



Data Origination, Management and WGS 84

ICAO PBN Manual Seminar
Data Origination & Management, WGS-84






Overview

Learning Objectives

- Understand the implication of publishing incorrect navigational data in the State's AIP
- Identify why it is essential to use a common reference system
- Understand the impact of using different ellipsoids
- Recognise why late publication of data should not take place.



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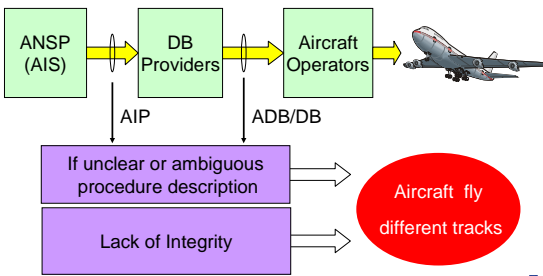
Content

- The Challenge
- The Data Chain
- Achieving data quality
- Reference systems
- Surveying
- Publishing the data



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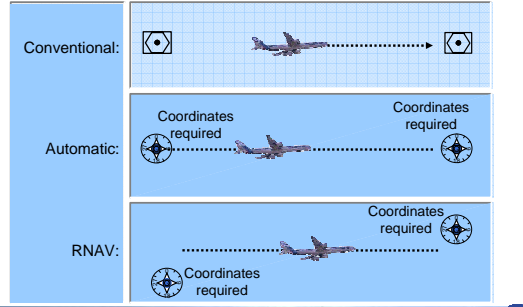
The Problem Identified





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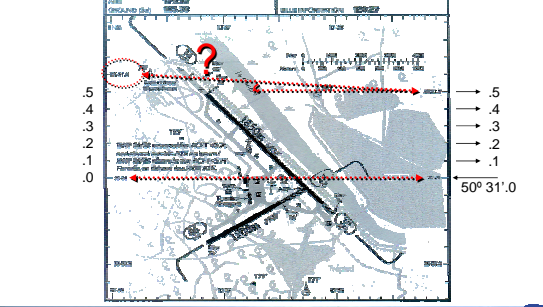
Impact of AIP Errors




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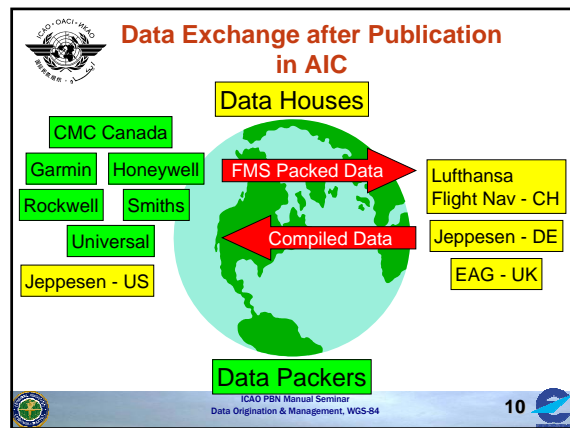
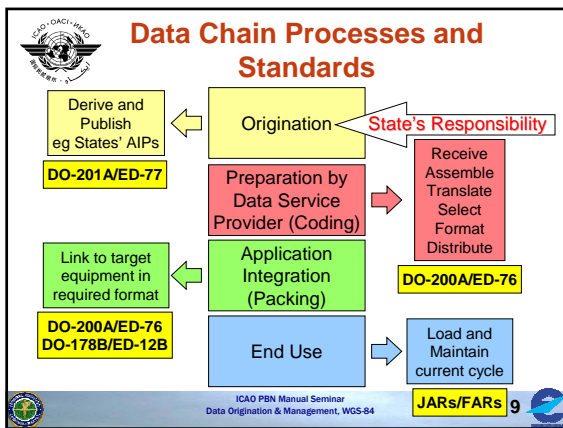
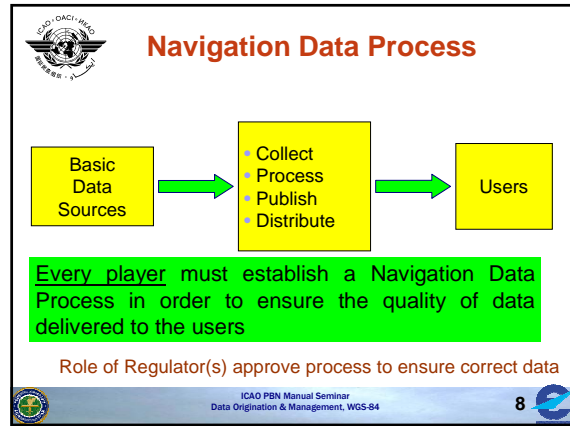
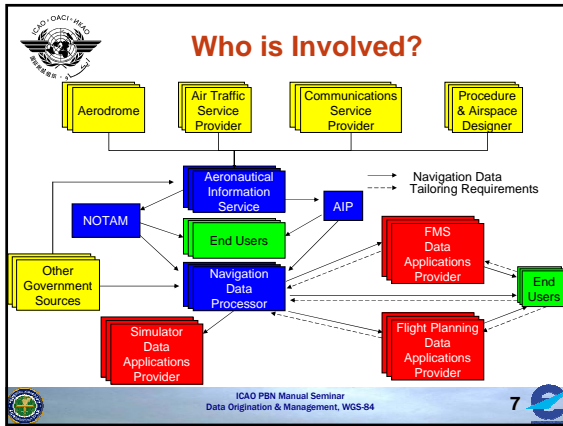



Sample Chart Error

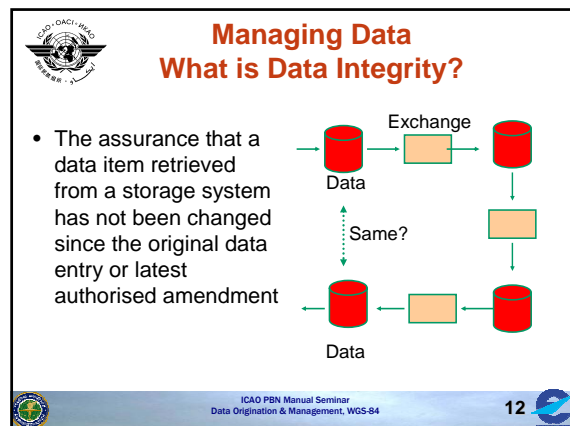


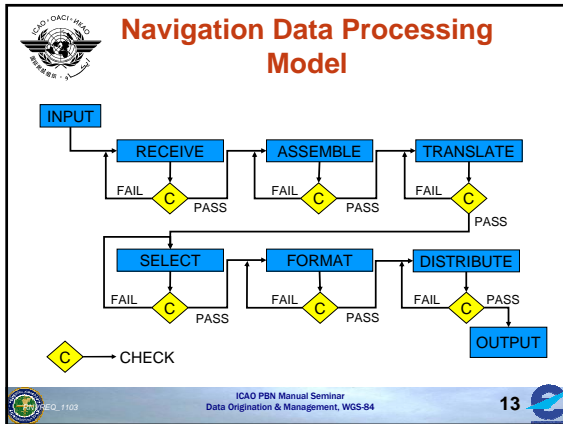
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- ### What is Data Quality?
- Quality is ability to meet requirements
 - Characterised by:
 - Accuracy
 - Resolution
 - Assurance Level
 - Traceability
 - Timeliness
 - Completeness
 - Format
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ICAO Requirements

User requirements in ICAO Annex 15

Critical (10^{-8})
Essential (10^{-5}) Data
Routine (10^{-3})

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RTCA Do 200A EUROCAE ED 76

From the executive summary:

These documents are submitted to the aviation community as a collection of disciplines necessary to provide assurance that the production of aeronautical databases meets the high integrity required for safe flight.

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- ### Processing Requirements
- Each supplier of data in the chain assures:
 - The data meets quality requirements
 - The source of any data can be traced
 - All detected data discrepancies addressed
 - All reported errors resolved in a timely manner
 - Delivery of data is made at the agreed time
 - Data is applicable to the intended period of use
 - Any unresolved errors or anomalies known to remain are made available to the client
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- ### Issues to be Addressed
- Survey
 - Not meeting accuracy and integrity requirements
 - No real data integrity
 - No guarantee that data not corrupted
 - RNAV coding
 - Has the data house correctly interpreted the design
 - No real Traceability
 - Cannot validate to confirm whether process working
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The Earth as a Geoid

- **Geoid**
 - The equipotential surface of the earth's gravity field which would coincide with the ocean surface, if the earth were undisturbed and without topography

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The Earth as an Ellipsoid

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WGS 84

Global Geodetic System - accurate to 1-2 Metres Realisation

- International Terrestrial Reference System (ITRS)
 - Precise geodetic system -1-3 cm over 5,000 km
 - Maintained by the International Earth Rotation Service
 - Plate Tectonic movements – therefore position changes
 - ITRF – globally distributed network with defined epoch (date), position and velocity
 - In Europe original surveys done to ETRF 89 network – move to ITRF 2000 – accepted realisation of WGS 84
 - Use transformations to update:

➤ IF DATA INTEGRITY SUFFICIENT

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Deviation of the Vertical and Undulation

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What is a Height?

Question

- Implicit question in what direction water is flowing
- Water is in rest on an equipotential gravity surface (⇒ heights are equal)
- Definition of such a height cannot be geometrical

⇒ "Point A is higher than point B"
⇒ "Point B has the same height as point C"

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WGS 84 vs. Geoid

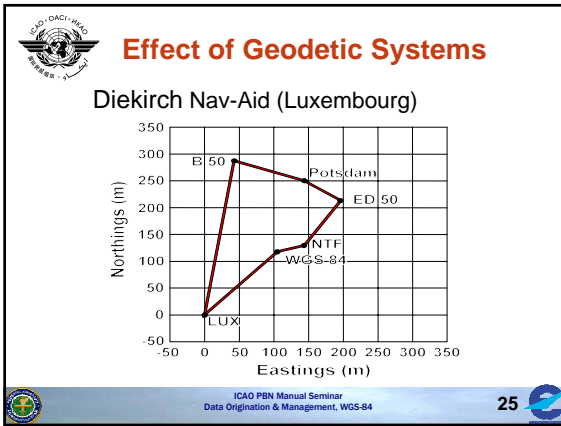
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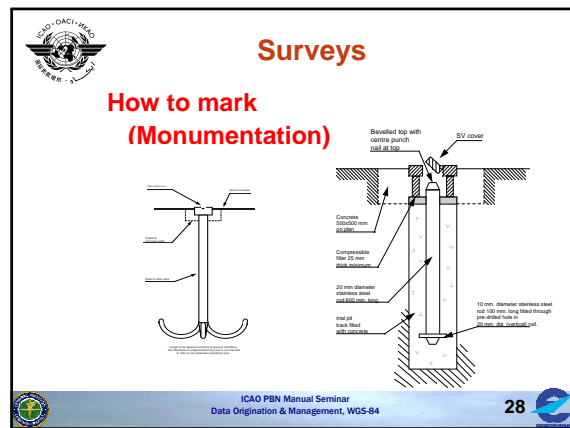
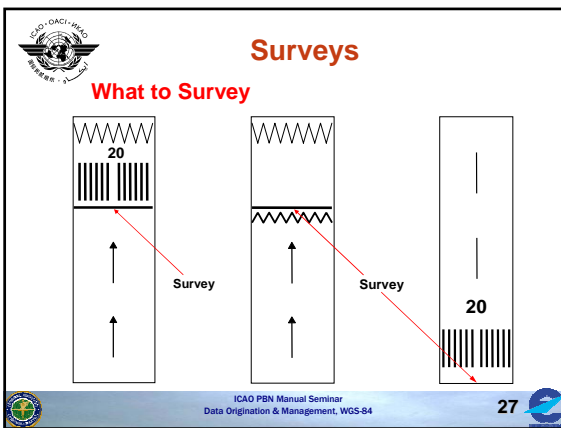
Impact of Different Ellipsoids

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- ### How to Survey
- #### GPS Survey Consideration
- GPS Observation Techniques
 - Connection to the geodetic reference frame
 - Stations with defined ITRF coordinates
 - Control Stations
 - Clear line of sight away from reflecting surfaces
 - Ensure no interference
 - Redundancy of data collection to allow validation
 - Hardware selection – NB take care if mixed receiver network – antenna phase centre differences
 - Survey Execution and Marking
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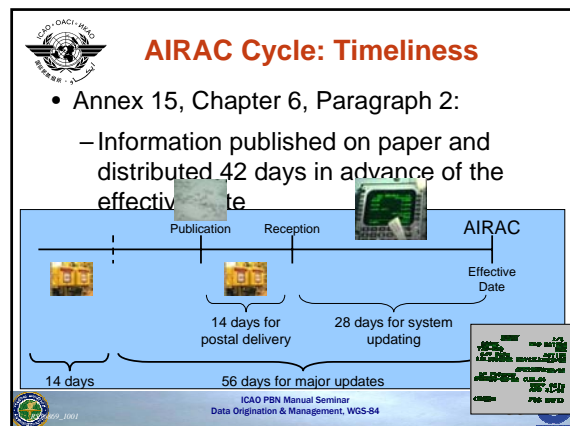
ICAO Annex 15

6.1.1 Information ..., shall be disseminated under the regulated system (AIRAC), i.e. basing establishment, withdrawal or significant changes upon a series of common effective dates at intervals of 28 days, including 10 January 1991.

Note:
10 January 1991 is the starting point for counting the 28days AIRAC Process started long before 1991

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Why 28 Days
To update a wide range of systems!

Commercial Data Providers
Airline operators
Charts
Flight Management Systems
Aircraft Performance DB
Flight Planning
Simulators
ATC Centres
Flight planning
Simulators
ATC screens
OTHERS
Simulators
Flight Planning

Varying freeze dates!

Publication Reception Effective date
14 days for postal delivery 28 days for system updating

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**PBN Consideration:
Operational Implementation Date**

- Experience has shown that an additional 3 to 10 days after publication effective date should be allocated before operational implementation (“turn-on”) in the air traffic system
- Additional period provides time to ensure ground and aircraft system data is correctly validated and loaded in data bases

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Data Origination

EUROCONTROL Guidance Material

- Integrity of Aeronautical Information
- *Aeronautical Data Origination*
AFN/NAV/DAT/ORG/DOC001-150404
Survey and procedure Design Requirements

FAA Guidance Material

- FAA Specification 405 *Standards for Aeronautical Surveys and Related Products*
- FAA Order 8260.19 *Flight Procedures and Airspace*

ICAO

- Doc 9674 -WGS 84 Manual

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Summary

- AIP Issues
- Data Chain
- Aeronautical Data Processes
- WGS 84
 - Geoid
 - Impact of different ellipsoids
- Surveying Issues
- Timeliness

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**Audience Response System
Questions**

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