

Briefing to CANS

Ian Strachan, IGC CANS Representative



Scope: GPS testing and results, and
Activities of the IGC GNSS Flight Recorder
Approval Committee (GFAC)

IGC GNSS Flight Recorder Approval Committee (GFAC)

Created: March 1995

Members: Angel Casado PhD (Spain)
Marc Ramsey (USA)
Tim Shirley (Australia)
Ian Strachan (UK, **Chairman**)
Hans Trautenberg PhD (Germany)

Plus Technical Advisors

3 permanent, others as required

**All the above will help FAI,
for instance by participating in CANS Working Groups**

IGC GNSS Flight Recorder Approval Committee (GFAC)

IGC-approvals

43 types of GPS Recorders are IGC-approved
from

16 different manufacturers

First IGC-approval January 1996, latest August 2008

Documentation: Each recorder has a comprehensive IGC-approval document describing its characteristics and limitations and showing how to use it.

Example - Flarm-IGC was 5 pages + annexes for pilots & OOs.

All on the web at fai.org/gliding/gnss

IGC GNSS Flight Recorder Approval Committee (GFAC)



Three IGC-approved GNSS Recorders in this glider
(GPS 1 and 2, and Flarm-IGC)

IGC GNSS Flight Recorder Approval Committee (GFAC)

What do we test to?

The IGC Flight Recorder Specification

On the web, comprehensive (59 Pages), fai.org/gliding/gnss

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What testing do we do?

Ground tests, then flight tests, check for anomalies

GPS accuracy tests, Pressure Altitude Calibration

Standard output data (IGC file), check for correct format

Motor Gliders - Engine Noise Level (ENL) testing (tricky)

Security - Physical (microswitch) & Electronic

Electronic = Public/Private Key system, RSA or equivalent

IGC GNSS Flight Recorder Approval Committee (GFAC)

GFAC testing 2008



Nielsen-Kellerman ClearNav system



Triadis Altair recorder



IMI Erixx recorder

1. Nielsen-Kellerman ClearNav (USA)
2. Triadis Altair (Switzerland)
3. IMI Erixx (Czech Republic)

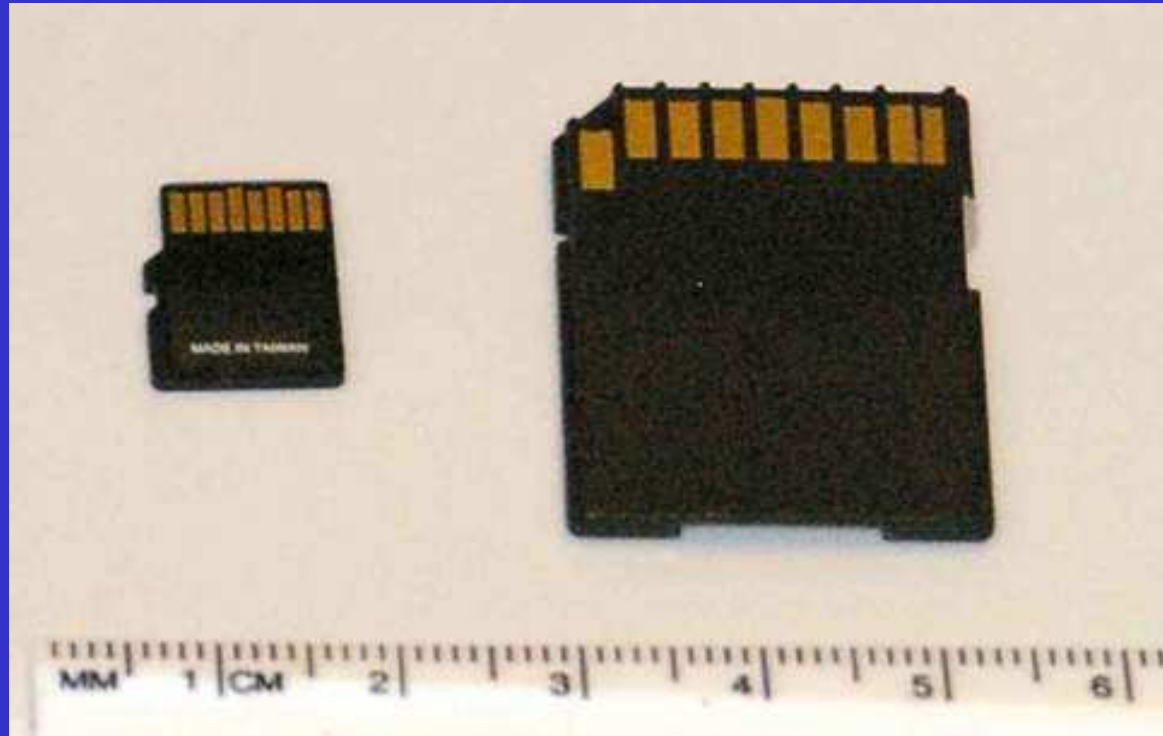
(Recorders without Traffic Alert function)

IGC GNSS Flight Recorder Approval Committee (GFAC)



1. Flarm-IGC (Switz)
2. LX8000 (Slovenia)
3. DSX T-advisor (panel version) (Switz)
4. LXN Mini-box (Slovenia)
5. DSX T-advisor (BB version) (Switz)
6. LXN Red Box (Slovenia)

Trends 1



IGC flight data file

auto download to SD card in recorder
then to PC via card reader

Trends 2



Moving Map displays

with airspace overlay (useful for access/airspace)

Also, Recorders without displays drive cockpit PDAs using NMEA outputs

IGC flight file data

Flight data files are checked with the free IGC electronic Validation program

This ensures the file comes from the correct recorder and is the same as after download

Principle: Public/Private Key security (RSA or equivalent)

When Validated, that IGC file data is electronically secure
(one wrong character in file will fail Validation)

Results from GFAC tests

Horizontal GPS Accuracy from moving vehicle

Average (50%) within 11.5m

(Since Selective Availability error was
removed in May 2000)

Results from GFAC tests

Horizontal GPS Accuracy

Average (50%) within 11.48m

60% within 13m

70% within 15m

90% within 18m

95% within 20m

99% within 27m

Better than radar & its transponders

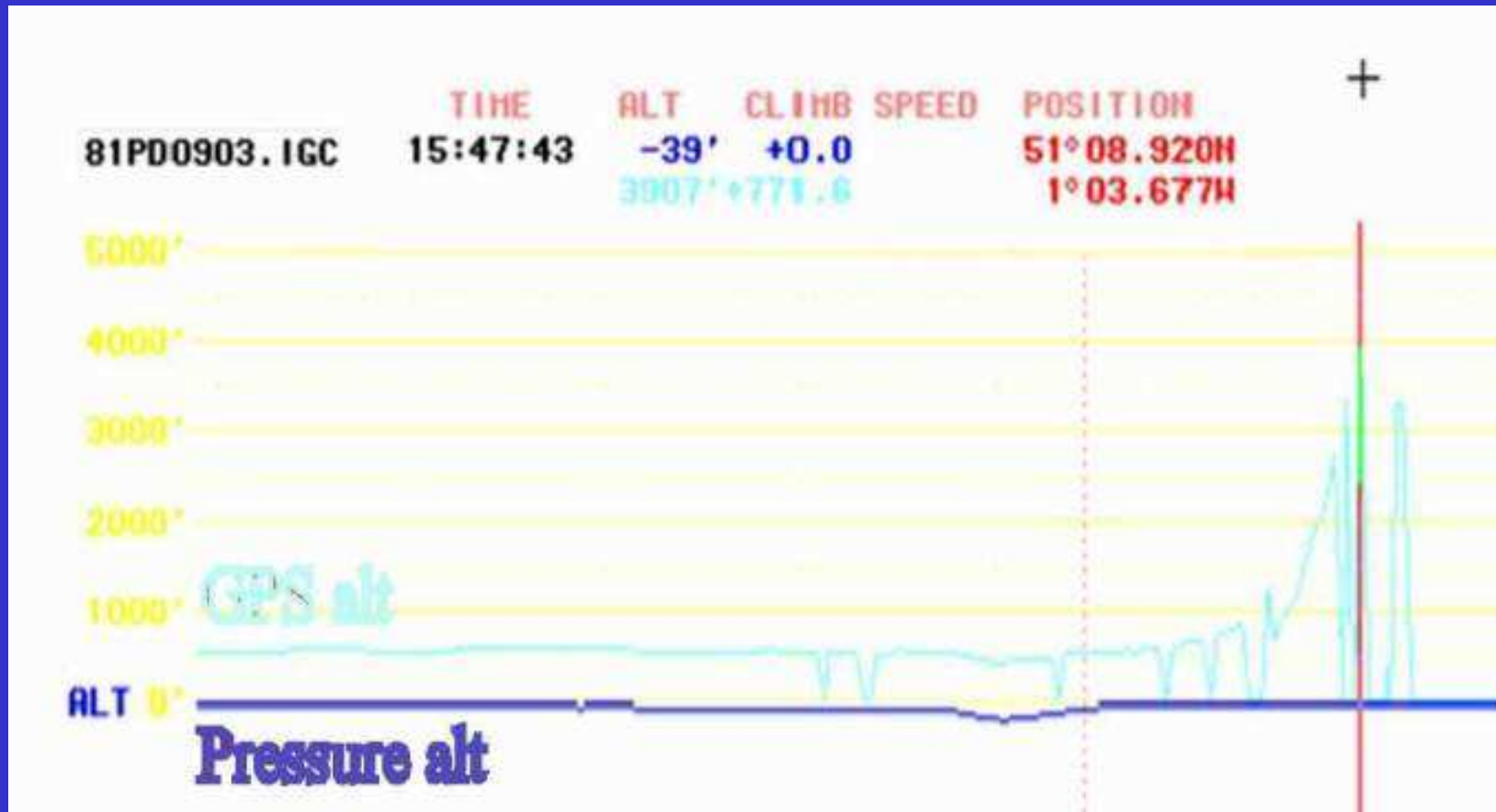
Results from GFAC tests

Vertical GPS Accuracy

Significant errors are regularly found
in GPS Altitude as recorded in IGC files

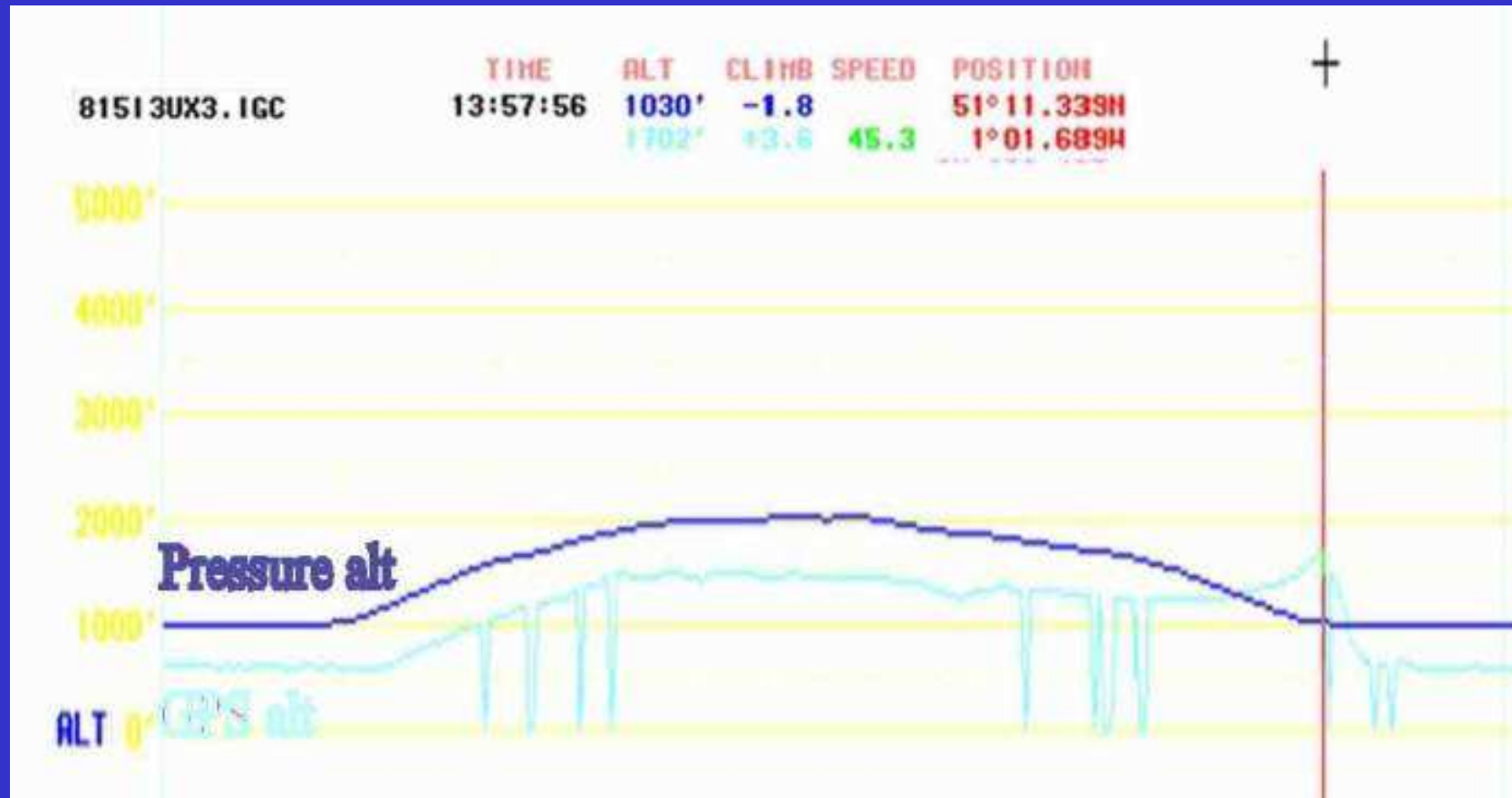
(when Lat/Long fixing continues to be OK)

Ground test from Car drive 2008



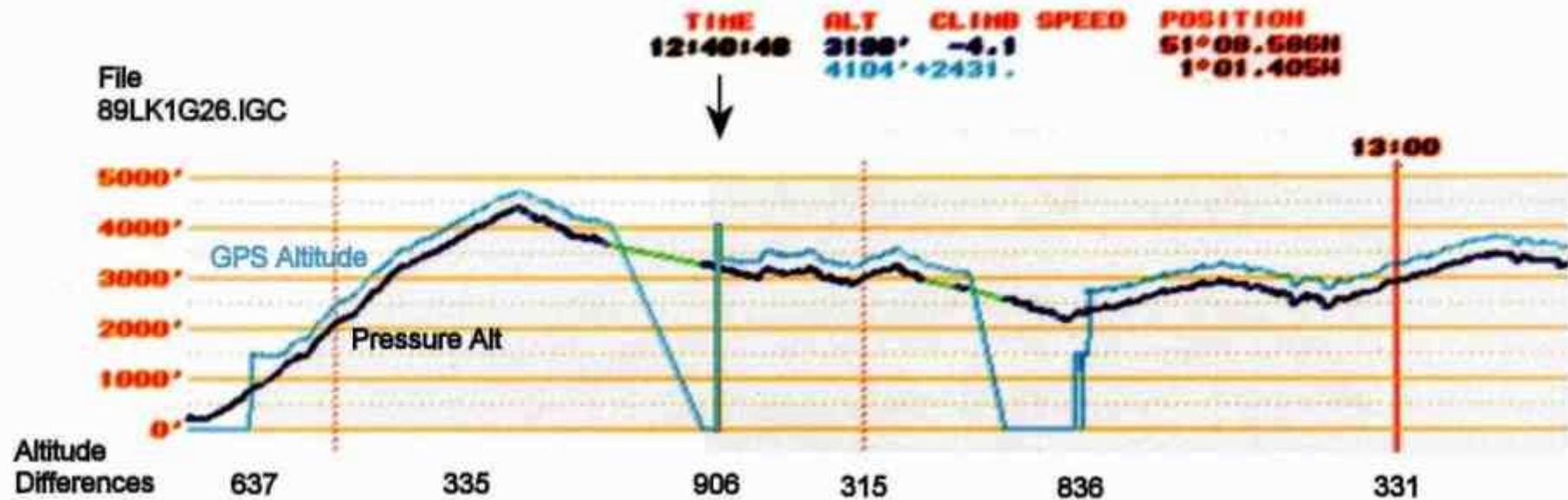
Start: GPS alt 500 ft above Pressure Alt
10 mins later: GPS alt 4000ft above Pressure Alt

Winch Launch 2008

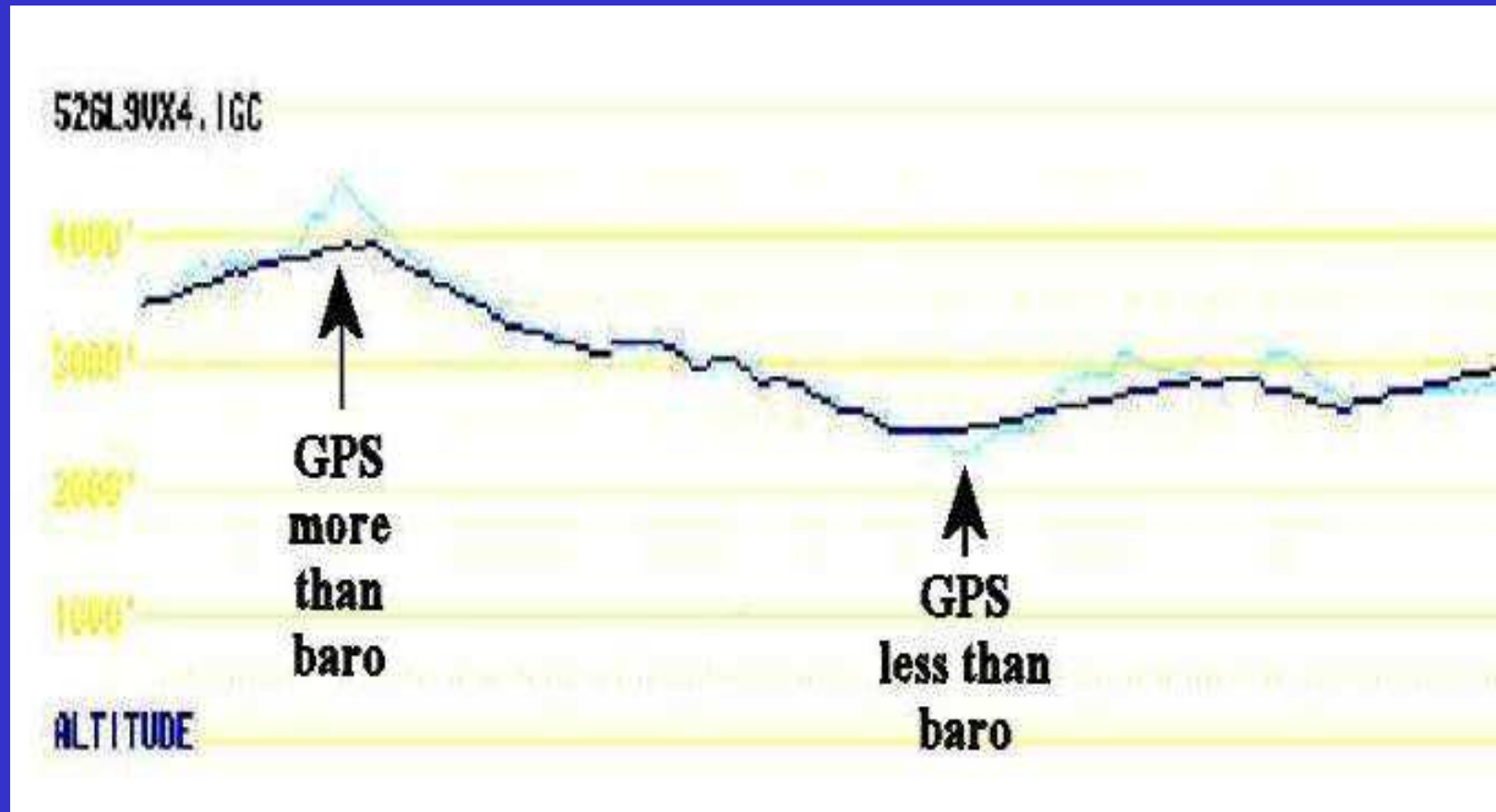


Start: GPS alt 400 ft below Pressure Alt
10 mins later: GPS alt 600ft above Pressure Alt

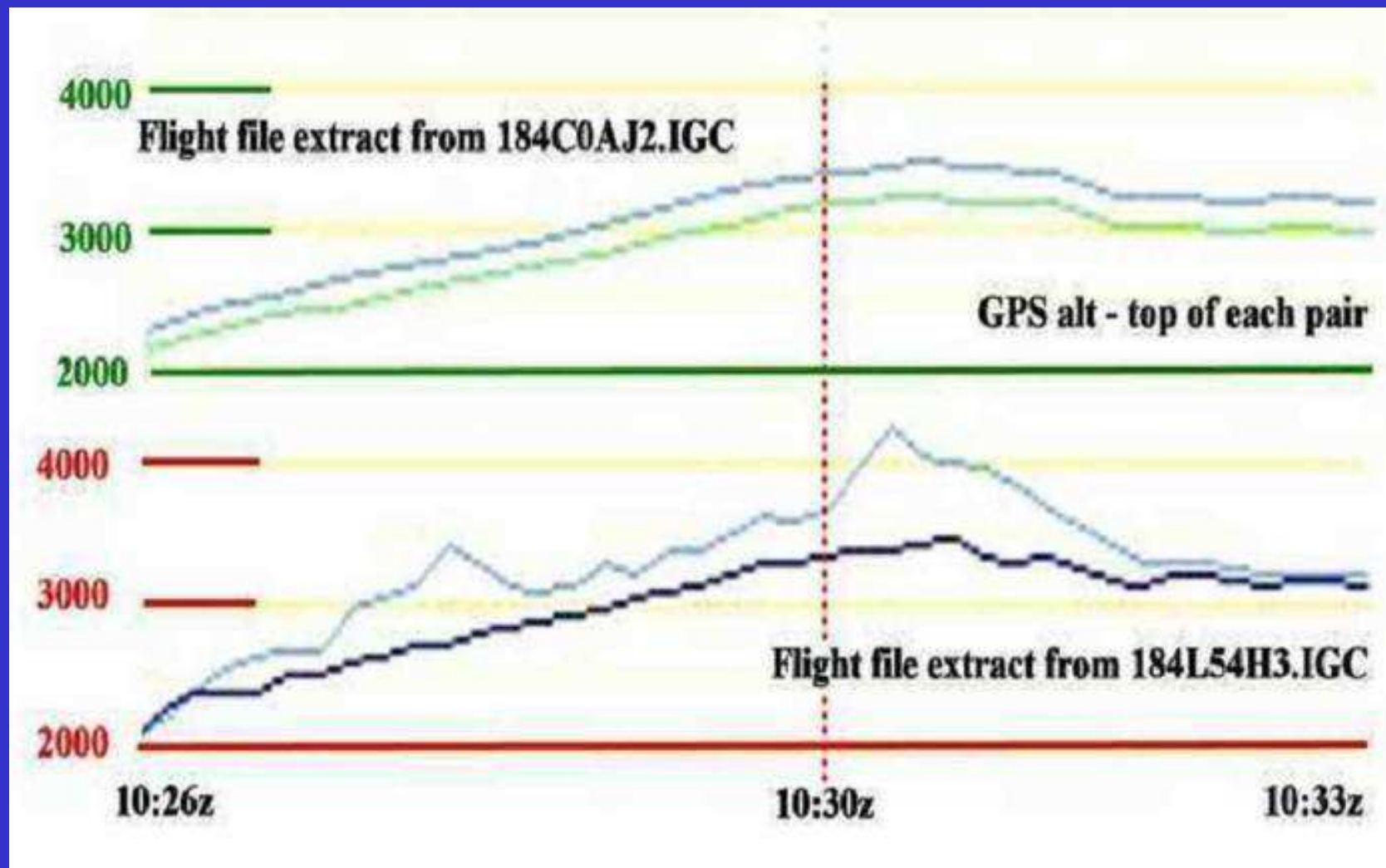
21 September 2008 - Nimbus 4DM



1. GPS slow to lock on, slow to settle down
to (correct) height difference of about 325 ft
2. Two later unlocks followed by anomalous ht diffs



Gain of Height difference
Baro (less) to GPS (more)



GPS altitude anomaly in lower file



1. GPS alt unlocks when Lat/long fixes continue
2. GPS alt when recorded is erratic
(in this slide, generally below pressure alt but sometimes above it)

Results from GFAC tests

Vertical Accuracy

Conclusion


Pressure altitude - is reliable and accurate

(to the ICAO ISA)

GPS altitude - is sometimes erratic and should
not be used for FAI measurement purposes

Questions?






GPS AT connector


Swiss Flarm

Push-button (on Power switch)

micro SD card slot



LXN LX 8000 with embedded Flarm module



DSX T-Advisor Panel model

GFAC testing 2008
Recorders with GPS-based Traffic Alert function
(proof of concept for GPS-based ADS-B TCAS function)




LXN Red Box Flarm

LX navigation

LX n/On Red Box

Standard Flarm display



DSX T-Advisor Black Box version



LXN Flarm Mini Box

