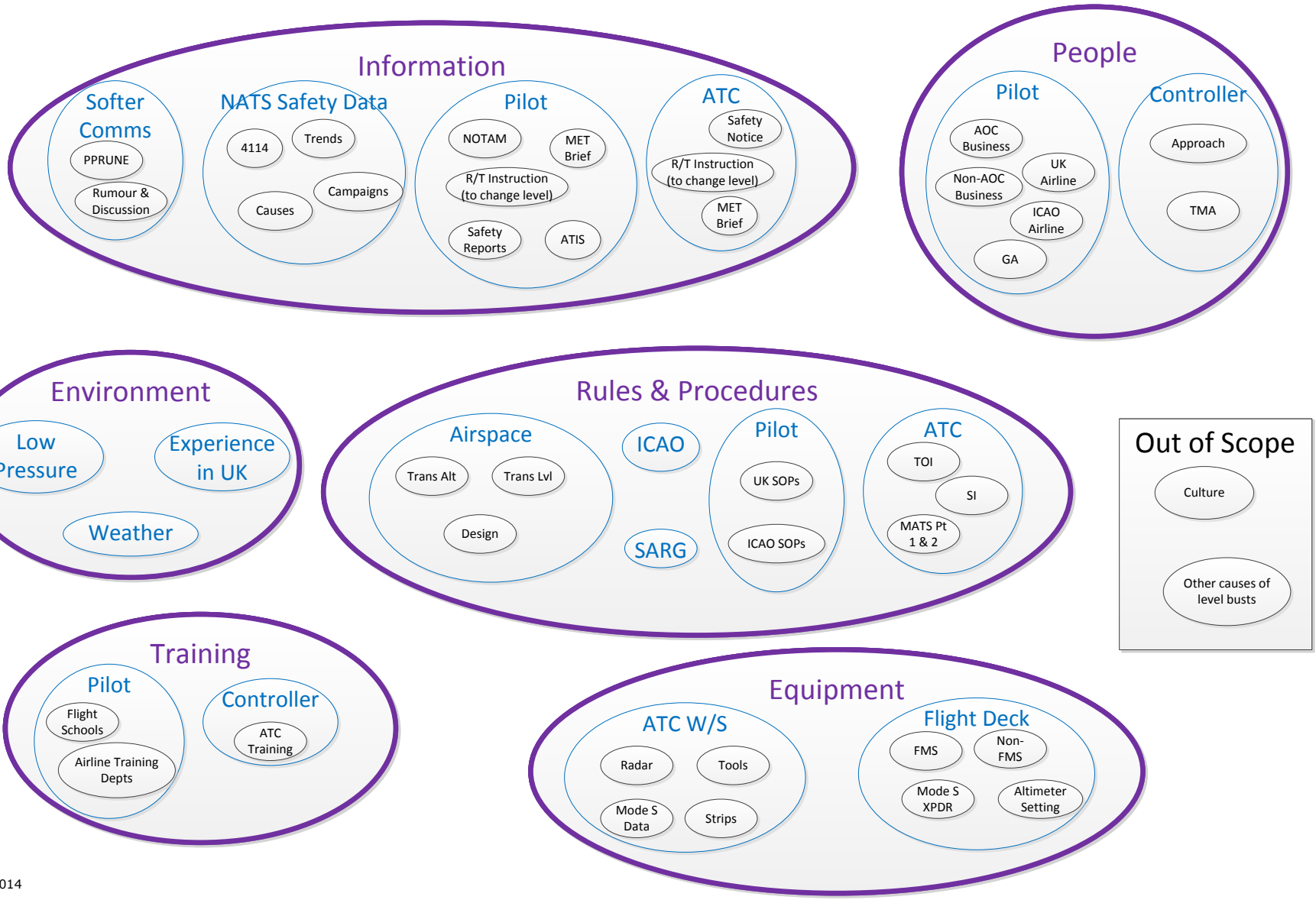
- During the first days of implementation several occurrence reports were filed
- Controllers noted that:
  - Flight crews did not understand the meaning of the instruction
  - Did not read back as required
- Required:
  - Additional R/T to explain the instruction
  - Additional workload
  - Other unintended consequences

"... Standard Pressure Setting"

A Systems Thinking Approach

- Reports served as a weak signal
- Decided to explore the level bust problem, the TOI and the response to its introduction as events unfolded
- Used some straightforward Systems Thinking techniques
- Reflected on the 10 Systems Thinking principles in the White Paper
- Highlighted that the TOI was
  - Simple, rational, understandable
    - TOIs are normal work for quickly mitigating issues in the operation
- Outcome: Unfortunately ineffective solution to a more complex system problem
  - Couldn't predict the cause and effect

Purpose: Prevent Level Busts (due to altimeter setting error)



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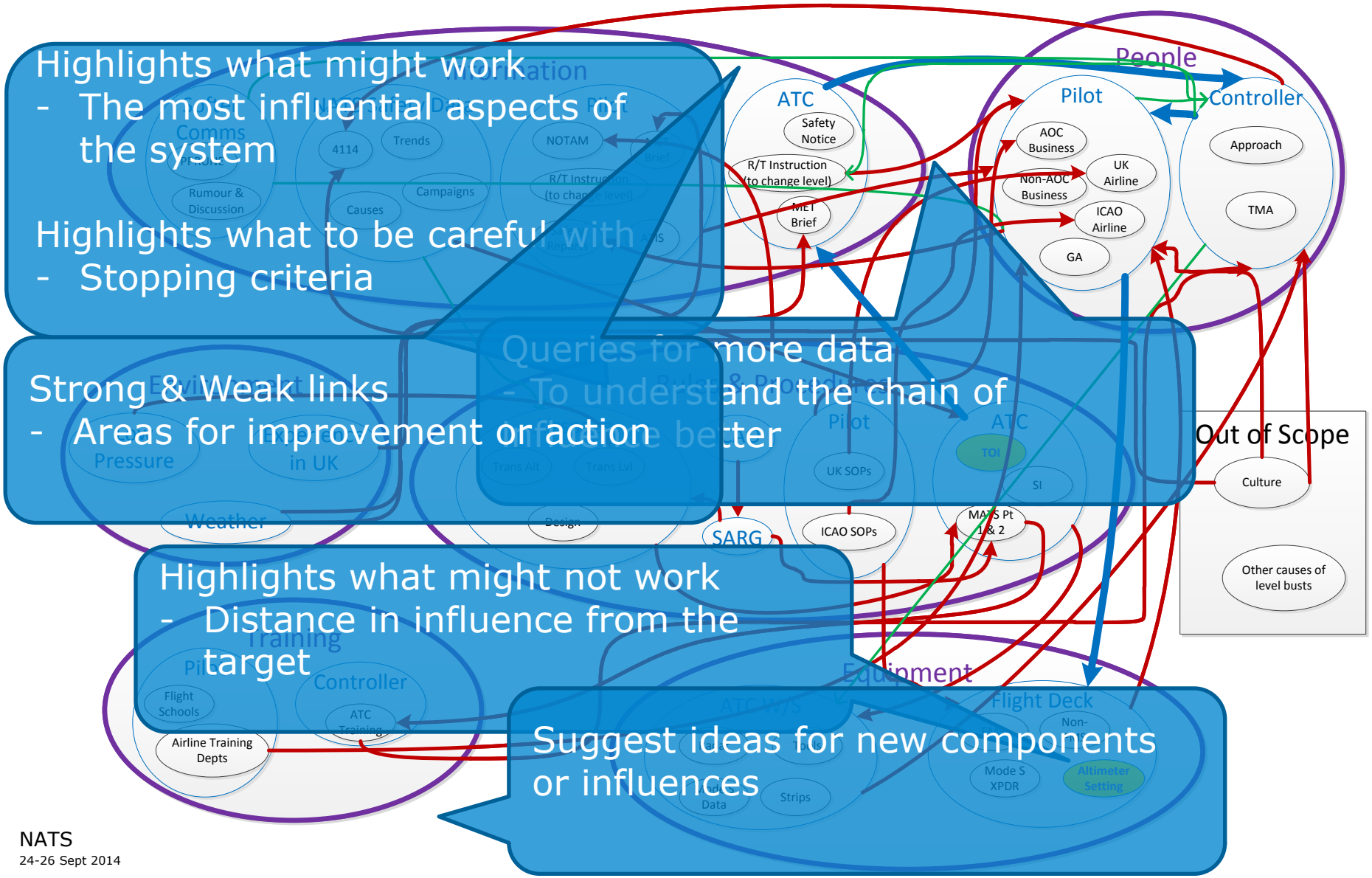


10 Principles - A few findings

Pilots and controllers are field experts, but their involvement in the TOI's development was limited

Goal & intent of the TOI may have been unclear

No one intends to deviate from their level

The nature of work changes in low atmospheric pressure

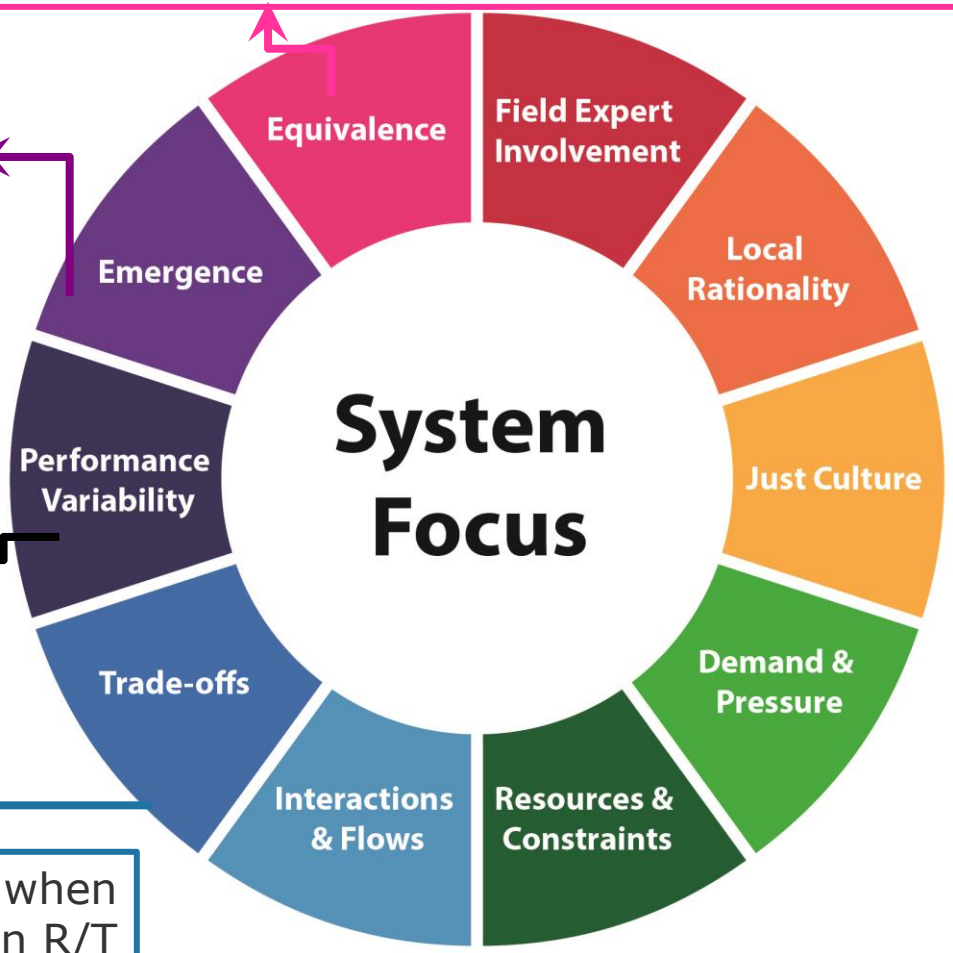
Need to do something

Frequent users of the LTMA have an expectation regarding R/T – deviations are confusing Requests for clarification disrupt flow

10 Principles - A few findings

Analysis of normal work as source of both success and failure
Initially 'work as imagined' - next stage to consider 'work as done' via observational techniques

Outcome can be seen as a case of emergence



R/T is already deliberately tailored to pilots unfamiliar with the London TMA or due to differences in perceived English proficiency

Requiring all instructions to contain the new phraseology removes flexibility and performance variability

Efficiency and thoroughness when reading briefings and on R/T

Systems Focus: – Overall Impressions

- Systems Thinking & the 10 principles present a:
  - New Language
  - New Philosophy
  - New Mind-set

  … which can be integrated and/or run in parallel with our other safety management activities
- New perspectives and new questions
  - Allows 'total system' view
    - Socio-technical view not just equipment
- Pictorial & Positive view of the way the system works
  - Helps communication & shows how work is really done
- Systems safety principles guide a conversation about how components are influential on the system
  - Weaknesses and strengths of the system
  - Areas for possible action
- A way of probing for unintended consequences

Systems Focus: – Overall Impressions

- There is still value in the 'Old Way' but should consider incorporating these ideas into our existing processes
- Current focus has been on investigation
- Further work is needed on embedding these ideas into the design and assurance of procedures & equipment
- Benefits go beyond safety
  - Discussion of flow (and interruptions to flow) possibly highlights requirements for processes, systems, actions etc. to improve how the work works

What happened to the TOI?

NATS

SIN 007/14 SWN

Level Busts during Low Pressure - REISSUE

User Group(s): All TMA ATCO, ALL APC ATCO Effective: 7-MAR-14

Introduction

This Safety Notice replaces the previous notice (SIN005.14SWN) referring to Level Busts during low Pressure.

We continue to experience high numbers of pressure related level busts in the TC operation; 20 incidents since the beginning of the year resulting in 7 losses of separation.

We have trialled and evaluated several different pieces of phraseology and targeted these at particular groups in particular scenarios. While these phraseology based reminders may or may not be effective in mitigating the risk of specific events, it is now clear that a 'one size fits all' solution was found not to be appropriate.

It is also clear that people already apply a range of different operating techniques in their day to day work to protect themselves and the operation from the risk of pressure related level busts. This approach to mitigating risk is very important and is encouraged wherever possible.

As well as continuing to publish low pressure NOTAMS, briefing sheets to pilots and also transmit items such as the transition level on the ATIS, the unit will focus its efforts to involve the CAA in owning and helping us to manage this risk.

Continued investigation into the most recent level busts has confirmed the following;

- Statistically, the 'high risk' group of operators can be summarised as North American carriers and aircraft operating on registrations.
- Crews who fail to set the standard pressure when climbing to a Flight Level appear to be susceptible to the error in periods of high pressure as well as low pressure when the error is often more apparent.

The remainder of this notice reiterates and builds upon considerations previously published that you may choose to apply when controlling aircraft in higher risk circumstances.

Nothing suggested in this notice is intended to prevent or deter an individual controller from applying whatever techniques or phraseology they choose to mitigate the risk in a particular scenario.

Techniques and Phraseology for Consideration

These points are not exhaustive.

- When issuing a climb instruction from an altitude to a Flight Level consider reinforcing the instruction with additional phraseology i.e.
  - "Climb Flight Level xx standard pressure 1013",

Safety Notice (SWN)

Safety Notice (SWN)

SIN 007/14

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- The 'one size fits all' approach of the TOI was not sustainable
- It was withdrawn
- Subsequently, a safety notice was issued highlighting:
  - Level bust issue
  - Range of operating techniques available and already applied in day-to-day work
  - Reiterated possible risk mitigation actions including:
    - possible phraseology options
    - changes to controlling style
    - consideration of the cockpit workload

Summary, Conclusions & Next Steps

- Systems Thinking, Safety II & Resilience Engineering present a welcome challenge to the accepted safety management principles used in NATS
- Work shows considerable promise and …
- … has been embraced within NATS Safety Strategy
  - Available on-line from www.nats.aero
- But new approaches must
  - Be practical
  - Address more than just investigations but also the design of new systems & procedures
  - Be usable by people whose day job isn't safety management processes
- Tentative, but positive, steps in this direction have been made

http://nats.aero