Radio Navigation Aids
Flight Test Seminar

Flight Inspection of Global Navigation Satellite Systems (GNSS)

Curt Keedy
FAA Flight Inspection
Policy and Standards

Aircraft

BE-300

MGW - 14,000

MIAS - 265 Kts

Alt - FL 350

Range - 5+ hrs

Bae 125-800

MGW - 28,000

MIAS - 330 Kts

Alt - FL 410

Range - 6+ hrs

Aircraft

Lear 60

MGW - 23,500

MIAS - 340 Kts

Alt - FL 510

Range - 6+ hrs

Challenger 601-3A

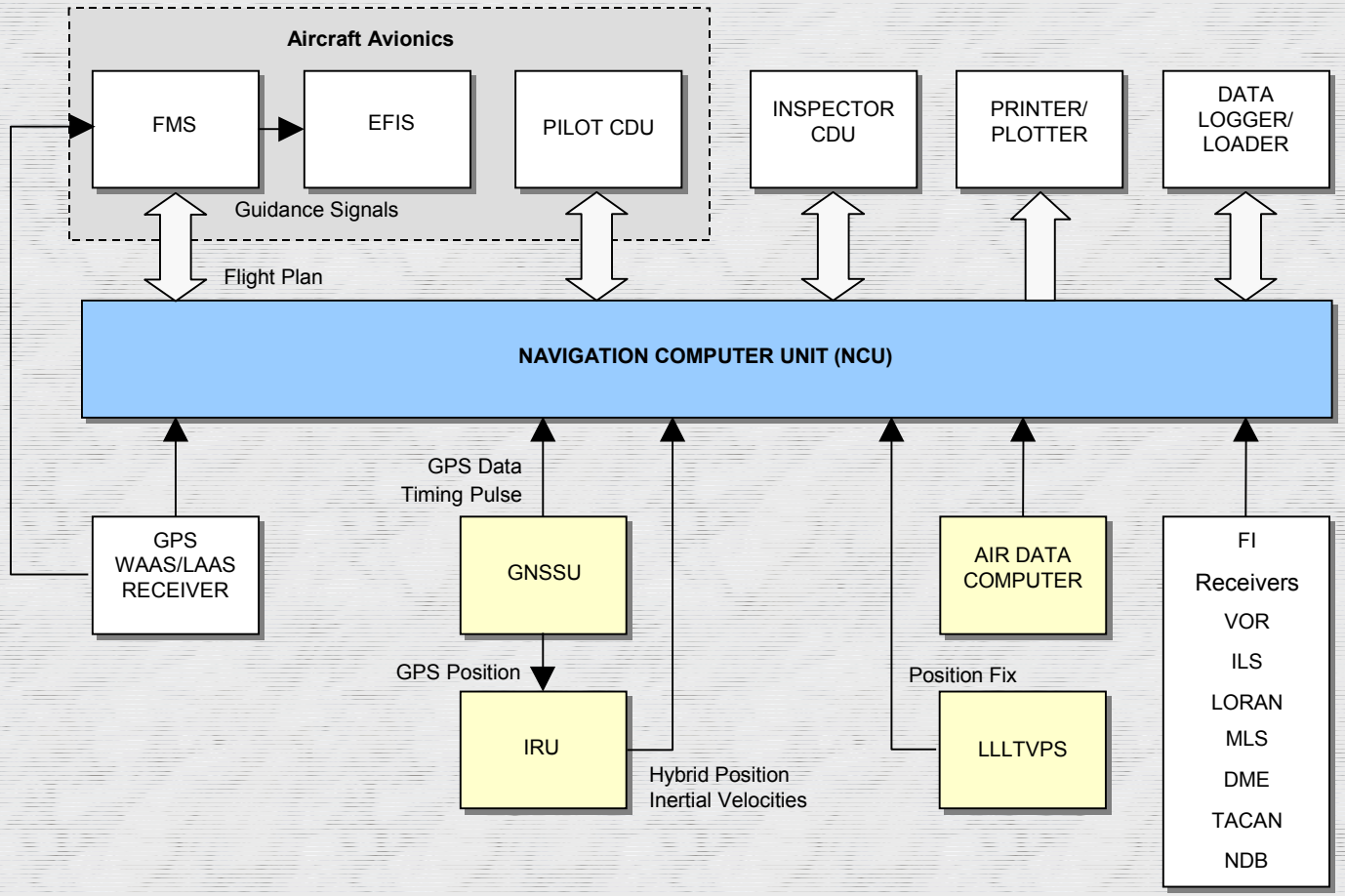
MGW - 45,100

MIAS - 360 Kts

Alt - FL 410

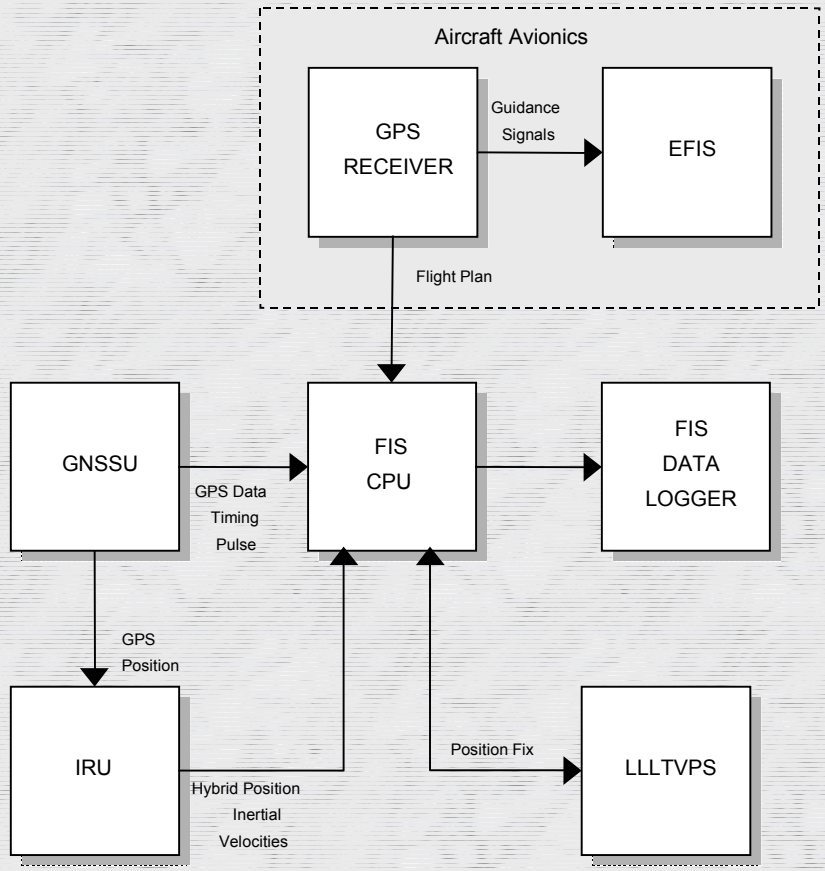
Range - 9+ hrs

Automated Flight Inspection System (AFIS)



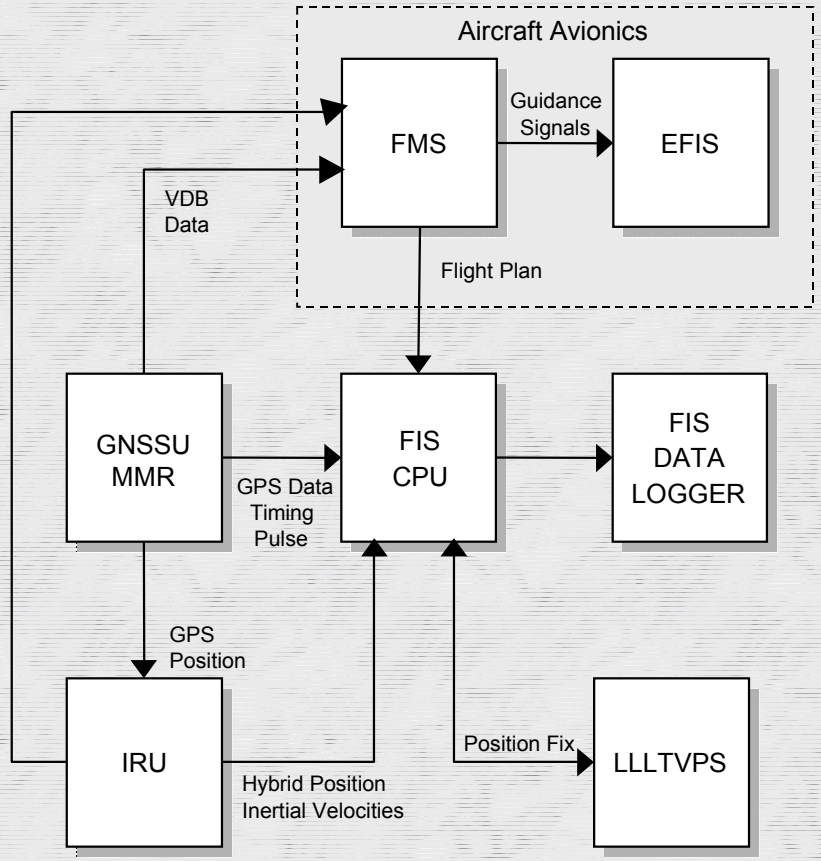
FIS Console - BE-300

BE-300 GPS/FIS



Challenger FIS

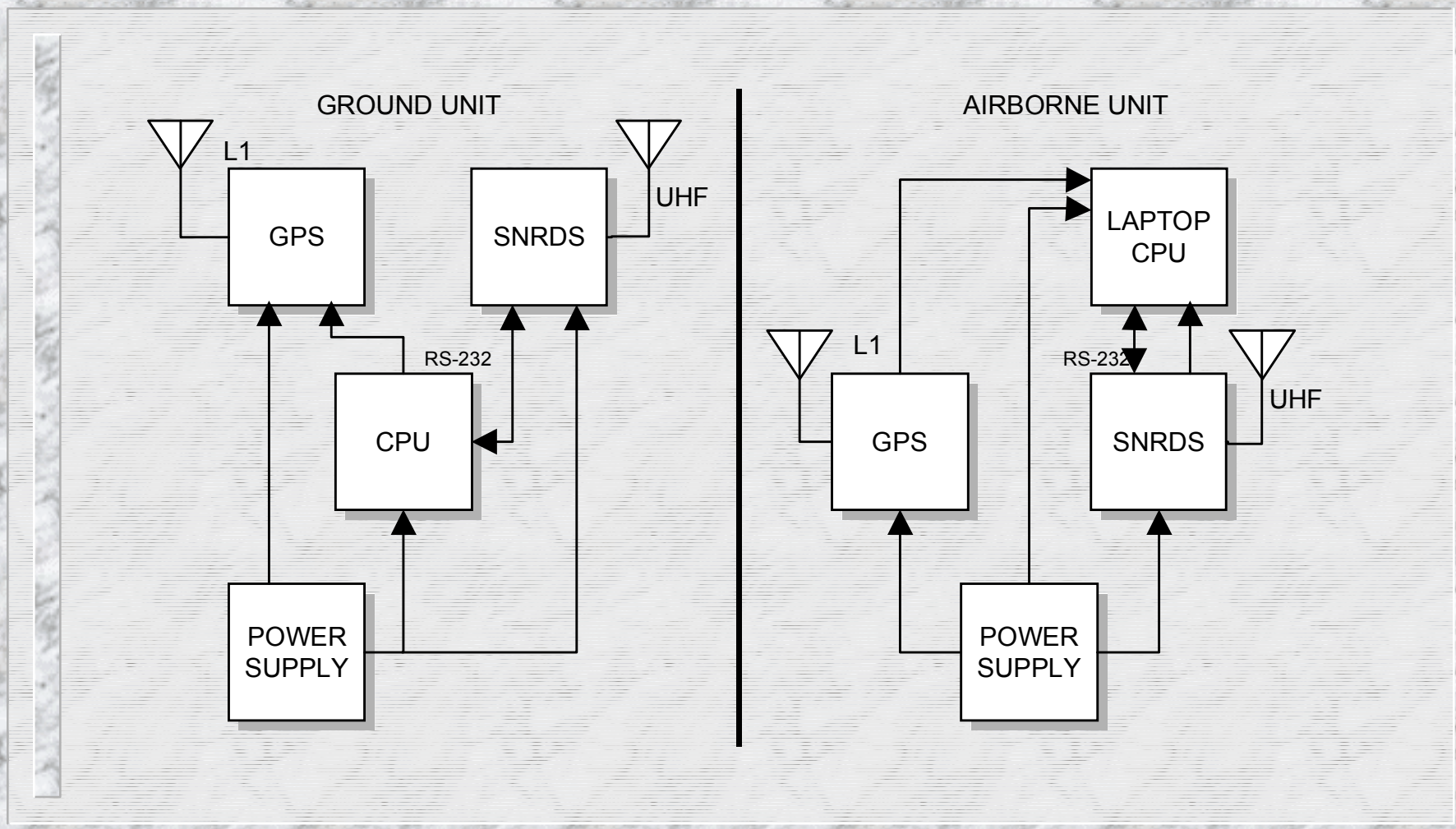
Hawker, Lear & Challenger GPS/FIS



Passive Monitoring

GPS Sensor (GNSSU)	FMS or GPS Receiver	FIS
UTC	UTC	Heading
GPS Altitude (MSL)	Latitude	Altitude
HDOP	Longitude	Pitch
VDOP	Ground Speed	Roll
GPS Latitude	Altitude (MSL)	Ground Speed
GPS Longitude	HDOP	Latitude
GPS Ground Speed	VDOP	Longitude
Date	Status	
GNSSU Status	RAIM	
Measurement Status		
Autonomous Horizontal Integrity Limit		
Autonomous Integrity Limit		

GFIS


GROUND UNIT
L1
GPS
SNRDS
UHF
RS-232
CPU
POWER SUPPLY
AIRBORNE UNIT
LAPTOP CPU
L1
GPS
RS-232
SNRDS
UHF
POWER SUPPLY

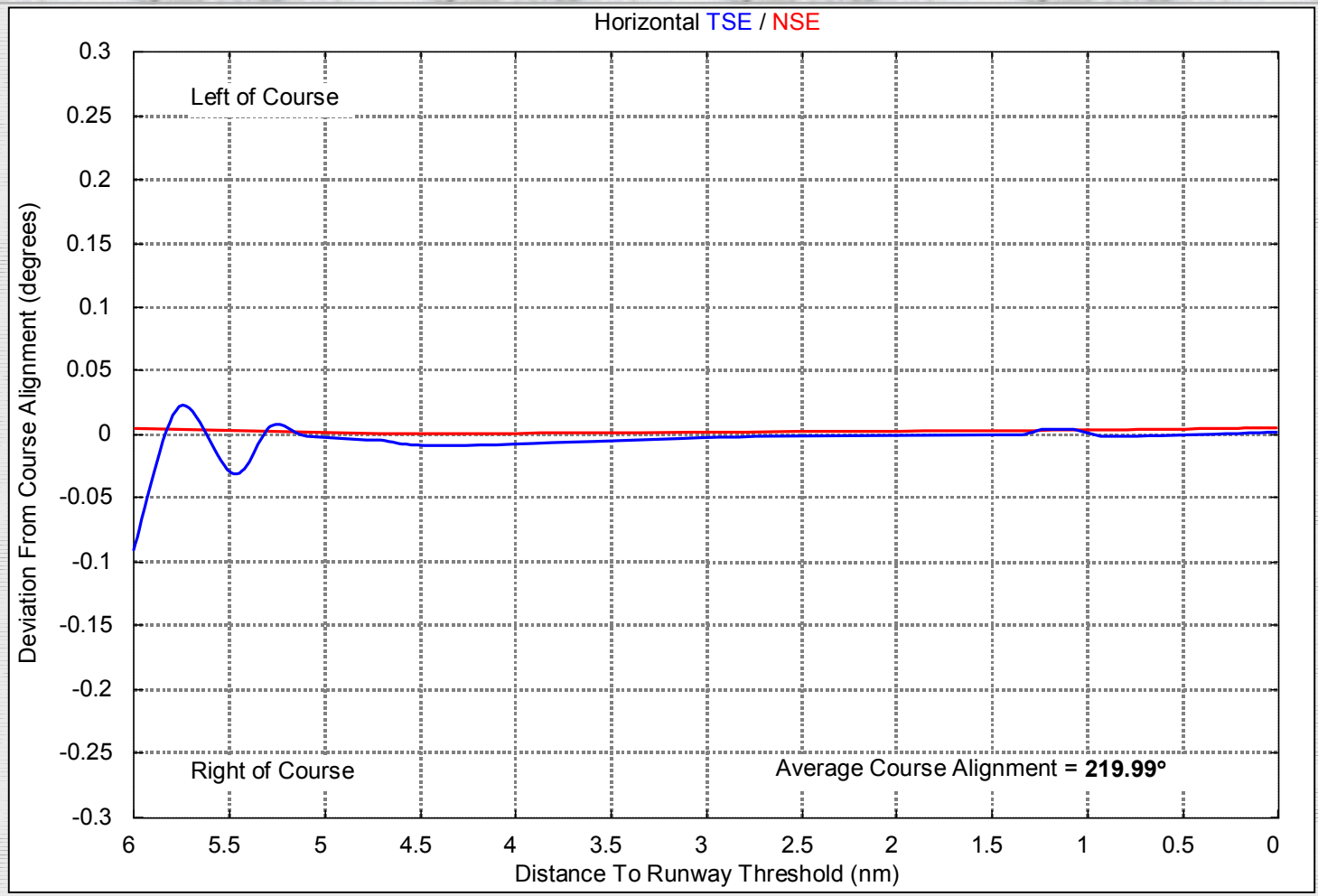
ILS vs. GPS Parameters

ILS		GPS	
Signal-in-Space			
Alignment	Transmitter	Data either contained in the onboard database or transmitted to the aircraft via satellite or VHF link from WAAS or LAAS system.	Receiver
Width	Transmitter		Receiver
Symmetry	Transmitter		Receiver
Modulations	Transmitter		Receiver
Clearances	Transmitter		Receiver
Course Structure	Transmitter		Receiver
Polarization	Transmitter		Receiver
RF Power	Transmitter		Receiver
Coverage	Transmitter		Receiver
Monitors			
Alignment	Monitor	Monitoring includes satellite health messages, clock bias, RAIM, Horizontal and Vertical Protection Limits, and the RNP Tunnel. Error Budget.	Receiver
Width	Monitor		Receiver
RF Power	Monitor		Receiver

Captured GPS Parameters

PRN	GPS, WAAS AND WAAS HEALTHY SATELLITES (WM #1277)
PSEUDORANGES	EACH SATELLITE (WM #1277)
CARRIER PHASE	EACH SATELLITE (WM #1278)
SATELLITE COORDINATES	(WM #2422)
SNR	EACH SATELLITE (WM #4)
WAAS OPERATING MODE	(WM #4)
HDOP	WAAS RECEIVER (ARINC 429)
VDOP	WAAS RECEIVER (ARINC 429)
HPL	WAAS RECEIVER (ARINC 429)
VPL	WAAS RECEIVER (ARINC 429)
WAAS LATITUDE	WAAS RECEIVER (ARINC 429)
WAAS LONGITUDE	WAAS RECEIVER (ARINC 429)
WAAS ALTITUDE	WAAS RECEIVER (ARINC 429)
WAAS EAST VELOCITY	WAAS RECEIVER (ARINC 429)
WAAS NORTH VELOCITY	WAAS RECEIVER (ARINC 429)
WAAS UP VELOCITY	WAAS RECEIVER (ARINC 429)
WAAS HEADING	WAAS RECEIVER (ARINC 429)
WAAS GROUND SPEED	WAAS RECEIVER (ARINC 429)
HFOM	WAAS RECEIVER (ARINC 429)
VFOM	WAAS RECEIVER (ARINC 429)
ALERTS	WAAS SATELLITE NOT VISIBLE, WM #4
WAAS DOWNLINK (RAW)	WM #6100 WORDS 1 - 30
REAL-TIME NAV DATA	POSITION SAMPLES, CAST-FREE IRU POSITION, TVPS FIX …
SUMMARY DATA	ERRORS XTER, ATKER TSE, NSE (min, max, avg)

GBAS Horizontal TSE/NSE



GBAS Vertical TSE/NSE