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Processing Aeronautical Data, RTCA/DO-200A

Standards For Processing Aeronautical Data

RTCA/DO-200A



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RTCA/DO-200A

- RTCA Special Committee 181 completed a new standard for processing aeronautical data (1998)
- Applies concepts from RTCA/DO-178(B)
- Has been referenced in new equipment standards (e.g., TSO-C146 for GPS/WAAS)
- Will be the basis of a new AC on navigation databases

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Purpose



- Minimum Standard & Guidance for Processing Aeronautical Data.
- Provides the User with an Assurance level of Quality.
- Emphasizes Regulatory Responsibilities.

Layout

- Section 1 - Concepts
- Section 2 - Requirements
 - ◆ Appendix B
 - ◆ Appendix C
- Section 3 - Compliance



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BASIC CONCEPTS



Premise

- **Ultimate responsibility of ensuring data meets the quality for its intended application rests with the end-user of the data.**
 - ◆ “A user shall not alter the data from any supplier without informing the data originator of the change and endeavoring to receive concurrence in a timely manner”

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Data Quality

- Aeronautical Data has certain characteristics
 - ◆ Accuracy
 - ◆ Resolution
 - ◆ *Assurance Level*
 - ◆ Traceability
 - ◆ Timeliness
 - ◆ Completeness
 - ◆ Format

Assurance Level

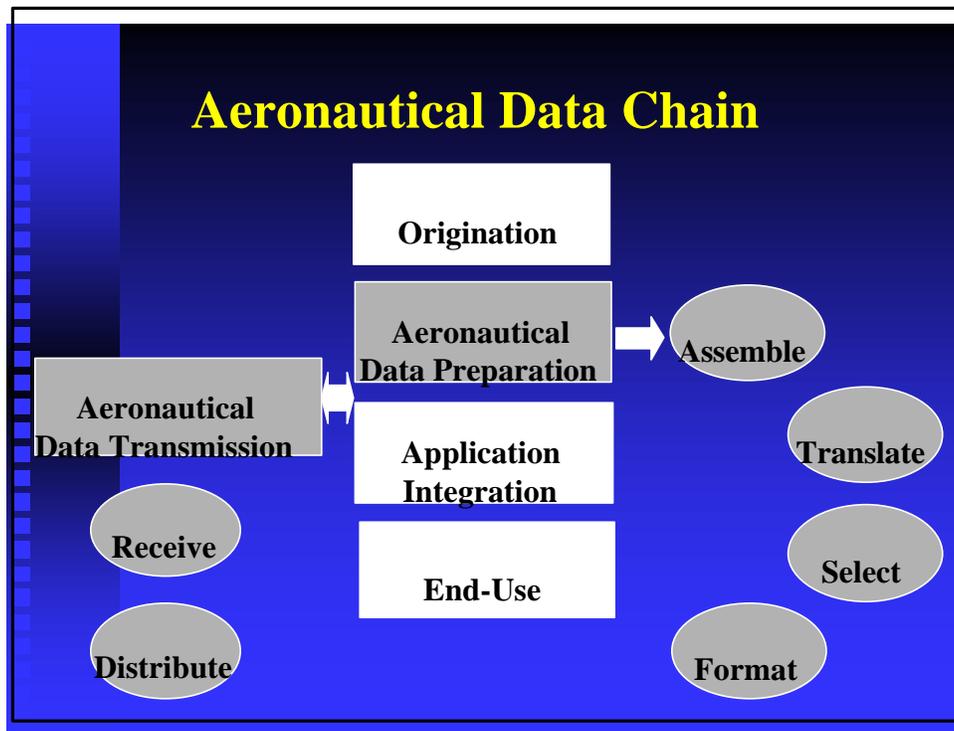
- DO-200A defines three levels for the processing of aeronautical data:
 - ◆ Level 3=routine(no safety effect)
 - ◆ Level 2=essential(minor or major safety effect)
 - ◆ Level 1=critical(hazardous or catastrophic safety effect)
- Levels harmonized with ICAO Aeronautical Information Publication (AIP) standards

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Failure Condition Categories

Failure Condition	Effect	Design Assurance Level	Data Level
Catastrophic	Prevent safe flight and landing	A	1
Hazardous Severe	Large reduction in safety margin.	B	
Major	Significant reduction in safety margin.	C	2
Minor	Slight reduction in safety margin.	D	
No Safety Effect	No affect on operational capability	E	3



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REQUIREMENTS



DO-200A - Requirements

- Compliance Plan
- Defining Data Quality Requirements
- Aeronautical Data Processing Requirements
 - ◆ Process Procedures
 - ◆ Data Alteration Communication
 - ◆ Configuration Management
 - ◆ Skills & Competencies
 - ◆ Tool Qualification

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DO-200A - Requirements (cont.)

- Quality Management
 - ◆ QM Procedure
 - ◆ QM Control
 - ◆ Reviews
 - ◆ Event-driven
 - ◆ Periodic
 - ◆ Records
 - ◆ Management Reviews

COMPLIANCE



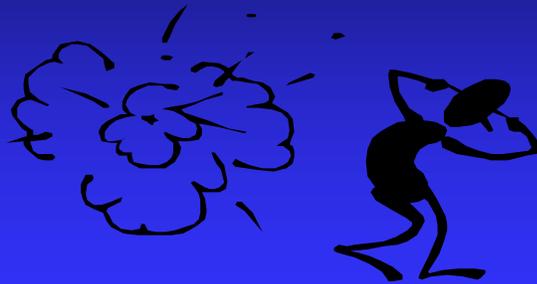
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Demonstration of Compliance

- Audit
- Report
 - ◆ Major
 - ◆ Minor
 - ◆ Observation

Applying DO-200A



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Defining the Assurance Level

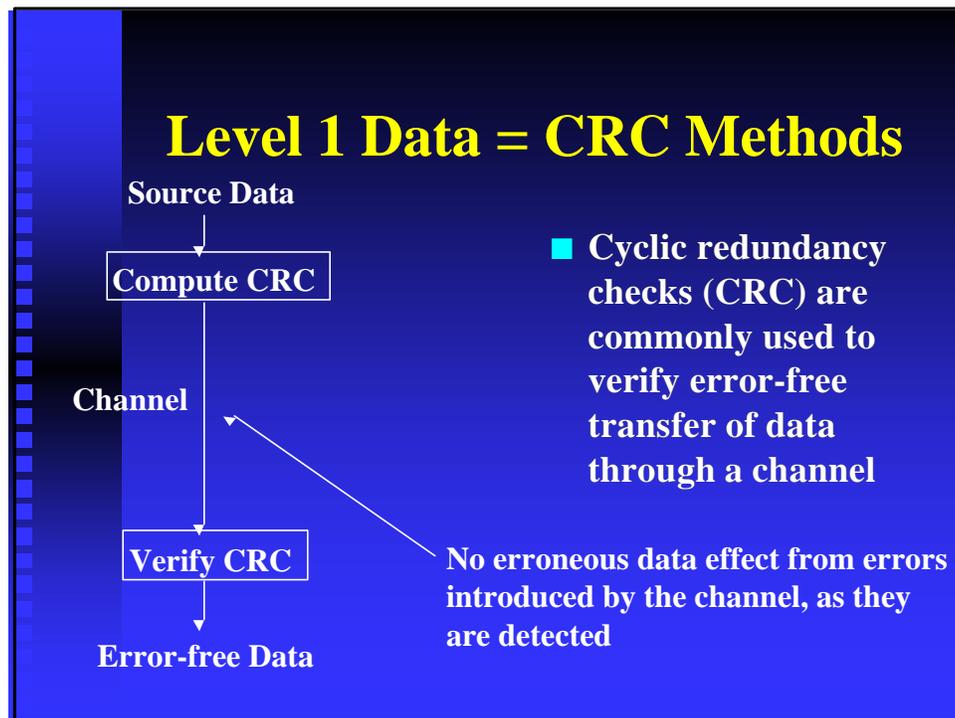
- Apply standard principles when determining assurance level for the application
 - ◆ What is the failure effect of erroneous data on the aircraft?
 - ◆ What is the failure effect of missing data on the aircraft?
- Examples
 - ◆ Data to define precision approach for WAAS or LAAS = Level 1
 - ◆ Nav. Data for RNAV systems = Level 2
 - ◆ Data for information only = Level 3

Applying the Assurance Level

- Pragmatic application:
 - ◆ Level 1 = only applies to precision approach path definition, use unique coding protection (CRC)
 - ◆ Level 2 = current industry best-practices for ensuring data is reproduced without error
 - ◆ Level 3 = no requirements

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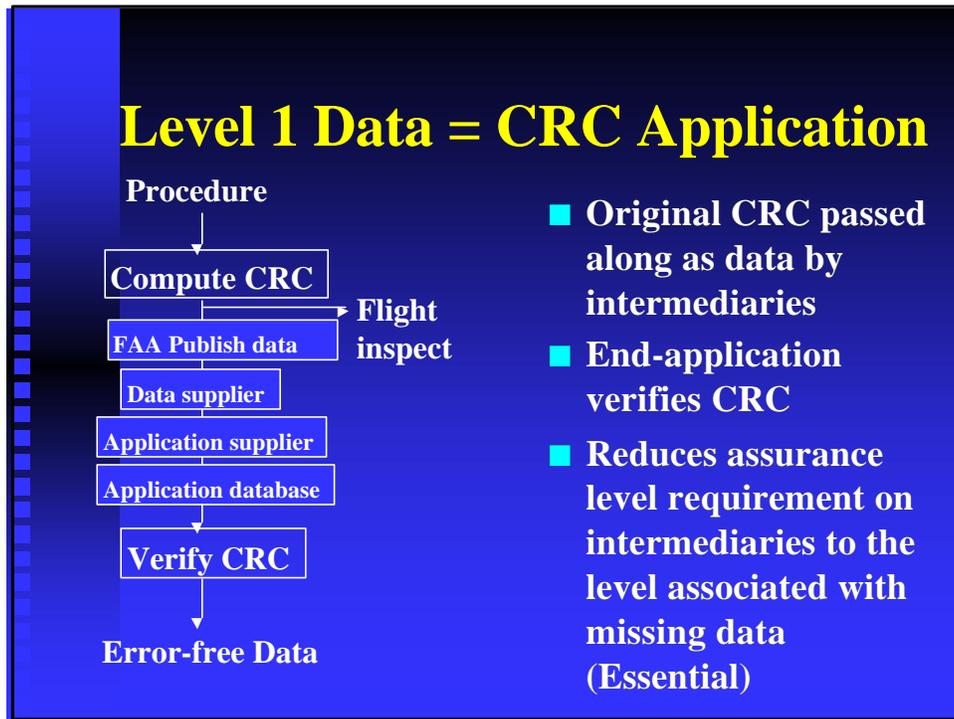
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- ### Level 1 Data
- Procedure designer publishes WAAS or LAAS approach
 - Will also publish a cyclic redundancy check (CRC) calculated on all of the critical data using a standard format
 - All intermediary handlers pass the CRC on as a piece of information (ie, don't compute a new one) - they become the "channel"
 - End-application verifies CRC using standard format

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DO-200A - Miscellaneous

- Significant requirement:
 - ◆ “A user shall not alter the data from any supplier without informing the data originator of the change and endeavoring to receive concurrence in a timely manner”
- Best source of guidance on application of DO-200A is in the appendices of the document

Application to TC/STC

- Applicant should define data characteristics
 - ◆ Data format
 - ◆ Data coding techniques
 - ◆ Assurance level based on use of data
 - ◆ Minimum required set of data
 - how much data?
 - how timely?
- Document requirements in AFM(S):
 - ◆ “Navigation data updates must be obtained from XYZ company, or their licensed supplier, to ensure compatibility with this equipment.”
 - ◆ or
 - ◆ “Navigation data updates must comply with the requirements stated in XYZ Co. Standard 130, available from...”

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Application to TSO Authorizations

- TSO Authorization for equipment should include same things as TC/STC
 - ◆ Manufacturer identifies data characteristics requirements for the database
 - ◆ Document requirements in installation instructions/example AFM(S)

Sample Questions to Ask



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How do you know decoded path matches procedure?

■ Acceptable answers:

- ◆ We verify them end-to-end, drawing random samples
- ◆ We have defined our data input requirements in an internal standard, and we verify that the incoming data complies. We have verified that our standard is complete.

◆ Unacceptable answers:

- ◆ Jeppesen (They do find many problems, but do not know how different equipment uses the information)
- ◆ ARINC 424 (Too much room for interpretation)

Verify that the answers are documented in the Process

How do you ensure future updates are compatible?

■ Acceptable answers:

- ◆ We verify them end-to-end, checking every one that is marked as changed
- ◆ DB software decoding requirement has top-level requirement of backward-compatibility to all prior versions
- ◆ We do compatibility checks to all prior versions of DB decoding software

■ Unacceptable answers:

- ◆ If the current one is okay, shouldn't all the future ones?

Verify that the answers are documented in the Process

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How do you know info. in DB is correct?

- Acceptable answers:
 - ◆ We verify data, have qualified tools, etc.
 - ◆ We have a licensing agreement with XYZ Company, and they have a process standard.
- Unacceptable answers:
 - ◆ It comes from the government
 - ✦ For data which originally comes from State, manufacturer can assume data is correct. But many people/organizations handle data before it gets into the equipment.
 - ✦ Verify that the answers are documented in the Process

THE END

