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DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION HANDBOOK

FAA Data Standardization

This handbook is for guidance only.
Do not cite this document as a requirement.

Foreword

This handbook is approved for use by all Departments of the Federal Aviation Administration (FAA).

This document provides technical guidance on how to create application-independent data standards for representing commonly shared Federal Aviation Administration data. It outlines procedures for initiating, developing, seeking approval of, registering, and maintaining FAA data standards. The procedures support FAA data standardization as established by FAA Data Management Order 1374.1D (07/25/2006) and may be used as guidance to FAA-STD-060, Data Standard for the National Airspace System (NAS).

Comments, suggestions, or questions on this document should be addressed to the FAA Data Registrar, Office of Information Management, 800 Independence Avenue, S.W., Washington, D.C. 20591 or emailed to Mojdeh.Supola@faa.gov.

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1 Scope

1.1 Introduction

Standard data is the cornerstone of the information infrastructure that supports the systems and overall mission of the Federal Aviation Administration (FAA). Standard data will help the FAA to operate in an integrated, effective and efficient manner and allow the sharing of information which is critical to the establishment of FAA-wide information services envisioned to support the FAA for the future. Each individual data standard is a description of a data element shared among FAA information systems, and is portrayed through a common set of metadata (data about data). These metadata sets comply with recommendations set forth in International Organization for Standardization / International Electrotechnical Commission (ISO/IEC) 11179 and follow best practices for managing sharable data.[1]

In June 2006, the FAA Administrator signed the FAA Data Management Order 1375.1D (07/25/2006) which gives the responsibility to the FAA Data Governance Board (FDGB)[2] to review and manage standard descriptions of FAA data. It is under that authority that this handbook has been developed and will be maintained.

1.2 Purpose

This Handbook is for guidance only and cannot be cited as a requirement. It describes the process that all FAA organizations should follow for standardization of FAA data. This handbook conforms to the program objectives set forth in the FAA Data Management Order 1375.1D (07/25/2006) and outlines the procedures for initiating, developing, seeking approval of, registering and maintaining FAA data standards. Use of these procedures will improve the consistent and uniform identification and standardization of FAA data in support of interoperability, data sharing, system design and development, system integration, and business process improvements.

To maximize data sharing across systems in the FAA, approved data standards must be registered and stored in the Federal Data Registry (FDR). The FDR is the authoritative source of FAA data standards and is the mechanism to be used in the data standardization process. The FDR has been made publicly accessible via the internet (user-ID and password is required) to facilitate the creation and use of aviation data exchange standards throughout the aviation community.

The document is intended for those individuals who will play a role in standardizing data, namely information stewards and other staff with data management responsibilities (e.g. Data Architects, Data Modelers, etc.) so some knowledge of sound data management practices is assumed. For those who

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1 “For systems to be truly open, data must be portable and shareable within and among these various application environments, which span localized and distributed networks. For data to be shareable, both the users and owners of data must have a common understanding of its meaning, representation, and identification. To understand the meaning of any data, the descriptions of the data must be available to the users from, for example, a Data Element Registry. Data must be adequately described and users must have a convenient way to obtain these descriptions. Data Element Registries provide a way to organize the content and representation of data elements so that data descriptions are consistently specified and can be easily located by data designers and users. Uniform specification of data facilities, data retrieval, data exchange, and consistent use of data are needed throughout the Software Development Life Cycle. The units of information with normalized meanings and formats are known as “standardized data elements””. – ISO/IEC STANDARD 11179, Metadata Registries.

2 The FAA Data Governance Board was established to implement information and data management policy described in the FAA Data Management Order 1375.1D (07/25/2006).

would like more information prior to using this Handbook, there is a detailed list of Data Management Reference documents included in Section 2 (Applicable References) below.

2 Applicable References

Document Control Center
http://www.faa.gov/cm
Aeronautical Information Exchange Model, AIXM
http://www.aixm.aero/public/subsite_homepage/homepage.html
FAA Enterprise Data Architecture
https://intranet.faa.gov/faaemployees/org/staffoffices/aio/programs/e_government/enterprise_architecture/view/dsp_index1.cfm
FAA Data Governance Board (FDGB) Charter (appendix to Order 1375.1)
https://intranet.faa.gov/faaemployees/org/staffoffices/aio/documents/#ord

FAA Data Governance Board (FDGB) Operating Procedures -
Operating Procedures for the FAA Data Governance Board (FDGB), Revision A, May 14, 2007
FAA Data Modeling Process
https://intranet.faa.gov/faaemployees/org/staffoffices/aio/programs/business_value/data_management/
FAA Enterprise Architecture
https://intranet.faa.gov/faaemployees/org/staffoffices/aio/e_government/enterprise_architecture/
FAA Order 1375.1D, *Data Management Policy*
https://intranet.faa.gov/faaemployees/org/staffoffices/aio/documents/#ord
FAA-STD-025, *Preparation of Interface Documentation*
http://ato-p.se-apps.faa.gov/faastandards/
FAA-STD-060, *Data Standard for the National Airspace System*
http://ato-p.se-apps.faa.gov/faastandards/
Federal Data Registry (FDR)
http://www.fdr.gov/
Federal Data Registry's User Guide
http://www.fdr.gov/ (integrated in FDR user help)
ISO/IEC 11179 standard: *Information Technology – Metadata Registries, Parts 1 – 6*
http://standards.iso.org/ittf/PubliclyAvailableStandards/
National Airspace System Enterprise Architecture (NASEA)
http://www.faa.gov/nasarchitecture/
NAS Configuration Control Board (NAS CCB) Charters
http://acm.faa.gov/nasccb/
NAS Configuration Control Board (NAS CCB) Operating Procedures
http://acm.faa.gov/nasccb/
NAS-DD-1000 – NAS Level I Design Document
http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/cm/dcc/
NAS-SR-1000 – NAS Level Requirements
http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/cm/dcc/
NAS-SS-1000 – NAS System Specification
http://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/cm/dcc/
Office of Information Services/CIO (AIO)
https://intranet.faa.gov/faaemployees/org/staffoffices/aio/

3 Definitions

Administrative Domain Data - All information used to perform the general business functions of the FAA (e.g., payroll, human resources, and accounting).

Attribute - A characteristic of an object or entity.

Business Rule - A statement of fact that identifies constraints governing the business functions and information requirements of an enterprise.

Case file - The case file/NCP prepared on FAA Form 1800-2 is used to propose changes to or establish baselines of NAS systems/subsystems and their associated documentation.

Change Proposal - The Change Proposal form is used to propose changes to those items under the purview of FDGB.

Data - Representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by human or automated means. [FAA-STD-060 Rev. B]

Data Element - A basic unit of identifiable and definable information that occupies the space provided by fields in a record or blocks on a form. A data element has an identifying name and value or values for expressing specific facts. [FAA Order 1375.1D]

Data Life-Cycle Management - The span of interest and associated processes for data. It encompasses creation through implementation to destruction of the agency's data resource. Thoughtful planning is required for the business use, retention, and expiration of data. [FAA Order 1375.1D]

Data Model - A graphical and/or lexical representation of data, specifying their properties, structure and inter-relationships.

Data Registry - A tool that supports the registration and standardization of data elements and other administered items by recording and disseminating data standards, which facilitates data sharing among organizations and users. A data registry provides users of shared data a common understanding of a data element's meaning, attributes, and unique identification. Approved data standards in the registry will be used by information systems developers to enable data sharing. [FAA-STD-060 Rev. B]

Database - A collection of data items that have constraints, relationships, and schema. A collection of interrelated files stored together, where specific data items can be retrieved by various applications. A collection of data arranged in groups for access and storage. [FAA Enterprise Data Architecture]

Derived Data Elements - Derived data elements represent the results of computational operations performed on other data elements. The computations may involve algorithms supported by two or more data elements within a single entity instance or algorithms summarizing data element values across multiple entity instances within a single entity or across multiple entities.

Enterprise Data Architecture - Enterprise Data architecture depicts the objects that are relevant to an enterprise and their relationship to each other. It describes the structure of the data objects and elements, their relationships, and the principles and guidelines governing their design and evolution over time. It defines a process for rationalizing data needs across applications and determining its appropriate distribution and placement [FAA Enterprise Data Architecture]

Entity - Any concrete or abstract thing that exists, did exist, or might exist, including associations among these things EXAMPLE A person, object, event, idea, process, etc.

Information - Any communication or representation of knowledge such as facts, data, or opinions in any medium or form, including textual, numerical, graphic, cartographic, narrative, or audiovisual form. Data that have been processed in such a way that it can increase the knowledge of the

person who receives it. Information is the output, or finished goods, of information systems. [FAA Order 1375.1D]

Information steward - The FAA information stewards are agency individuals with statutory or operational authority for specified information and responsibility for establishing clear definition and standards, including the controls for its generation, collection, processing, dissemination, and disposal. They are responsible for establishing the rules for appropriate use and protection of the information, even when the information is shared with other organizations. [FAA Order 1375.1D]

Information System - A combination of information, computer, automation system, telecommunications resources, personnel resources, and other information technology that collects, records, processes, stores, communicates, retrieves, and displays data. [FAA-STD-060 Rev. B]

Initiator - Someone to begin the process. For data standardization, this could be a data analyst, steward, working group, etc.

Life Cycle - The entire spectrum of activity for an asset, starting with the identification of need and extending through design, development, production or construction, deployment, operational use, sustaining support, and retirement and disposal. [Acquisition Management System Policy]

Logical Data Model - A fully attributed model of data entities that represents the meaning and relationships of data requirements that is independent of individual applications, software, and hardware constraints.

Mandatory Metadata – The minimum set of metadata required to specify a data standard. Refer to Table II for metadata definitions and requirements.

Metadata - Metadata includes information that describes the characteristics of data; facts or information about data; and descriptive information about an organization's data activities, systems, and holdings. [FAA-STD-060 Rev. B]

Mission Support Domain Data - Relatively static information used to support NAS operations or provide other FAA unique services (e.g. the condition and position of navigational aides and copies of aircraft inspection reports),

Modeling - Application of a standard, rigorous, structured methodology to create and validate a physical, mathematical, or otherwise logical representation of a system, entity, phenomenon, or process.

NAS Operations Data - Time-sensitive, safety critical information used to provide separation of aircraft (e.g., the position of aircraft in the sky and communications between pilots and controllers).

Relationship - An association between two entities or between instances of the same entity.

Standard Data Element - A data element that has been formally approved in accordance with the Standardization procedures. Alternatively, standard data elements are data that have been coordinated through the standardization process and approved for use in information systems. [FAA-STD-060 Rev. B]

Standardization - Process of requiring application of an approved, uniform definition and representation to a data element or entity [FAA Order 1375.1D]

Terms of Reference (ToR) - is a contract that describes the Working Group's composition, leadership, interest, products, and goals is developed by the working group for approval by the FDGB. The format and topical outline of the ToR is shown in APPENDIX D – Outline of Working Group Terms of Reference.

4 Roles and Responsibilities

Development of FAA data standards requires participation across all FAA functional communities. This section identifies the key participants and their roles and responsibilities in the FAA data standardization process.

4.1 Participant Roles and Responsibilities

4.1.1 FAA DATA GOVERNANCE BOARD

The FDGB is the group chartered by the FAA Administrator under FAA Order 1375.1 D to manage the standardization process for FAA data and to be the decision-making body for all proposed data standards that are not processed by the National Airspace System Change Control Board (NAS CCB). The FDGB is organized into three permanent bodies: Co-Chairs, Permanent members, and Executive Secretary. In addition, the FDGB is supported by the FAA Data Registrar and a number of goal-specific, defined-lifetime working groups. For more information on the operation of the FDGB, refer to its Charter and Operating Procedures.

4.1.2 FDGB CO-CHAIRS

The FDGB Co-Chairs are the designated FAA senior-level individuals who must approve the products and output of the FDGB They act as pre-screening authority for changes presented to the NAS CCB, including signing NAS data standard case files before they are submitted to the NAS CCB. They act as approval authority for changes not under the purview of NAS CCB and other items as defined by the FDGB Charter. They approve the Terms of Reference (ToR) contracts with the FDGB Working Groups, and they ensure that implementation actions assigned to the FDGB are completed as specified in Decision Records.

4.1.3 FDGB PERMANENT MEMBERS

The FDGB Permanent Members are the Designated Data Authority representing various FAA organizations and are empowered to speak and act for those organizations on data management. They represent their organization and evaluate, comment, and advise the FDGB on change proposals and other items before the board.

4.1.4 FDGB EXECUTIVE SECRETARY

The FDGB Executive Secretary facilitates and supports the Working Group activities, including assistance with meeting logistics and collaboration tools. The Executive Secretary has the key administrative role of monitoring and tracking the progress of the Working Groups and managing relations with the NAS CCB.

4.1.5 NAS CONFIGURATION CONTROL BOARD

The NAS CCB is the authoritative decision making body for all proposed NAS data standards. For detailed information on the operation of the CCB, refer to the NAS CCB Charters and Operating Procedures.

4.1.6 INFORMATION STEWARD

An information steward is responsible for the accuracy, reliability, quality, and currency of descriptive information (metadata) about data in his/her assigned area of responsibility. Every established data standard will have a steward assigned who will be responsible for maintaining that standard throughout its life cycle. If changes are proposed to a standard, the appropriate information steward will review and consider comments and recommendations.

Within the context of this document, a steward is responsible for the metadata that comprises the standard. Information stewards play an essential role in the creation of FAA data standards by working with the FAA Data Registrar and FAA Data Architect to resolve data integration issues, assign data element names, write definitions, specify business rules, identify sources of data, and establish data quality, security, and retention requirements. In coordination with LOB Data Architects, Information stewards are encouraged to submit candidate data elements for registration and standardization and to participate in FDGB Working Groups that are involved in their specific subject areas.

Information stewards will perform the duties assigned to them by FAA Order 1375.1D. The steward is also responsible for managing and transferring appointments as necessary and will update the FDR accordingly. Refer to the Order for more information about stewardship assignment and responsibilities.

4.1.7 LINE OF BUSINESS DATA ARCHITECTS AND MODELERS

Data Architects and Modelers, in coordination with stewards, are responsible for ensuring that the basis for the LOB logical models is driven off of the Enterprise Data Model and can provide a linkage between the two models. Data models are key in determining data naming conventions for administered items within the registry.

4.1.8 FAA DATA REGISTRAR

The FAA Data Registrar, or Registrar, is the person dedicated to the control of data standards and supports the FDGB with FAA data standards development and publication. They provide overall technical direction of FDR operations in accordance with ISO/IEC 11179 and FDR policies and procedures. The Registrar also promotes the reuse and sharing of data in the FDR within and across functional areas and among external interested parties.

4.1.9 FAA ENTERPRISE DATA ARCHITECT

The FAA Enterprise Data Architect is a person responsible for maintaining FAA Enterprise Data Architecture. The FAA Enterprise Data Architect advise and assist FDGB on impacts to FAA Enterprise Data Architecture, FAA Data Reference Model, Office of Management and Budget (OMB) Federal Enterprise Architecture requirements and related guidance from the DOT Enterprise Architecture. FAA Enterprise Data Architect works with initiators, information stewards, and working groups on development of their data models as required and review proposed changes for impacts to FAA Enterprise Data Architecture.

4.1.10 WORKING GROUPS

The basic organization for the compilation and creation of a case file/change proposal package of proposed data standards is the Working Group. The Working Group operates under a ToR contract with FDGB and is led by a person who has the managerial responsibilities to generate and follow up on the case file/change proposal package. There is no requisite size for a Working Group, but the composition should represent those organizations/systems in the FAA that have a vested interest in the metadata under evaluation.

5 Data Standardization Process Overview

5.1 Introduction

The FAA Data Standardization process is composed of two parts:

a. *Standards Development* - standards development is characterized by research and analyses of candidate data standards. The process for developing standards applies to all FAA data.
b. *Standards Approval* - approval consists largely of vetting the proposed standards and reaching consensus. There will be two processes for approving data standards. Although the FDGB will review all data standards:
    1. Data standards associated with systems under the NAS CCB purview, hereafter referred to as NAS data standards, will be processed for approval by the NAS CCB.
    2. Data Standards that are *not* associated with systems under the NAS CCB purview, hereafter referred to as Non-NAS data standards will be approved by the FDGB.

5.2 Standards Development

Any data that is shared needs to be standardized and placed in the FDR. Steps necessary to begin the standardization process are illustrated in Figure 1 below.

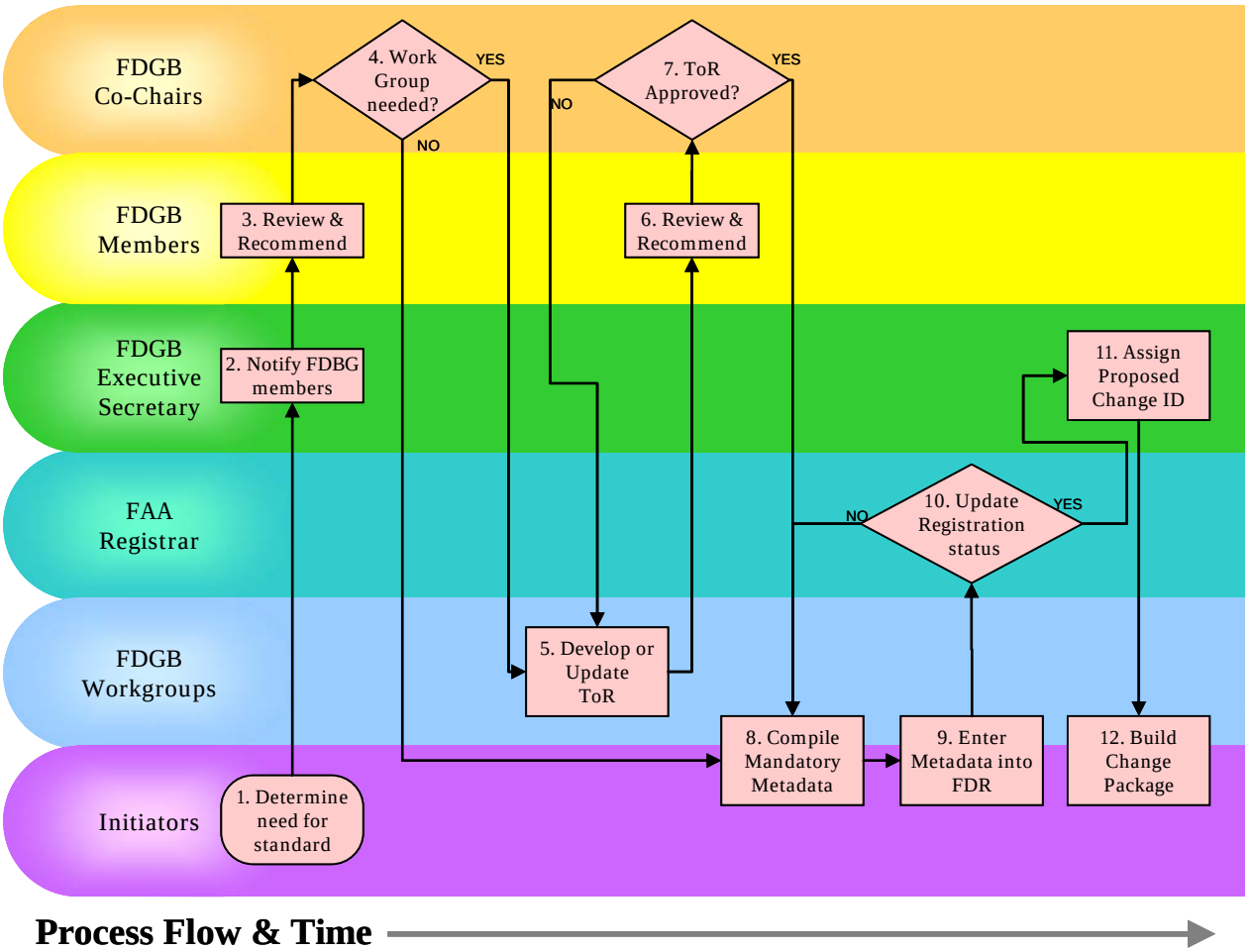

Figure 1 - Standards Development Process

The need for a standard must be reviewed against the FDR to determine if another data element, that might fulfill the specific need, has already been standardized. The initiator may always call upon the FDGB and the FAA Data Registrar to help find existing standards or determine the need for new ones. During this process, there will exist one of the following three possibilities:

a. If the standard already exists, the initiator should adopt the standard for the specific use. Data elements and other administered items[3] that are data standards or potential candidates for standardization are registered in the FDR.
b. If applicable data elements have been registered but not standardized, then regardless of their status, the initiator should find this information to be a good basis on which to commence a standardization effort.
c. If there is no information documented in either registry, the initiator will have a basis for proceeding to standardize needed data elements.

When it is determined that a new standard is needed, the initiator then contacts the FDGB Executive Secretary, who notifies the FDGB Permanent Members of the potential standardization effort. The permanent members[4] will determine whether a Working Group of subject matter experts is needed to help

3 Administered items are any metadata components that are managed in an ISO/IEC 11179-compliant data element registry, such as the FDR, and are further discussed in Section 8.
4 A group of Designated Data Authorities (DDA) with voting rights who represent the various Lines of Business of the FAA.

develop the standard, based on the size and complexity of the standardization task. One of two things will occur:

a. If a Working Group is needed, it is approved and the Working Group is formed, ad hoc, with a common interest in the proposed data standard. A Terms of Reference (ToR) is a contract that describes the Working Group's composition, leadership, interest, products, and goals is developed by the working group for approval by the FDGB.
b. If a Working Group is not required, the steward or user who initiated the need for a standard will be directed to continue with the process as an individual.

The data standardization development process now expects that either the individual initiator or Working Group will compile the prescribed mandatory metadata and enter it in the FDR. Once the standardization effort is complete and recorded, it is given to the Executive Secretary to complete the necessary steps to begin the approval process. Every standardization change requires a change proposal package identification/case file and number which will be used to track the change through the approval process.

A detailed description of the data standardization development process is presented in Section 6 below.

5.3 Approval Process for NAS Data Standards

The approval process is designed to qualify and formally review proposed data standards and their supporting material. Once reviewed and unanimity in metadata documentation is achieved, a standards decision may be made by the NAS CCB. Figure 2 illustrates the steps and actions of this process.

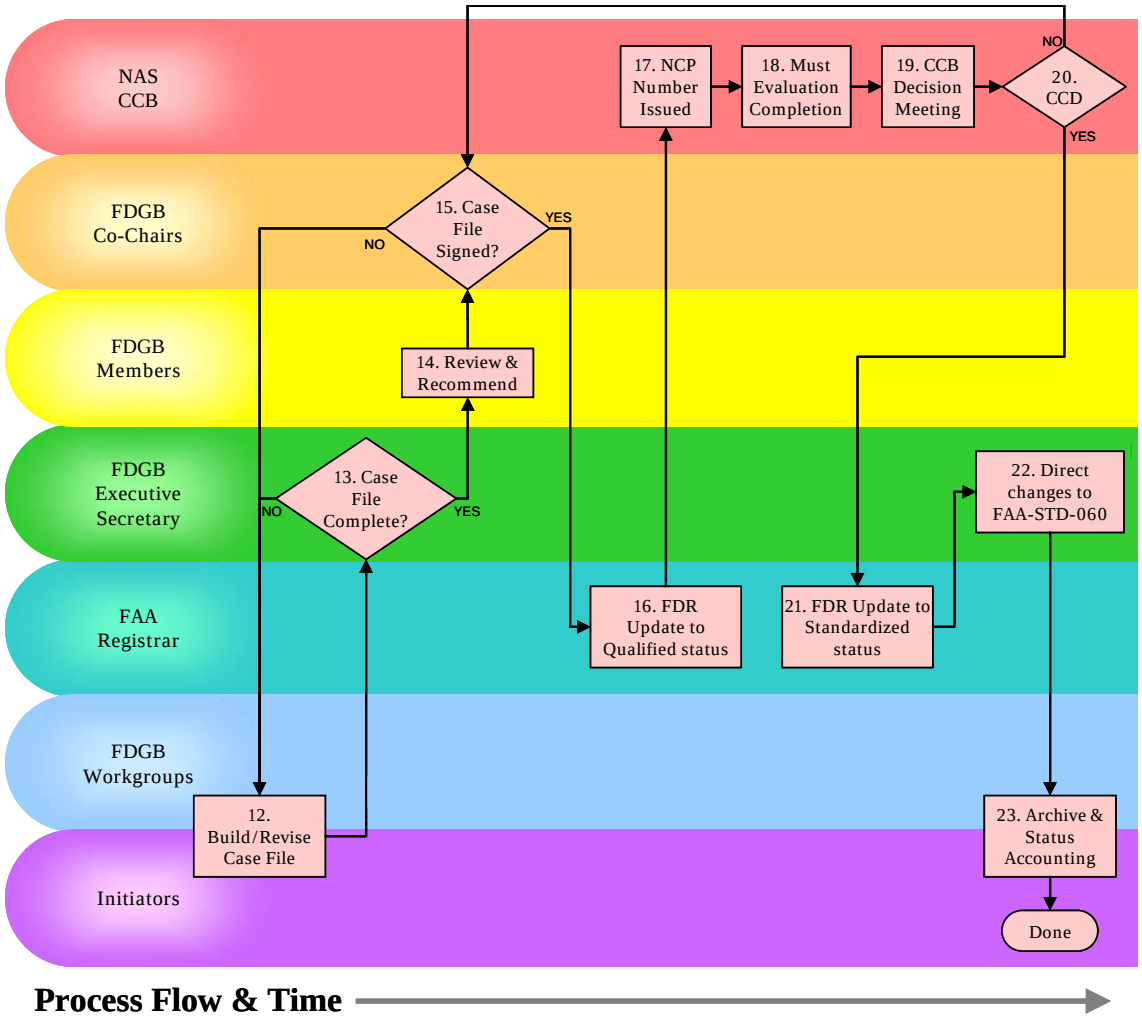

Figure 2 - Approval Process for NAS Data Standards

The process describes moving the proposed data standard through the examination, review, and approval steps. The case file is an artifact for handling NAS configuration management items. Traditionally, the case file describes proposed changes to a system's hardware or software baseline; however, in this process the case file describes proposed changes to metadata. Note that any number of proposed data standards might be submitted in a single case file.

In the earlier discussion, the initiator or the Working Group compiled the case file. The case file includes a collection of information about the proposed standard(s) with any relevant supporting materials such as a) related data elements; b) results of collaboration among stakeholders; c) documented requirements for the data standard(s); d) and a relevant data model or system data blueprint. The whole package is forwarded to the FDGB Executive Secretary for a completeness review and processing.

The Executive Secretary then presents the case file to the FDGB Permanent Members for pre-screening review. The FDGB Permanent Members examine the material in the case file for completeness with respect to each Member's Line of Business. If there are no issues for resolution, the package is signed by the FDGB and submitted to the NAS CCB Control Desk. The Enterprise Configuration Management Control Desk who handles the Configuration Control Board administrative actions and the staff issues and assigns a NAS Change Proposal (NCP) number and sets up the must evaluation. The must evaluation is a final screening by NAS stakeholders. Issues must be evaluated and resolved before a case file is

presented to the CCB for approval. Once it is approved by the CCB, a Configuration Control Decision (CCD) is announced, and a new standard is established.

Various administrative and registration statuses of the proposed data elements in the FDR have been assigned by the FAA Data Registrar and updated throughout the process. Now, as the case file exits the CCB process, the Registrar is alerted to the event and will change, as appropriate, the status of the data elements to "standardized." The case file then is returned to the FDGB Secretariat for action that will include making the required additions or updates to FAA-STD-060, which is the formal document supporting the data standards. The case file is then archived, and the initiator or the Working Group completes the cycle by performing the housekeeping task of status accounting or closing the books, as may be appropriate.

5.4 Approval Process for Non-NAS Data Standards

The approval process is similar to those of NAS CCB data but only requires FDGB approval. The process as shown in Figure 3 describes moving the proposed data standard through the examination, review, and approval steps as a proposed change.

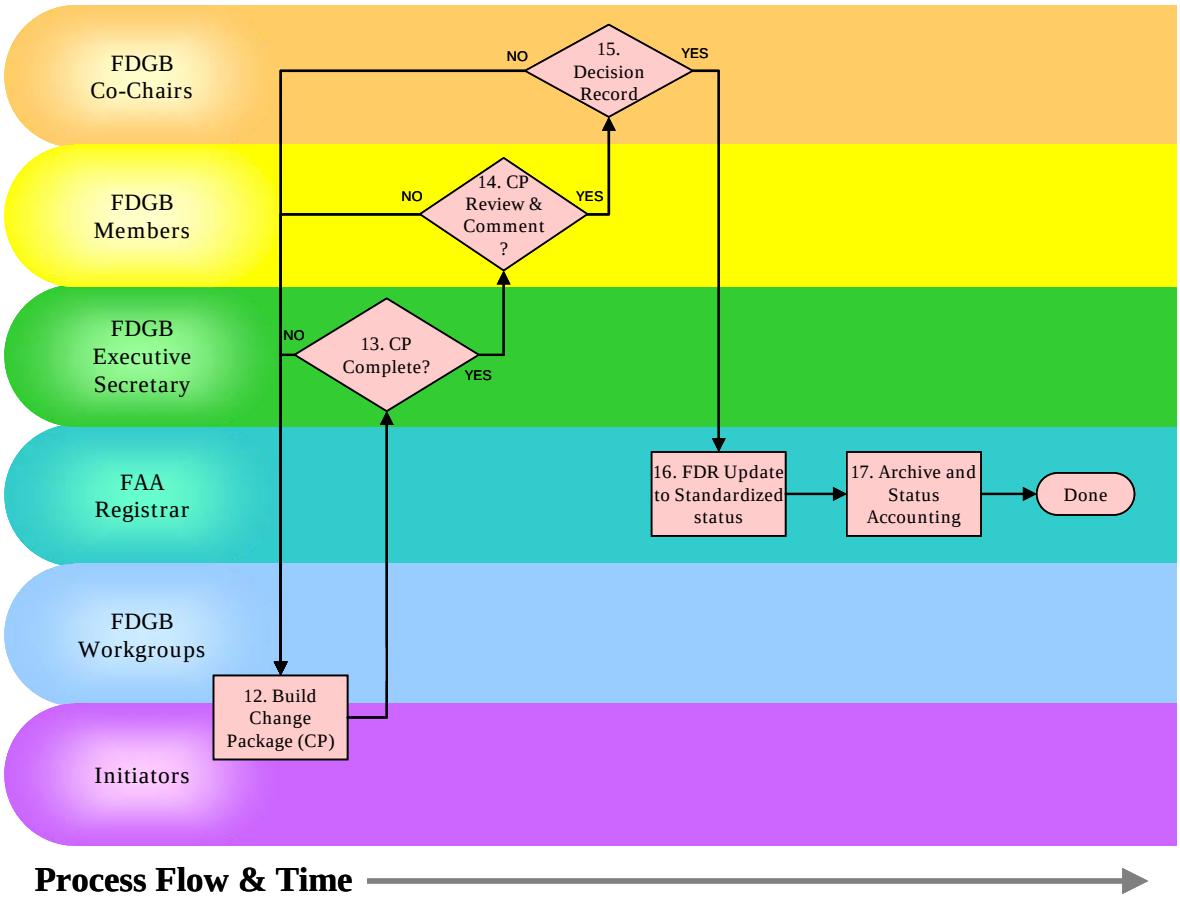

Figure 3 - Approval Process for Non-NAS Data Standards

In the earlier discussion, the initiator or the Working Group compiled the change proposal package. This package is similar to a case file, is a collection of information about the proposed standard(s) with any relevant supporting materials such as a) related data elements; b) results of collaboration among

stakeholders; c) documented requirements for the data standard(s); d) and a relevant data model or system data blueprint. The whole package is forwarded to the FDGB Executive Secretary for a completeness review and processing.

The Executive Secretary then presents the change proposal package to the FDGB Permanent Members for review. The FDGB Permanent Members examine the material for completeness with respect to each Member's Line of Business. If there are no issues for resolution, the package is signed by the FDGB Co-Chairs. Once it is approved by the FDGB Co-Chairs, a Decision Record is announced, and a new standard is established.

Various administrative and registration statuses of the proposed data elements in the FDR have been assigned by the FAA Data Registrar and updated throughout the process. As the change proposal package is approved by the FDGB, the FAA Data Registrar is alerted to the event and will change, as appropriate, the status of the data elements to “standardized” and make necessary updates in FDR.

6 Data Standards Development Process

The determination of a need for a data standard is a function of good systems engineering practice. Where interoperability risks are high or a cost-benefit assessment is positive, a standard should be a first consideration. At a minimum, new system development programs and projects, including major modifications, should propose standardized data elements for any data that is exchanged with other systems outside of one's Lines Of Business or Staff Office or with parties outside of the FAA. Good information engineering practices encourage the use of open systems and application-independent data practices to reduce costs and allow for modernization.

6.1 Step 1 – Determining Need for Data Standard

The fundamental rules for determining a need for a data standard are:

a. Is the data element in question considered a commonly or widely used item? *In other words, is this data element used across the FAA, between air route traffic control centers (ARTCC) or between facilities? Is it listed in several system data dictionaries?*

b. Is it likely that the data element in question is exchanged between different or distributed systems? *An example would be the data in a flight position report: aircraft identification, departure airport, arrival airport, etc.*

c. Is this data element a new requirement for a modernization program? *An example would be system specific "new data" like runway threshold latitude and longitude required for the Standard Terminal Automation Replacement System (STARS).*

Primary references that should be consulted to help answer these questions include the FAA Enterprise Architecture (FEA), FAA Enterprise Data Architecture (FAA EDA), and the NAS Enterprise Architecture (NASEA). If the response to any of these questions is "yes," the individual (data steward or other user of the data element in question) who is initiating this standardization effort should document the findings for their potential utility as change proposal package/case file supporting material, and move to Step 2. In general, the collection and compilation of metadata under the direction of data stewards is encouraged. Though the data element in question may not be ultimately "standardized," the effort to compile and assess the metadata is a valid activity for all data stewards.

Sources for potential FAA data standards will be any technical documentation such as Interface Requirements/Control Documents (IRDs/ICDs) and Computer Program Functional Specifications (CPFS) documents.

The next objective is to compare the data element of interest with metadata of data standards in the FDR, which is easily accessed via the Internet. The best approach for evaluating a new data element against the FDR contents is to compile the following metadata for the data element of interest:

a. Definition or description of the data element

b. Common name of the data element

c. Range of values that the data element may assume

d. Systems or databases that may employ the data element now or in future

e. General classification of the data element.

The initiator should then begin a comparison search of the registry by using the search and listing functions of the FDR. This task is generally a discovery effort in which the initiator is expected to assess the contents

and determine the similarities of any new finds and the data element of interest. The following is the suggested priority of comparison and equation:

a. **Similar or same definition**. If the *data element of interest* and existing registry entries have about the same definition, which describes their purpose, further investigation is clearly warranted.

b. **Similar or close range of permissible values**. If the *data element of interest* and an existing registry entry have nearly the same value domain, further investigation is warranted.

c. **Similar or same name**. If the *data element of interest* and existing registry entries have about the same name, or have the same name in a different context, which suggests similar usage, further investigation is warranted.

d. **Similar or common system usage**. If the *data element of interest* and existing registry entries are used by the same or adjacent installations of the system, further investigation is warranted.

e. **Same classification**. If the *data element of interest* and existing registry entries possess the same classification, there is a basis for continuing the investigation.

In each situation, a continuation of the specific investigation implies that there is a basis for finding a similar, perhaps suitable standard or qualified data element for use.

The objective in this analysis is to move toward a decision on a data standard. A refinement of the rules is as follows:

a. If there is agreement with comparison item 1 and 2 for the *data element of interest*, then there is a basis for adopting the FDR standard data element for the system or database in lieu of the *data element of interest*.

b. If there is agreement with comparison items 3 and 4 for the *data element of interest* with other data elements in the registry, then there is a basis for standardization of the data element of interest.

c. If there is agreement with comparison items 4 and 5, then there is a basis for establishing a new standard based upon the *data element of interest* and those data elements found in the FDR.

These rules are offered as general guidance. It is incumbent on the initiator to assess the issues and work with the Registrar to develop a strategy for advancing those data elements under his/her purview toward standard data.

This information and assessment is summarily presented to the FDGB Executive Secretary for coordination and processing.

6.2 Steps 2 through 4 – Assessing Need for a Working Group

The initiator contacts the FDGB Executive Secretary, who determines, based on the following criteria, whether a work group is needed. If it is determined that the effort is cross-domain and requires DDA's participation, the Executive Secretary notifies the FDGB Members (Step 2) of the standardization effort and resources needed. The Members may use the following criteria to help determine whether or not a Working Group is required (Steps 3 and 4):

a. Is the *data element of interest* being processed (even singly) related to a larger set of data elements? Is sufficient information available to understand the relationship of the *data element of interest* to a broader formulation? If so, this would suggest wide use and interest, and a Working Group would be a prudent investment of resources. The Members may recommend: 1) starting a new Working Group or 2) adding this item and initiator to an active (standing) Working Group.

b. Is the *data element of interest* presented as a part of a large set? The presence of a large group of data elements for standardization suggests a broad impact and investigations will be extensive in the course of building the change proposal package/case file. If so, this would suggest wide use and interest, and a Working Group would be a prudent investment of resources.

c. Is the *data element of interest* presented as part of an ongoing work effort being done under an existing FAA initiative or project? If so, the Members may advise the initiator to use the resources available in that project to develop and coordinate a change proposal package/case file for the proposed data standard.

d. Is the *data element of interest* presented as a new version of an existing standard? In this case, the initiator should be familiar with the various interested parties. In this situation, the Members may advise the initiator to develop and coordinate a change proposal package/case file for the new data element version. If other individuals or groups are working on the same data standard, the work may be combined.

6.3 Step 5 – Developing the Terms of Reference (ToR)

The determination of need for a Working Group requires either the new development of a formal document called the ToR, or that an existing ToR be updated to reflect the new responsibilities being placed on an existing Working Group. Please refer to the definitions at the beginning of the handbook for a definition and reference for an example of a ToR. The following roles and responsibilities exist in the working group:

a. **Working Group Chair** - The ToR is normally developed by the individual designated the candidate Working Group Chair. This designation is a collaborative selection, normally done by the FDGB Members and the manager of the initiator organization.

b. **Working Group Membership** - The composition of the Working Group is a function of those organizations and individuals who can be considered stakeholders in standardizing the *data element of interest*. Generally, this group of people will be subject matter experts, systems engineers, and database administrators representing the systems that use the data element or the class of data represented by the data element.

The ToR sets up a “partnering workshop” among those organizations represented. It is not expected to be a lengthy document but simply a work statement that outlines the products, timelines, and commitments.

6.4 Steps 6 and 7 – Approving the Terms of Reference

The Executive Secretary is responsible for reviewing a prepared ToR for completeness. The format and outline shown in APPENDIX D – Outline of Working Group Terms of Reference is the basis for this review. The prepared ToR is then circulated among the FDGB Members. This circulation offers each Member the opportunity to assess and comment on the endeavor described in the ToR. The FDGB Co-Chairs will sign the approved ToR or return it to the author for coordination and resolution of any issues that surfaced during the review.

The FDGB Co-Chairs’ signatures formalize the activities and provide notice to the larger community that a standardization effort is authorized. If collaborative efforts are necessary, the ToR is evidence that project should command the necessary resources to fulfill the need.

6.5 Step 8 – Compiling Mandatory Metadata

This step is necessary for gaining an understanding of the data element of interest and collecting the information for input into the FDR. Creation and registration of a potential standard data element requires that certain characteristics of the data element, called metadata, be recorded to clearly describe and define it. A list of this metadata is shown in APPENDIX A – Metadata Requirements. The initiator should ensure

that these characteristics are stored in the FDR. The discussion[5] that follows is intended to describe the creation and capture of high quality, consistent metadata that meets the requirements of the Data Registry.

6.5.1 UNDERSTANDING THE DATA ELEMENT

The first thing to do is to gain an understanding of the data element. This means answering questions like:

a. What kind of data will be stored in this data element?

b. Is there a definition or description of the data values?

c. Were permissible values or examples of the data provided?

d. Will the data values be determined by an arithmetic or statistical procedure?

e. What will the data values look like, e.g., are they names or descriptions of things, numbers to be calculated, strings of characters, and numbers that are identifiers?

f. How is the data element used in existing applications?

Where documentation is inadequate to fully understand the data element, consult those who represent the source of the data element to get the necessary information.

When examining existing computer systems to find out how the data element is used, do not automatically assume that there will be a one-to-one correspondence between a field in a record and a data element. Data dictionaries may be available for mid- to large-scale systems, and they are a source of descriptive information. However, as systems evolve, fields can become used for multiple purposes under various conditions. When such a situation is detected, the field must be analyzed to understand the data item and to break down complex items into their constituent components. It may be desirable, if not necessary, to declare one or more data elements within a single data field. The reverse situation, where multiple fields correspond to or are necessary to define a single data element, is also possible, though less likely.

6.5.2 COLLECT BASIC DATA ELEMENT INFORMATION

Begin collecting information on the data element of interest. If the initiator prefers to begin compiling metadata off-line rather than enter it directly into the FDR, the FAA-STD-060 data standard/developer compliance report shown in APPENDIX E – Proposal Package Sample may be used as a worksheet to support the input of metadata into the FDR when the work has progressed to the point of registry input.

While collecting and evaluating the metadata, consider the following:

a. Is the data element described as an existing International, National, or FAA standard? *If so, there is good reason to accept the standard for use.*

b. Does a data element exist in the FDR or other registries? *If so, research and assessments are already completed to assist in advancing a new data standard.*

c. Does the data element have the potential for being reused? *If so, there are probably other interested parties or stakeholders who should participate in the standardization effort.*

The collection process product is a basis for developing the data standards, and the following steps expand and refine the data element information in preparation for registry operations.

a. Data Element Identification (Name)

5 Some material in this section is adapted from: ISO/IEC PDTR 20943-1.3 *Information technology – Data management and interchange – Procedures for achieving metadata registry content consistency – Part 1: Data elements*, April 2001

The initiator should record the common term that identifies or names the *data element of interest*. At this point, it may be something cryptic like ACFT_POS_XYZ, but if this term is often used in FAA applications, then it should be used initially.

Modern naming conventions, or rules, are useful in removing ambiguity and helpful in communicating use and meaning, especially when the identification process for a data element is initiated. The "old term" may be kept for accountability purposes, but modern conventions must be applied. A set of conventions for naming data elements in the FDR has been adopted; the conventions as well as a detailed description of how to create names can be found in APPENDIX B – Naming Conventions and Guidance. It should be noted that organizations or communities of interest that have already adopted their own data naming conventions may use those when they are registering their metadata in their own contexts. Those who wish to use different conventions must also provide the Registrar with a copy of the conventions to post on the FDR portal.

Developing the data element definition first helps to develop well-formed names by providing relevant words to use in the name. Briefly, formulation of data element names is accomplished by recognizing the component concepts of the data elements: object class term, property term, and value domain term. An object class term is the name of a kind of "thing." A property term is the name of some information about the kind of "thing." A value domain term is the name for an explicit representational form and interchange format. At least one formulated name must be assigned to a data element. The following example data element name structure is shown with the proper case structure and separators between terms:

ObjectClassTerm_PropertyTerm_value-domain-term.

Note that the object class term is first, then the property term, and finally the value domain term. The terms are separated by an underscore ("_"). For example:

Employee_Birthday_date-Julian
*Employee_LastName_tex*t.

Naming is important to the standardization effort. Careful formulation of the names (and other documenting meta-attributes) of data concepts promotes consistency of data element names and helps to prevent development of inappropriate data element names (i.e., different names for the same data element or the same name for different data elements).

If a data element might be adapted to meet a new requirement or if some attributes of an existing data element (e.g., value domain, data element concept, or conceptual domain) might be reused with the new data element, then an efficiency gain can be realized. Content research should include a search of conceptual domains, data element concepts, and value domains as well as data elements to identify attributes that might be relevant to the new data element.

b. Data Element Definition

The definition of the *data element of interest* is important and its composition should be the first step in documenting the data element. This definition may initially come from the data dictionary associated with the data element and application or system. The essential meaning of the data element must be captured in a data element definition. The definition should enable the reader to appreciate the purpose and use of the data element. The aforementioned data naming conventions should have helped the definition development. APPENDIX C – Writing Good Definitions describes rules and guidelines for formulating good definitions.

c. Value Domain and Permissible Values

Data is frequently thought about in terms of the values that it may assume. Therefore, in compiling the metadata that describes the *data element of interest*, this key information must be noted. The value domain of a data element describes the values that the data element is allowed to have. APPENDIX A – Metadata Requirements contains detailed information about the kind of metadata captured for value domains, such as data type and interchange format.

The interchange format is used to indicate the position of punctuation, symbols, or other editing requirements for the data item value (e.g., YYDDD is the interchange format for Julian date). The value domain is an administered item, which means that administrative data, such as its name, definition, source, steward, any explanatory comments, etc., need to be entered. Domains can be enumerated (i.e., established through a list) or non-enumerated (e.g., specified through a formula, rule, procedure, or reference). Different metadata attributes are used depending upon whether the permissible values are enumerated or non-enumerated. Each enumerated permissible value is associated with a value meaning and value meaning description. Each enumerated permissible value is also entered in the registry with its begin date (i.e., the date when that permissible value became valid for a value meaning in that registry). End dates will also be entered when the permissible value for a value meaning becomes invalid. Value domains for non-enumerated domains must include a *description* of the values that are valid for those domains.

d. Steward Organization

At some point in the standards development, organizational responsibility in the form of a data steward must be declared. It is useful to gather and record information of organizational interest or responsibility for the *data element of interest*.

e. References

References are used to cite additional specifics (i.e. possible list of code values), about a data element, that are important to understanding its meaning.

f. Usage

Like references, understanding the applications or systems that use the *data element of interest* is important. These applications and systems must be documented as they will lead to other interested parties with unique requirements that must be understood in order to promote an application-independent data standard. It is important to understand the specific contexts in which the data is used now or is planned to be used in future.

6.6 Step 9 – Entering Metadata in the Federal Data Registry

The initiator or person(s) who will be entering the metadata into the FDR should access the FDR and apply for a user account with the Registrar. Once the account is established, the initiator can conduct transactions with the registry. Explicit directions for entering metadata into FDR can be found in the FDR on-line help and Users Guide for the FDR. FDR training is also offered periodically by the Office of Information Services.

6.7 Step 10 – Update Registration Status

All potential standards entered in the FDR have an Administrative Status, which explains where the candidate element is in the standardization workflow process, and a Registration Status, which reflects the level of quality and utility of its metadata in the FDR. At various points in the process and always in coordination with the initiator, the Registrar assigns these statuses appropriately. Some of the metadata items in APPENDIX A – Metadata Requirements are denoted as “mandatory” and the initiator should know

that all of the mandatory fields must be completed in the FDR for the Registrar to qualify the Registration Status of the data element of interest as “recorded.” (The default or lowest Registration Status is “incomplete.”) As the candidate element passes through the succession of quality reviews by FDGB and the NAS CCB, it will achieve “qualified” status and ultimately become “standardized.” The “standardized” data element is the preferred data element to be used for data sharing to ensure consistent representation and understanding of the data being communicated.

6.8 Steps 11 and 12 – Preparing the Change Proposal Package/Case File

If a Working Group has been tasked with initiating the proposed data standard effort, the Working Group Chair will collaboratively discuss and resolve technical and data stewardship assignment issues within the Working Group. When these issues are resolved, the Working Group Chair or individual initiator (data steward or other user) then prepares a change proposal package/case file containing the proposed standard(s) with supporting materials deemed relevant by the initiator. The initiator requests a change proposal package/case file number (Step 11) from the FDGB Executive Secretary and coordinates with the Registrar to promote the Administrative Status of the proposed data standard(s) from “proposed” to “interim,” which means that it is ready for FDGB review.

When the proposed data standard(s) have been documented (Step 12) and registered as described above, the initiator or Working Group Chair is ready to proceed to the approval phase. This phase is described in Section 7.

7 Data Standards Approval Process

7.1 Introduction to Data Standards Approval Process for NAS Data

This section addresses the technical and cross-functional review and approval of data standards using the NAS Change Proposal (NCP) process. This process is illustrated in Figure 4.

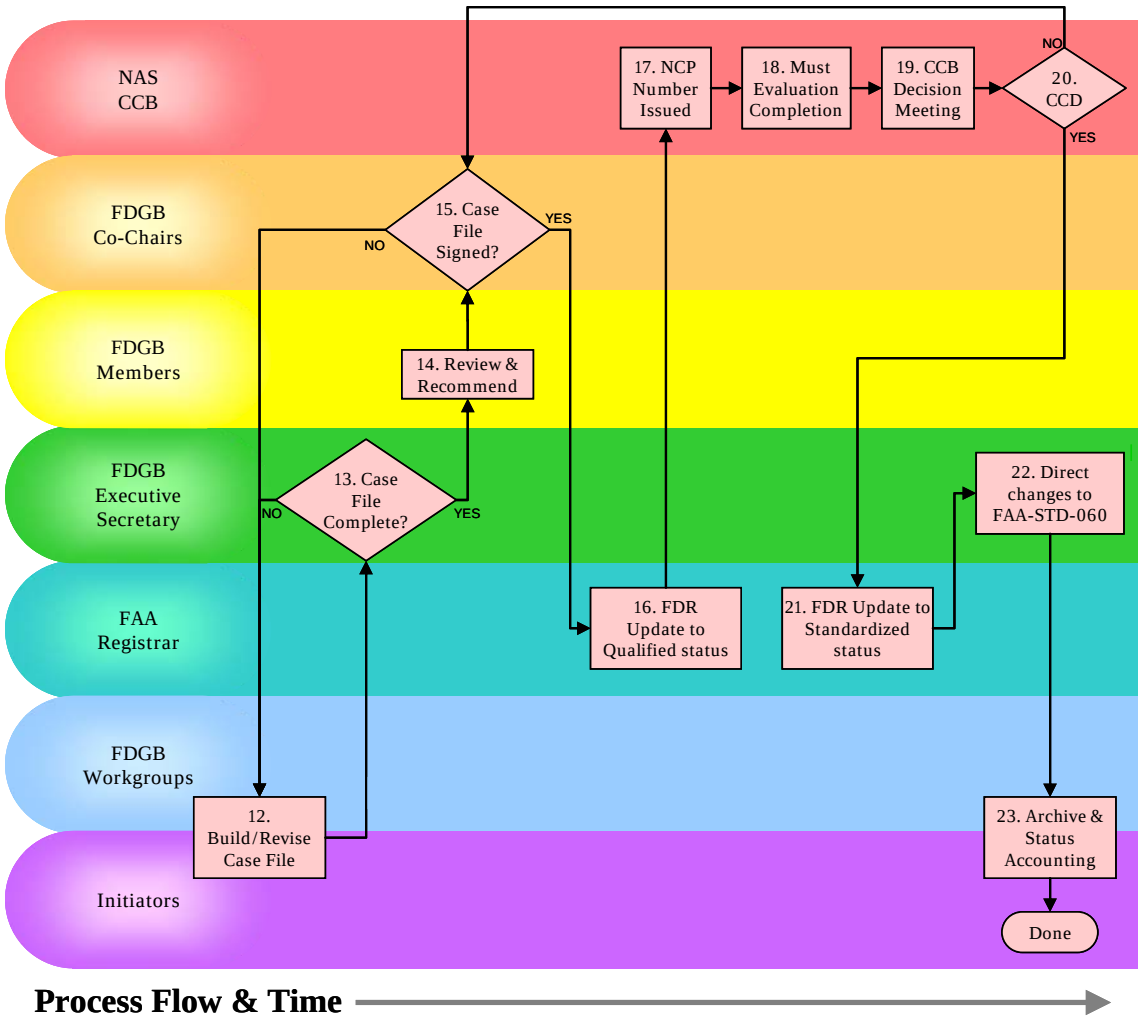

Figure 4 - Approval Process for NAS Data Standards

7.1.1 STEP 13 – REVIEWING THE CASE FILE FOR COMPLETENESS

The Working Group Chair or individual initiator (data steward or other user) prepares a case file package containing the proposed standard(s) with supporting materials deemed relevant by the initiator. The initiator then forwards the case file package to the FDGB Executive Secretary who reviews this package for completeness and works with the initiator to obtain any missing information. Once it has been determined that the case file package is complete, notification is made to the initiator (also known as the case file originator for NAS CCB purposes), and the case file package is distributed to the FDGB Members for pre-screening review. During this review period, the Administrative and Registration Statuses of the candidate data elements in the FDR are updated to “proposed” and “recorded” respectively.

7.1.2 STEPS 14 THROUGH 16 – PRE-SCREENING THE CASE FILE

The results of the FDGB Members' technical review (Step 14) will be provided to the case file originator. Any comments that have been produced as a result of this review must be addressed and resolved by the case file originator. The consolidated result of the pre-screening review will be submitted to the Members for final signature and recommendation to NAS CCB. Once the case file has been signed by the Co-Chairs (Step 15), the Administrative and Registration Statuses of the candidate data elements in the FDR are updated to "interim" and "qualified" respectively (Step 16). NAS data standards are attached to a case file and the case file is submitted to the Central Configuration Management Control Desk for processing

The pre-screening review ensures that the candidate data standards are represented uniformly with a NAS perspective. The pre-screening review accomplishes the following:

a. Ensures that the candidate entities and data elements and required metadata are clear, meaningful, and consistent with cross-functional area missions, objectives, and information requirements.

b. Validates that the candidate entities and data elements are represented uniformly with a NAS perspective so that they can be interpreted consistently.

c. Validates that the entity relationships accurately reflect business rules that are implemented uniformly with a NAS perspective.

d. Provides the functional community with the opportunity to review the proposals and determine the impact of candidate standards on current implementations.

e. Ensures data requirements are represented using as general terminology as possible.

7.1.3 STEPS 17 THROUGH 20 – EVALUATING THE NAS CHANGE PROPOSAL

The Central Configuration Management Control Desk receives the completed signed case file package from the FDGB Executive Secretary. Once it has determined that the case file package meets the NAS Configuration Management criteria, the case file is assigned a NCP number (Step 17). The Administrative Statuses of the candidate elements are also updated at this time from "interim" to "review." The NCP is forwarded to the NAS CCB Configuration Management Lead and prepared for distribution to NAS CCB permanent members and other subject matter experts for a formal review (Step 18). Comments that are produced as a result of this review are coordinated through the FDGB Executive Secretary with the case file originator for resolution. All comments must be addressed and resolved prior to CCB decision. The case file originator will formally present the NCP at both the NAS CCB pre-brief meeting and the NAS CCB formal meeting (Step 19). Upon approval of the NCP, a CCD is issued (Step 20).

7.1.4 STEPS 21 THROUGH 23 – IMPLEMENTING THE CONFIGURATION CONTROL DECISION (CCD)

A signed CCD records the decision of the NAS CCB and assigns the implementation actions such as the following:

a. Update the Administrative and Registration Statuses of the newly approved data elements in the FDR to "final" and "standardized" respectively (Step 21).

b. Publish the new data standard and provide hard copies to the Document Control Center, which includes updating the list of approved individual data standards maintained in Appendix C of FAA-STD-060 (Step 22).

c. Maintain the FDR, including retiring or superseding the previous versions of the new individual standards, if any, and updating the FAA Enterprise Data Architecture as appropriate (Step 23).

7.1.5 MODIFICATION TO EXISTING DATA STANDARDS

Modifications to approved NAS CCB data standards will be processed in the same manner as for new data standards. These modifications will be entered in the FDR as developmental versions of the existing approved NAS CCB data standard. If the modification is approved, the previous NAS data standard will be retired or superseded, and the FAA Data Registrar will update the FDR appropriately.

7.2 Introduction to Data Standards Approval Process for Non-NAS Data

This section addresses the technical and cross-functional review and approval of Non-NAS data standards using the change proposal package. This process is illustrated in Figure 5.

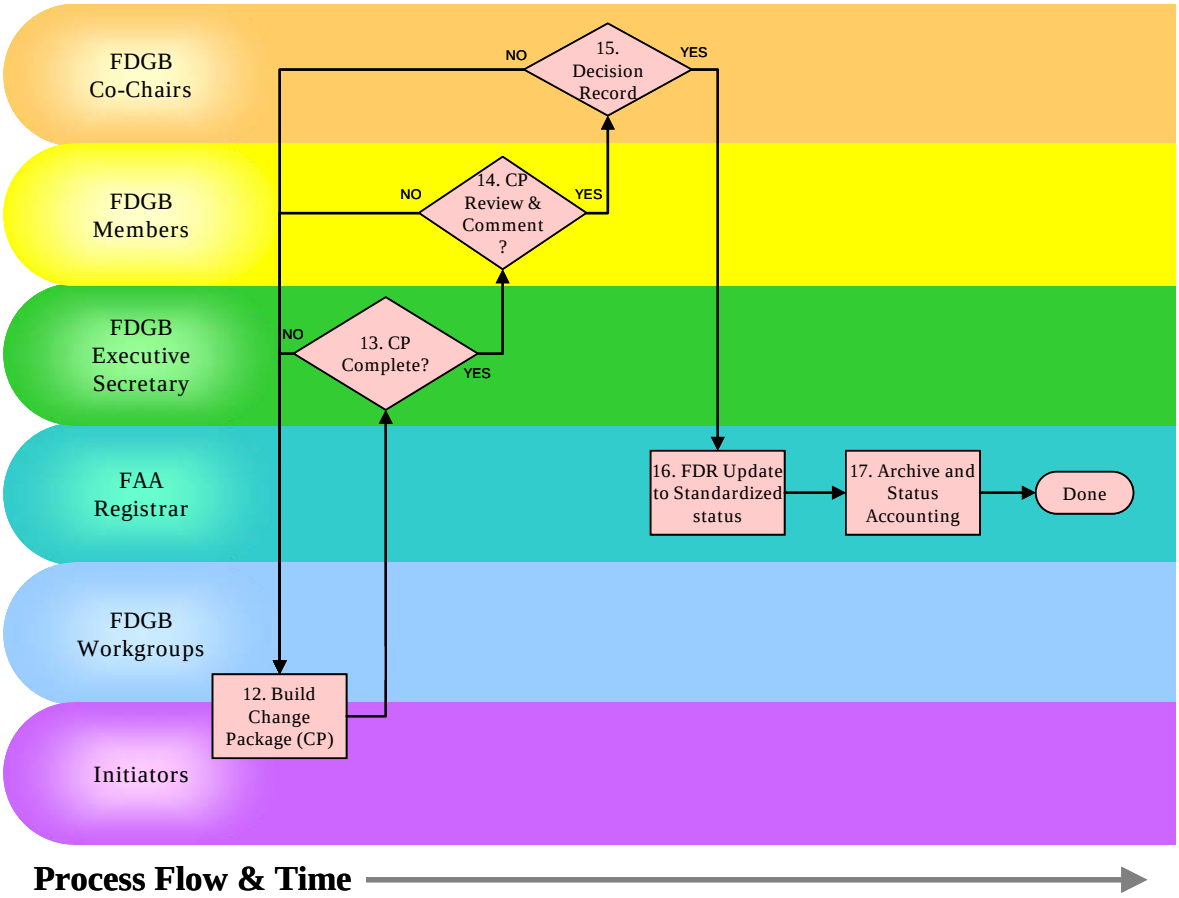

Figure 5 - Approval Process for Non-NAS Data Standards

7.2.1 STEP 13 – REVIEWING THE CHANGE PROPOSAL PACKAGE FOR COMPLETENESS

As described in the previous section, the Working Group Chair or individual initiator (data steward or other user) prepares a change proposal package containing the proposed standard(s) with supporting materials deemed relevant by the initiator. The initiator then forwards the package to the FDGB Executive Secretary who reviews this package for completeness and works with the initiator to obtain any missing information. During this review period, the Administrative and Registration Statuses of the candidate data elements in the FDR are updated to “interim” and “recorded” respectively. Once it has been determined that the change proposal package is complete, notification is made to the initiator and the change proposal package is distributed to the FDGB Members for review.

7.2.2 STEP 14 – CHANGE PROPOSAL PACKAGE REVIEW

The results of the FDGB Members' technical review will be provided to the change proposal package originator. Any comments that have been produced as a result of this review must be addressed and resolved by the originator. The consolidated result of the review will be submitted to the FDGB Co-Chairs for their decision. During this review period, the Administrative and Registration Statuses of the candidate data elements in the FDR are updated to "review" and "qualified" respectively.

The review accomplishes the following:

a. Ensures that the candidate entities and data elements and required metadata are clear, meaningful, and consistent with cross-functional area missions, objectives, and information requirements.

b. Validates that the candidate entities and data elements are represented uniformly with an FAA perspective so that they can be interpreted consistently.

c. Validates that the entity relationships accurately reflect business rules that are implemented uniformly with a FAA perspective.

d. Provides the functional community with the opportunity to review the proposals and determine the impact of candidate standards on current implementations.

e. Ensures data requirements are represented using as general terminology as possible.

7.2.3 STEP 15 – FDGB DECISION

All comments must be addressed and resolved prior to FDGB decision. The change proposal package originator will formally present the package at a meeting of the FDGB. Upon approval of the change proposal package, a Decision Record is issued.

7.2.4 STEPS 16 AND 17 – IMPLEMENTING THE DECISION RECORD

A signed Decision Record chronicles the judgment of the FDGB and outlines the implementation actions, such as the following:

a. Update the Administrative and Registration Statuses of the newly approved data elements in the FDR to "final" and "standardized" respectively (Step 16).

b. Publish the new data standard on the FDR portal.

c. Maintain the FDR, including superseding or retiring the previous versions of the new individual standards, if any, and updating the FAA Enterprise Data Architecture, as appropriate (Step 17).

7.2.5 MODIFICATION TO EXISTING DATA STANDARDS

Modifications to approved data standards will be processed in the same manner as for new data standards. These modifications will be entered in the FDR as developmental versions of the existing approved data standard. If the modification is approved, the existing data standard will be superseded or retired, and the Registrar will update the FDR appropriately.

7.3 Periodic Review of Data Standards

The Registrar will run periodic FDR status reports to assist the FDGB Members in determining appropriate actions.

Once a year or as requested by FDGB, the Registrar will review all developmental and candidate data standards that have not been registered and have remained static for longer than three years with no revisions or modifications. The Registrar will inform the FDGB Executive Secretary and the Members of the review results. If FDGB approves, these unregistered data items will be removed from the FDR and their steward or initiator notified.

8 Data Standards Concepts and Tools

8.1 Introduction

This chapter describes the key components of the standardization process infrastructure and explains how they are used to support the collection, validation, and documentation of FAA data requirements. Key components include:

a. Federal Data Registry – FDR
b. FAA Enterprise Data Architecture
c. Data Standardization Requirements Information Sources
d. Data Modeling Tools
e. Lexicon of Terms (under development)

8.2 Federal Data Registry (FDR)

The FDR is a tool for recording, publishing, and maintaining metadata about application-independent data standards. It provides information about the precise meaning of FAA data[6] and it provides a place to capture information during the development of data standards. It is the authoritative source for FAA data standards. This section highlights important concepts and definitions with which one should be familiar in order to understand how the FDR is used to create and maintain data standards. Details of the kinds of metadata FDR maintains, and the conventions by which the metadata is created, are contained in the Appendices to this document.

FDR is based on the ISO/IEC 11179 standard entitled Information technology - Metadata Registries (MDR). The purpose of the ISO/IEC 11179 standard is to support the identification, definition, registration, classification, management, standardization, and interchange of data elements and to promote the sharing and exchange of data throughout the international community. This standard has six parts:

a. Part 1: Framework for the specification and standardization of data elements
b. Part 2: Classification for data elements
c. Part 3: Registry metamodel and basic attributes
d. Part 4: Rules and guidelines for the formulation of data definitions
e. Part 5: Naming and identification principles for data elements
f. Part 6: Registration of data elements

6 Note: FAA Order 1375.1D has established the FDR as the registry for FAA data standards.

8.2.1 ADMINISTERED ITEM

An administered item is an object that requires naming, identification, and administration (management). The FDR supports the following administered items:

a. Data Elements
b. Data Element Concepts
c. Value Domains
d. Conceptual Domains
e. Object Classes
f. Properties
g. Classification Schemes
h. Context
i. Representation Class
j. Derivation Rule

Figure 6 is a high-level model showing how the first four items are related. These four are integral to specifying data elements.

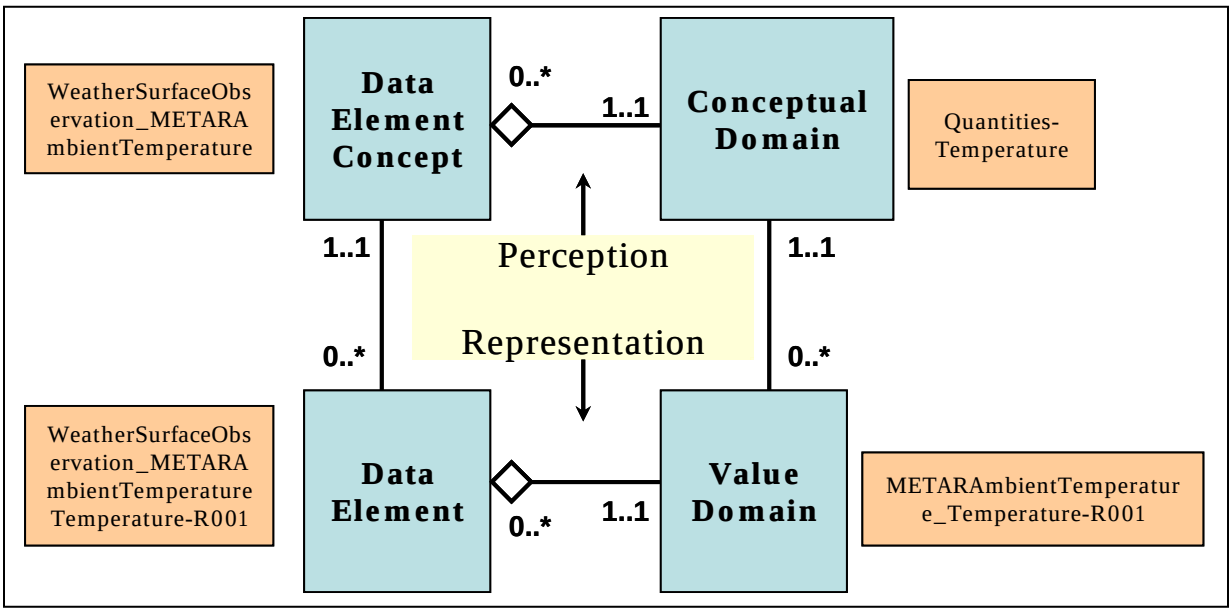

Figure 6 - ISO/IEC 11179 UML Metamodel

Following are some additional examples of administered items that help to illustrate the ideas portrayed in Figure 6.

Data Element Concept: "WeatherSurfaceObservation_METARAmbientTemperature"
Definition: A weather condition within the domain of a surface observation. This specific weather condition is the temperature of the surrounding air, typically measured with a thermometer. Instances of this element are observed at the station and reported in the Aviation Weather Report (METAR) or unscheduled special report (SPECI).
Note: The data element concept makes no reference to a specific value domain.

Conceptual Domain: "Quantities-Temperature"
Definition: An amount representing the degree of hotness or coldness measured on a definite scale.

Data element 1: "WeatherSurfaceObservation_METARAmbientTemperature_Temperature_R001"
Definition: The temperature of the surrounding air, typically measured with a thermometer. Instances of this element are observed at the station and reported in the Remarks section of a scheduled routine Aviation Weather Report (METAR) or unscheduled special report (SPECI).
Data Element Concept: WeatherSurfaceObservation_METARAmbientTemperature
Value Domain: METARAmbientTemperature-Temperature-R001

Data element 2: "WeatherSurfaceObservation_METARAmbientTemperature_Text-R001"
Definition: The temperature of the surrounding air, typically measured with a thermometer. Instances of this element are observed at the station and reported in the body of a scheduled routine Aviation Weather Report (METAR) or unscheduled special report (SPECI).
Data Element Concept: WeatherSurfaceObservation_METARAmbientTemperature
Value Domain: METARAmbientTemperature_Text-R001
Note: Data element definitions may refer to explicit value domains, since this may be all that distinguishes two data elements.

Value Domain 1: "METARAmbientTemperature_Temperature-R001"
Definition: Temperature as expressed in the Remarks section of aviation surface weather observation reports.

Value Domain 2: "METARAmbientTemperature_Text-R001"
Definition: Temperature as expressed in the body of aviation surface weather observation reports.

All of the administered items are discussed more thoroughly in the sections that follow.

8.2.2 DATA ELEMENT

A data element is a unit of data that in a certain context is considered indivisible. Often, the terms "variable," "code," and "field" are used synonymously to mean a data element (e.g., Person Name, Person Age, Hospital ID, and Airport Elevation).

Derived data elements (also called complex data elements) are a special grouping of data elements and have a derivation type (also called representation type) as illustrated in Table I below.

Table I - Derived Data Element

Derivation Type	Derived Data Element	Sub Data Elements	Description
Compound	Mailing Address	Street Address City State Zipcode	Grouping of Data Elements with a Display Order
Concatenation	Telephone Number	Phone Area Code Phone Exchange Phone Instrument	Grouping of Data Elements with a Display Order and Concatenation Character
Object Class	Person	Person ID Person First Name Person Last Name Person Age Person Sex	Grouping of Data Elements with optional Methods
Calculated	Person Annual Salary	Person Weekly Salary	Data Elements with a Derivation Rule (e.g. PAS = PWS * 52)

Furthermore, two data elements can be related to each other with a specified relationship (e.g., Part-of, Similar To, etc.).

8.2.3 DATA ELEMENT CONCEPT

The difference between a data element and a data element concept is that a data element has a physical representation (data type, maximum length, interchange format, unit of measure, valid values, etc.), while a data element concept does not have a physical representation. A data element concept is just the idea or perception of the data element, e.g., “I am thinking of Person Income, but I cannot tell you if it is represented in dollars or yen.” Data element concepts are useful for grouping similar data elements, and they may be used in a process for harmonizing data elements.

A data element concept consists of an object class and property. An object class is a thing or abstraction in the real world for which one would want to record information. It is much like an “entity type” in relational terms, e.g., Person, Organization, or Airport. A property is a unit of information about an object class. It is much like an “attribute” in relational terms, with the important exception that a property does not have a specified representation, e.g., Age of a Person, Sex of a Person, Number of Employees in an Organization, Elevation of an Airport. A data element concept’s object class and property determine its name.

Concepts can be related to each other, and the relationship between the data element concepts can be specified (e.g., Part-of, Similar To, etc.).

Note: In the FDR, a “data concept” is the same as the “data element concept.”

8.2.4 VALUE DOMAIN

A data element is represented by a value domain. A value domain establishes the permissible values that can be used to represent a data element. A value domain has a data type (e.g., Boolean, decimal, integer) and, optionally, a unit of measure (e.g., feet, miles, dollars) and an interchange format or layout of a representation for data interchange (e.g., YYYYMMDD for representing a date). A value domain can be enumerated (specified through a list of at least two individual permissible values) or non-enumerated (specified by a range of numbers, set of rules, formula, procedure, etc.).

Permissible values are valid values for an enumerated value domain. The permissible value is represented by a permissible value and a value meaning. An example would be “AL” (permissible value) and “ALABAMA” (value meaning) for the “Postal U.S. State Codes” (value domain). Value meanings may be maintained and reused, such as “ALABAMA” (value meaning) also being used for “FIPS U.S. State Codes” (value domain) with a permissible value of “01.”

Value domains can be related to each other and the relationship type (e.g., Part of, Similar to, etc.) can be documented in FDR. For example, the Postal U.S. State Codes and FIPS U.S. State Codes might be assigned the relationship type as “Is Equivalent To”.

8.2.5 CONCEPTUAL DOMAIN

A conceptual domain is to a value domain as a data element concept is to a data element. While a data element concept does not have a value domain, it does have a conceptual domain without specific physical representations. A conceptual domain is the perception of a value domain and may be associated with items (meanings) that belong to the domain, but without their physical representations (valid values). To illustrate, one might say, “I am thinking of States of the United States. The states are Alabama, Alaska, Arkansas, etc., but I do not know if they are represented by Postal Codes (e.g., AL, AK, AR) or by FIPS Codes (e.g., 01, 02, 04).”

Instead of assigning permissible values to a conceptual domain, only value meanings may be assigned. To illustrate, one might say, “I am thinking of a Value Domain for U.S. State, but I cannot tell you if it is represented by Postal codes or FIPS codes, but I can tell you that it is made up of the following states (value meanings): Alabama, Alaska, Arkansas, etc.”

Conceptual domains can be related to each other, and the relationship between the conceptual domains can be specified (e.g., Part-of, Similar To, etc.).

8.2.6 OBJECT CLASS AND PROPERTY

An object class is a thing or abstraction in the real world that is desirable to be modeled. It is much like an “entity” in relational terms. (For example: Person, Airport, Aircraft, Facility, etc.) A property is a peculiarity common to all members of an Object Class. It is much like an “attribute” in relational terms, with the important exception that a Property does not have a specified representation. (For example: Elevation, Location, ID, First Name, Last Name, Address, etc.) A potential source for FAA object classes is the FAA Enterprise Data Architecture which contains hundreds of entities and their definitions. The entities may be considered in identifying or naming object classes, data concepts and data elements.

As is the case for the other administered items, relationships between two object classes or two properties can be specified (e.g., Part-of, Similar to, etc.).

8.2.7 CLASSIFICATION SCHEME

A classification scheme (CS) is used to classify or group data elements in order to organize them and make them easier to find and analyze. There are many kinds of schemes, including keywords, thesauri,

taxonomies, ontologies, etc. A CS has a classification scheme type (e.g., taxonomy or keyword), and it is made up of classification scheme items (CSI) that may be hierarchical. The CS-CSI pair may be associated with zero or more data elements, and a data element may be associated with zero or more CS-CSI pairs. Relationships between two schemes can be specified (e.g., Part-of, Similar to, etc.).

Currently there are no approved classification schemes in the FDR. Upon approval of the FAA Enterprise Data Architecture V 6.0, its associated taxonomy will be used to create one classification scheme. Additional classification schemes can be developed and processed for approval by FDGB. New classification schemes will be processed like data standard; they will be developed, processed, and approved. The approval is captured via a Decision Record, which will include action items for the FAA Data Registrar to enter the classification scheme into FDR and make it available for use. The FDR can support and manage multiple classification schemes.

8.2.8 CONTEXT

A context is an important concept in the FDR. The ISO/IEC 11179 standard defines a context as a "designation or description of the application environment or discipline in which a data standard is applied or from which it originates." Alternatively, it is the scope in which a particular administered item has meaning. A context may be a business domain, an agency, an information subject area, an information system, a database, file, data model, standard document, or any other environment. To illustrate, suppose that two user communities each deal with information that they both call "flight time en route." However, one community considers flight time en route to include the initial climb as part of the en route phase of flight, whereas the other community does not. A third party receiving flight time en route data would have to know its context in order to interpret it correctly.

Context is similar to the notion of namespace, used by various computing disciplines. In a 11179-compliant registry, data elements and other administered items must be uniquely named within a particular context, and a context must be assigned to each administered item. Assignment of a context to a data element in FDR means that (1) the element has meaning and utility only within that context and (2) the element is uniquely named and defined within that context, i.e., another element with the same name but a different definition, or with a different name but an identical definition, may not exist in that context. Like any administered item, it must be taken through an approval process to become a standard. The process is similar to that described in section 7.2 Introduction to Data Standards Approval Process for Non-NAS Data.

8.2.9 STEWARDSHIP, REGISTRATION, AND ADMINISTRATION OF ADMINISTERED ITEMS

The ISO/IEC 11179 standard provides a standardization process where data elements and other administered items are formally submitted to a registration authority for standardization. There are three important roles and functions that are part of this process: stewardship, registration, and administration.

a. **Stewardship.** Each administered item has a data steward who is responsible for the metadata quality of an object and is the point of contact for a given data element. (Note: This person does not necessarily create or maintain the metadata.) The data steward belongs to an organization. An organization can be identified at any level (e.g., agency, program area, staff area, or project).
b. **Registration Status.** When a data element or other administered item is registered, it must conform to ISO/IEC 11179 standard and FDR requirements. The applicable registration status values for data standardization within the FDR are based on ISO/IEC 11179 definitions and include the following:

    1. **Incomplete**: An administered item with the "Incomplete" status indicates that the submitter wishes to make the community that uses this metadata registry aware of the existence of an administered item in their local domain. An item with the status of "Incomplete" in the metadata registry is not maintained under version control.

The minimum metadata attribute documentation for an item with "Incomplete" status in the metadata registry is as follows: preferred name, definition, submitter organization name, submitter contact name, and submitter contact information. The registered administered item may not necessarily contain all mandatory attribute values.

2. **Recorded**: An administered item with the "Recorded" status indicates that it has been proposed for progression through the registration levels. It also means that all mandatory metadata attributes have been completed. An administered item with "Recorded" status implies that the item may be being shared across domains; however, the contents of the mandatory metadata attributes may not necessarily conform to quality requirements specified in ISO/IEC 11179 and FDGB procedures. The submitter may request the retirement of a "Recorded" administered item at any time. Administered items with "Recorded" registration status or higher are maintained under version control.
3. **Qualified:** An administered item with the "Qualified" status means that the item had a "Recorded" registration status and the Registration Authority has confirmed that the mandatory metadata attributes are complete and conform to applicable quality requirements. In the event that an item is not approved by the Registration Authority for the "Qualified" registration status level, it shall remain at the "Recorded" registration status level.
4. **Standardized:** An administered item with the "Standardized" status indicates that the item had a "Qualified" registration status and the Registration Authority has confirmed that it is of sufficient quality and of broad interest for use in the community that uses this metadata registry. The "Standardized" administered item is preferred for use in new or updated applications. Note that "Standardized" does not necessarily imply uniqueness; there may be more than one "Standardized" item that addresses the same function, concept, etc.
5. **Retired:** An administered item with the "Retired" status indicates that the Registration Authority has determined the item is no longer recommended for use in the community that uses this metadata registry. A "Retired" administered item should no longer be used. "Retired" items should include a reference to replacement items when appropriate. Only editorial edits of "Retired" items are permitted.
6. **Superseded**: An administered item with the "Superseded" status indicates that the Registration Authority has determined the item is no longer recommended for use in the community that uses this metadata registry. A "Superseded" administered item may be used but the successor item is preferred for use. "Superseded" items should include a reference to replacement items when appropriate. Only editorial edits of "Superseded" items are permitted.

c. **Administrative Status**. These statuses are set by the Registrar as appropriate and as authorized by the FDGB. An internal administrative value for each data element or other administered item in the FDR that provides information about where the item is in the standardization workflow process. Administrative statuses, set by the Registrar, are as follows:

1. **Unassigned**: A workflow status has not been established.
2. **Proposed**: The need for a standard data element or other administered item has been identified.
3. **Interim**: A proposed data standard is being evaluated, by the subject matter experts. The Interim status ends when the proposed standard has been submitted to the executive level approval body
4. **Review**: A recommended data standard is under executive level review for approval.

5. **Final**: A recommended data standard has executive level approval for implementation in new application system development projects and in application system upgrades. The approved data standard is "frozen" meaning no changes to the approved data standard are permitted.

8.3 FAA Enterprise Data Architecture

The FAA Enterprise Data Architecture represents a high level conceptual data model which provides guidance on how best to logically design FAA data structures. The FAA EDA comprised of eight major subject area data models presented in entity-relationship diagram (ERD) notation. The Architecture is a key tool in the FAA data management program, supporting data standardization, data requirements analysis and design in programs and projects, life-cycle management of data as an asset, and data quality initiatives. As it grows, it will become an essential aid to data standardization efforts, helping to highlight shared or common data and key reference tables (value domains) and providing a basis for creating a proposed data standard.

8.4 Data Standardization Requirements Sources

Information necessary to support a specific data standardization requirement should be collected from appropriate sources. These information requirements may be collected from existing information systems' documents, data dictionaries, and data models; functional descriptions; and authoritative sources, such as policy and guidance. Information requirements may include a request to update (modify or retire) existing data standards.

The following are the prime sources of requirements:

a. Standards and Orders – Various FAA, federal and industry standards and orders specify procedures, practices, and protocols for interfacing subsystems.

b. Interface Documentation – This includes Interface Requirements Documents (IRD), Interface Control Documents (ICD), and Computer Program Functional Specification (CPFS) documents, as well as other technical documentation describing shareable data in the FAA.

c. FAA Enterprise Architecture – Contains information about FAA enterprise requirements in terms of processes, applications, data, and technology. The FAA Enterprise Architecture focuses on mission support and administrative functions of the FAA

d. External (Federal, National, and International) Data Standards – Reuse of applicable existing data standards should be considered before creating or modifying an FAA data standard. External Registrars or data stewards should be consulted to identify existing standards within their functional areas. The FDR should also be used to locate adopted external and FAA data standards.

8.5 Data Modeling Activities and Tools

Data modeling is a technique for formally describing data, its structure, and its relationships. Standards developers are encouraged to use or create a data model. This is beneficial for understanding the data scope of a proposed system or modification, identifying data requirements, supporting physical database design. In terms of data standardization, data modeling is useful to see the context of the data they are trying to standardize, to help them understand the primary entities or objects that are involved, and to aid them in naming their proposed standards. An FAA Data Modeling Process document provides guidance on how to use data modeling effectively in relation to the FAA's Data Management Policy and its initiatives on data standards and data architecture. As stated in the document, modeling activities performed during application development should advance the data standardization and integration of data models through:

a. Reuse of existing standard data elements and entity definitions within the FAA.
b. Submission of standard data elements to the FDR.
c. Reuse of standardized data models, such as industry-wide data model patterns.

Methodologies and tools are described in greater detail in the referenced document and include recognized techniques like entity-relationship diagramming and object modeling. Whichever methodology is chosen, accepted notation standards like Integrated Computer-Aided Manufacturing Definition One Extended Data Modeling Technique (IDEF1X) or Unified Modeling Language (UML) that are employed in popular commercial off-the-shelf (COTS) tools should be used.

8.6 Lexicon of Terms

The FDGB is promoting the establishment of a lexicon, or dictionary, of FAA-approved vocabulary terms and definitions maintained in an Internet-accessible database that can be browsed by anyone and updated by authorized users. A lexicon is essential to (1) preventing misinterpretation, (2) describing requirements consistently, and (3) creating meaningful names for metadata. The lexicon will also improve the ability of users to search the Enterprise Architecture, requirements databases, the FDR, and other registries for information.

There will be a configuration management process by which the lexicon will be populated and maintained over time by groups or individuals involved in modeling, data standardization, defining functional requirements, establishing web services, etc. An appropriate appendix describing lexicon usage will be developed after the lexicon is established.

9 Acronyms

AICM	Aeronautical Information Conceptual Model
AIXM	Aeronautical Information Exchange Model
ANSI	American National Standards Institute
ASCII	American Standard Code for Information Interchange
ARTCC	Air Route Traffic Control Center
CASE	Computer Aided System Engineering
CCB	Configuration Control Board
CCD	Configuration Control Decision
CIO	Chief Information Officer
COTS	Commercial Off-The-Shelf
CPFS	Computer Program Functional Specification
CS	Classification Scheme
CSI	Classification Scheme Item
DBMS	Database Management System
DC	Data (Element) Concept
DE	Data Element
EBCDIC	Extended Binary Coded Decimal Interchange Code
EDA	Enterprise Data Architecture
ERD	Entity Relationship Diagram
FAA	Federal Aviation Administration
FDR	Federal Data Registry
FEA	FAA Enterprise Architecture
FIPS	Federal Information Processing Standards
GIS	Geodetic Information System
ICAO	International Civil Aviation Organization
IDEF1X	Integrated Computer-Aided Manufacturing Definition One Extended Data Modeling Technique
IEC	International Electrotechnical Commission
IERS	International Earth Rotation Service
ISO	International Organization for Standardization
ICD	Interface Control Document
IRD	Interface Requirements Document
MSL	Mean Sea Level
NAS	National Airspace System
NASEA	NAS Enterprise Architecture
NCP	NAS Change Proposal
ToR	Terms of Reference
UML	Unified Modeling Language
UTC	Universal Coordinated Time
VD	Value Domain
XML	Extensible Markup Language

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APPENDIX A – Metadata Requirements

The metadata items needed for documenting data element standards are listed in the following table. An "X" in column two means that this metadata must be supplied in order to register a data element in the Federal Data Registry. Metadata entries drawn from two fictitious data elements, one with an enumerated value domain and one with a non-enumerated value domain, are shown in column four and five for illustrative purposes. The metadata items included in the table are those of primary interest to the user; for more information on other registry-specific metadata, see the FDR.

Table II - Metadata Attributes

Metadata		Definition	Example	Example
Administered Item Type	X	The type of data component as managed in the FDR. Item types include data element, value domain, data element concept, conceptual domain, object class, property, and classification scheme.	Data Element	Data Element
Preferred Name	X	A single or multiple word meaningful designation assigned to a data element constructed in accordance with the FDR naming convention. This name is unique within a single registry context.	Airport_Location_ identifier-ICAO	Airport_HighestLanding AreaPoint_elevation-MS
Alternate Name(s)		Single or multi-word designation for a data element that differs from the Preferred Name but represents the same data element. Alternatively, the synonymous name(s) by which a data element is known in this or other application environments or contexts. . In many cases, a shorter alternate name will be more viable for use in software than the longer preferred name.	ARPRT_LCTN_IDNTF R-ICAO	None
Alternate Name Type		The type of an alternate name as designated in the FDR, e.g. synonym, abbreviation, XML tag, etc.	Abbreviation	N/A
Alternate Name Context		The context in which an alternate name is used or has meaning.	FAA	N/A
Alternate Name Language		The identity of a language in which an alternate name is expressed. (Note: this includes programming languages.)	English	N/A

Metadata		Definition	Example	Example
Data element Preferred definition	X	A natural language textual statement that expresses the essential nature of the data element and permits its differentiation from all others.	The landing facility location identifier that was created in accordance with the International Civil Aviation Organization (ICAO) rules, assigned to the airport, and must be employed in filing of international flight plans conducted under the ICAO rules.	The vertical distance to the highest point of any commissioned runway, turfed or paved, of the airport measured from the mean sea level (MSL) datum.
Context Preferred Name	X	The domain of discourse within which a data element's or other administered item's Name is valid. Alternatively, a designation or description of the application environment or discipline in which a data standard is applied or originates from; the scope in which the subject item has meaning. A *Context* may be a business domain, an agency, an information subject area, an information system, a database, file, data model, standard document, or any other environment.	Federal Aviation Administration	Federal Aviation Administration

Metadata		Definition	Example	Example
Context Preferred Definition		A natural language textual statement that expresses the essential nature of the context, and permits its differentiation from all other contexts. (This is required only when adding a new context into the registry.)	FAA Context is all shareable Federal Aviation Administration Data used to perform our mission. Shareable Data is Data that is collected, stored, processed, disseminated, or transmitted electronically across FAA's key interfaces. The notion of key interface is adopted from the FAA Data Management Order 1375.1 and Department of Defense Architecture Framework: ... interfaces are defined by functional and physical characteristics that exist at a common boundary with co-functioning items and allow systems, equipment, software, and system data to be compatible. An interface may be designated as key when it spans organizational boundaries; is mission critical; there are capability, interoperability, or efficiency issues at that interface; or the interface is vulnerable or important from a security perspective.	FAA Context is all shareable Federal Aviation Administration Data used to perform our mission. Shareable Data is Data that is collected, stored, processed, disseminated, or transmitted electronically across FAA's key interfaces. The notion of key interface is adopted from the FAA Data Management Order 1375.1 and Department of Defense Architecture Framework: ... interfaces are defined by functional and physical characteristics that exist at a common boundary with co-functioning items and allow systems, equipment, software, and system data to be compatible. An interface may be designated as key when it spans organizational boundaries; is mission critical; there are capability, interoperability, or efficiency issues at that interface; or the interface is vulnerable or important from a security perspective.
Data Identifier	X	A language independent identifier of a data element or other administered item that, taken together with its Version, uniquely identifies it in the FDR. (provided by FDR)	235	228
Version	X	An identification of the latest or previous update in a series of evolving specifications for a data element or other administered item within the FDR. (provided by FDR)	1.0	2.0

Metadata		Definition	Example	Example
Classification Scheme Name		A reference to a scheme for the arrangement or division of objects into groups based on characteristics that the objects have in common, e.g., origin, composition, structure, application, and function. Examples of schemes include taxonomies, thesauri, etc.	Standards Approval Authority	Standards Approval Authority
Classification Scheme Item		A component of content in a classification scheme; this may be a node in a taxonomy or ontology, a term in a thesaurus, etc.	NAS CCB	NAS CCB
Effective Date		The date that a data standard is approved for use.	12/06/2001	05/30/2003
Effective End Date		The date that a data standard is no longer approved for use, i.e., retired.	None	None
Data Concept (a.k.a. Data Element Concept) Preferred Name	X	A concept that can be represented in the form of a data element, described independently of any particular representation.	Airport_Location	Airport_HighestLandingAreaPoint
Data Concept Definition	X	A natural language textual statement that expresses the essential nature of the data concept and permits its differentiation from all others.	The notion of the location or site of an airport.	The highest point on the landing area of an airport measured from the Mean Sea Level (MSL) datum and reported in a unit of measure.
Object Class Preferred Name	X	A set of ideas, abstractions, or things in the real world that can be identified with explicit boundaries and meaning and whose properties and behavior follow the same rules.	Airport	Airport
Object Class Definition	X	A natural language textual statement that expresses the essential nature of the Object Class and permits its differentiation from all others.	An area on land or water that is used or intended to be used for the landing and takeoff of aircraft and includes its buildings and facilities, if any. An airway facility including terminal, landing, control	An area on land or water that is used or intended to be used for the landing and takeoff of aircraft and includes its buildings and facilities, if any. An airway facility including terminal, landing, control
Property Name and Definition	X	A characteristic common to all members of an object class and a natural language textual statement that expresses the essential nature of the Property and permits its differentiation from all others.	Location. A place in physical space.	Location. A place in physical space.

Metadata		Definition	Example	Example
Value Domain Preferred Name	X	A named set of permissible values, enumerated or non-enumerated. NOTE 1: The value domain provides representation, but has no implication as to what data element concept the values may be associated with nor what the values mean. NOTE 2: The permissible values may either be enumerated or expressed via a description.	identifier-ICAO	elevation-MSL
Value Domain Definition	X	A natural language textual statement that expresses the essential nature of the value domain and permits its differentiation from all other value domains.	ICAO aeronautical facility location identifier.	The height or vertical distance of a level, a point, or object considered as a point, on, above, or below the surface of the earth, measured in feet optionally to the nearest tenth of a foot, from the earth's mean sea level (MSL) datum. See the Data Element Definition for constraints on precision or range of values.
Value Domain Type	X	An indicator as to whether the value domain is enumerated (specified through a list of at least two individual permissible values) or non-enumerated (specified by a range of numbers, set of rules, formula, procedure, etc.)	Enumerated	Non-enumerated
Non-Enumerated Value Domain Description	*	A description of a value domain that contains a wide range of data values that cannot be listed, i.e., is not an enumerated value domain. The ranges can usually be described by a set of rules. Example (for “text” value domain): “A string of alphanumeric characters (formatted or unformatted).” * This item is required if the Value Domain is of a Non-Enumerated type.	N/A	The height or vertical distance of a level, a point, or object considered as a point, on, above, or below the surface of the earth, measured in feet optionally to the nearest tenth of a foot, from the earth's mean sea level (MSL) datum. See the Data Element Definition for constraints on precision or range of values.
High Value		The highest value in the range of permissible values for data elements or value domains with representational forms of quantity.	N/A	30000.0

Metadata		Definition	Example	Example
Low Value		The lowest value in the range of permissible values for data elements or value domains with representational forms of quantity.	N/A	-300.0
Unit of Measure		A single or multiple word designation assigned to a measurement framework for data elements or value domains with representational forms of quantity, e.g., watt, mile, miles-per-hour, ton, ampere. Note: this meta-attribute applies only to quantity-oriented data elements.	N/A	FOOT
Unit of Measure Definition		A statement that expresses the essential nature of a measurement system associated with a data element or value domain and permits its differentiation from all other units of measure, e.g., ampere = "measure of electric current." See FDR for additional information. Note: this meta-attribute applies only to quantity-oriented data elements.	N/A	symbol: ft; 1 foot = 12 inches
Unit of Measure Precision		The degree of specificity for a Unit of Measure, expressed as the number of decimal* places to be used in the data element's values. *Precision may be reported in non-decimal units, e.g., in eighths, sixty-fourths, etc. Decimal is assumed unless otherwise specified.	N/A	None
Data Type	X	A set of distinct values, characterized by properties of those values and by operations on those values, for example the category used for the collection of letters, digits, and/or symbols to depict values of a data element determined by the operations that may be performed on the data element. Examples of data types are bitmap, Boolean, real, integer. See FDR for additional information.	String	Decimal
Data Type Definition		A statement that expresses the essential nature of a data type associated with a data element's value domain and permits its differentiation from all other data types. (Required when adding new data type)	Finite sequence of characters.	The set of real numbers with an exact fractional part
Maximum Length		The maximum number of storage units (of a corresponding data type) needed to represent a data element or value domain. The storage units are considered to be ASCII characters unless otherwise specified.	4	7

Metadata		Definition	Example	Example
Minimum Length		The minimum number of storage units (of a corresponding data type) needed to represent a data element or value domain. The storage units are considered to be ASCII characters unless otherwise specified.	4	1
Format (a.k.a. Interchange Format) and description		A single or multiple word designation assigned to a form of interchange for a data element that permits its differentiation from all other interchange formats, e.g., YYYYMMDD for calendar date, where YYYY represents a year, MM represents an ordinal numbered month in a year, and DD represents an ordinal numbered day of a month.	AAAA alphanumeric string of length 4	(-)NNNNN(.N) N = digit; ( ) indicates optional
Character Set		A collection of graphic symbols (e.g., letters or glyphs) used in writing or printing, in which each character in the collection is assigned a numeric index in a particular coding table. Examples of character sets include US (7-bit) ASCII, EBCDIC, Unicode.	US 7 ASCII	None
Permissible Values	*	The set of representations of allowable instances of an enumerated value domain of a data element represented according to the interchange format, data type, and maximum length constraints. The set of representations of permissible instances is associated with one set of **value meanings**. The set can be specified by name (e.g., Postal U.S. State Codes), reference to a source, enumeration of the instances' representations (e.g., AL, AK, etc.), or rules for generating the instances. * This is required for Value Domains that are of the "Enumerated" type.	"ICAO Identifiers" Alternatively, PANC PHNL Etc.	N/A
Value Meaning	*	A statement that expresses the essential nature of a set of permissible values without a specific representation and permits its differentiation from all other sets. The set can be specified by name (e.g., the states of the United States), or enumeration of the meanings of each permissible value (e.g., the state of Alabama, the state of Alaska, etc.) * This is required for Value Domains that are of the "Enumerated" type.	"ICAO 7910, the authorized source for ICAO aerodrome names and facilities" Alternatively, Anchorage International Airport, Honolulu International Airport, etc.	N/A
Conceptual Domain Preferred Name	X	A set of value meanings of a data concept, expressed without representation. NOTE: The value meanings may either be enumerated or expressed via a description.	Location	Location

Metadata		Definition	Example	Example
Conceptual Domain Definition	X	A natural language textual statement that expresses the essential nature of the conceptual domain and permits its differentiation from all other conceptual domains.	The notion of a place where an object exists or once was located.	The notion of a place where an object exists or once was located.
Dimensionality		An expression of measurement without units; a quantitative description of phenomena where physical or non-physical quantities have been grouped together into categories of quantities which are mutually comparable and have the same set of permitted functions. Examples of physical categories are: linear measure, area, volume, mass, velocity, time duration. Examples of non-physical categories are: currency, quality indicator, color intensity.	N/A	N/A
Example Instance		A representative sample of a typical instance of the data element if it can be represented as a printable character string.	KDCA	35.2
Document Title		The name of a document pertinent to a data element or other administered item.	FAA Order 7350.7F Location Identifiers	None
Document Type		The type of a document pertinent to a data element or other administered item.	FAA Order	N/A
Document Language		The kind of natural language used in a document.	English	N/A
Document URL		The Internet Uniform Resource Locator (URL) where the document may be found.	http://www.faa.gov/atpubs/index.htm	N/A
Document Description		An abstract or summary of the document or the actual text of a short document.	List of landing facility location identifiers created in accordance with ICAO rules	N/A
Comments		Additional explanatory information.	Continental United States airport codes begin with 'K'. Alaska and Hawaii airport codes begin with 'P'.	This version clarifies and improves the earlier definition by changing "the highest point on the landing area" to "the highest point of any commissioned runway, turfed or paved."
Related Administered Item		An administered item that has a special relationship or association with the subject administered item.	None	None
Relationship		The nature of the association between the subject administered item and the related administered item, e.g., part of, similar to, etc.	N/A	N/A

Metadata		Definition	Example	Example
Derived Data Element		A data element that has a special relationship or association with the subject administered item	None	None
Derived Relationship		The nature of the association between the subject data element and the related data element, e.g., part of, similar to, etc.	N/A	N/A
Steward Organization	X	The organization or unit within an organization that is responsible for the content and quality of the meta attributes documenting a data element or other administered item in the FDR.	Air Traffic	Air Traffic
Submitter Organization	X	The organization or unit within an organization that has submitted a data element or other administered item for addition, change, or cancellation/withdrawal in the FDR.	Office of Information Services/CIO	Office of Information Services/CIO
Registration Status (Entered by Registrar)	X	The registration status of a data element or other administered item is defined in 4.2.10 above. Values are summarized as follows: **Incomplete**: The registered item does not contain all Mandatory Attribute values. **Recorded**: The registered item contains all Mandatory Attribute values, but the contents may not meet the quality requirements specified in ISO/IEC 11179 and FDGB procedures. **Qualified**: The registered item has all mandatory metadata attributes complete and conforms to applicable quality requirements specified in ISO/IEC 11179 and FDGB procedures. **Standardized**: The registered item is established as an item preferred for use in new or updated applications. The "standardized" item may be unique within the registry, or it may be the preferred item among similar items. **Retired**: The registered item is no longer recommended for use in FAA applications, and should no longer be used. **Superseded**: The registered item is no longer recommended for use in FAA applications and may continue to be used but the successor item is preferred for use.	Standardized	Standardized

Metadata		Definition	Example	Example
Administrative Status (a. k. a. Workflow Status) (Entered by Registrar)	X	The administrative status of a data element or other administered item. Valid values: **Proposed**: The need for a standard data element or other administered item has been identified. **Interim**: A proposed data standard is being evaluated, by the subject matter experts. The Interim status ends when the proposed standard has been submitted to the executive level approval body. **Review**: A recommended data standard is under executive level review for approval. **Final**: A recommended data standard has executive level approval for implementation in new application system development projects and in application system upgrades. The approved data standard is "frozen" meaning no changes to the approved data standard are permitted. **Unassigned**: A workflow status has not been established.	Final	Final
Case File Number / Change Package Identifier		Case File Number is the identifier assigned by the NAS CCB (for NAS CCB data elements); Change Package Identifier is the identifier assigned by the FDGB (for FDGB data elements)	IO300-NAS-001 FDGB-001	SD100-NAS-003

APPENDIX B – Naming Conventions and Guidance

B.1 Scope

Conventions and guidance for assigning preferred names to data elements and their associated (component) administered items, as well as the use of alternate names for these items, are described in this Appendix. These conventions are consistent with principles of the ISO/IEC 11179 standard, *Metadata Registries*, Part 5, *Naming and Identification Principles*.

In ISO/IEC Standard 11179 a Data Element (DE) is an administered item consisting of two other administered items, a Data Element Concept (DEC) and a Value Domain (VD). The DC is itself made up of two other administered items, an Object Class and a Property. In addition to data elements, these conventions also apply to administered items which are components of a data element (data element concept, object class, property, and value domain).

The preferred name is a descriptive name that reflects the business meaning of the data element or component. The preferred name is a formalized synopsis of the data element's definition and representation. Other names, called alternate names, for that data element or component may also exist; an example would be an abbreviated name which is used primarily as a physical name (also referred to as internal, access, or symbolic name) in a database or programming environment. Alternate names are discussed later in this Appendix.

These conventions apply only to data elements and their components that are to be entered into the FDR. These conventions can be applied in naming data in other data constructs (such as in data models or specific applications) where it is useful to do so.

B.2 Purpose

Before creating a new administered item for inclusion in the FDR, it is recommended that the registry be searched for existing standardized administered items that could potentially be re-used.

The purpose of this Appendix is to provide specific guidance to follow when constructing names for data elements and their component administered items that are to be entered into the Federal Data Registry (FDR). Using these conventions will provide consistency to the names of data contained in the FDR and comply with naming principles specified in ISO/IEC 11179, Part 5. Such names are readily recognizable nationally and internationally in any community with an ISO/IEC 11179 compliant registry.

B.3 Structure of Data Element Names

A data element is a formalized **representation of information** (fact, proposition, or observation) **about something** (person, place, process, thing, concept, association, or event). A data element representation may be character-based, graphic, imagery, sonic, or other complex form.

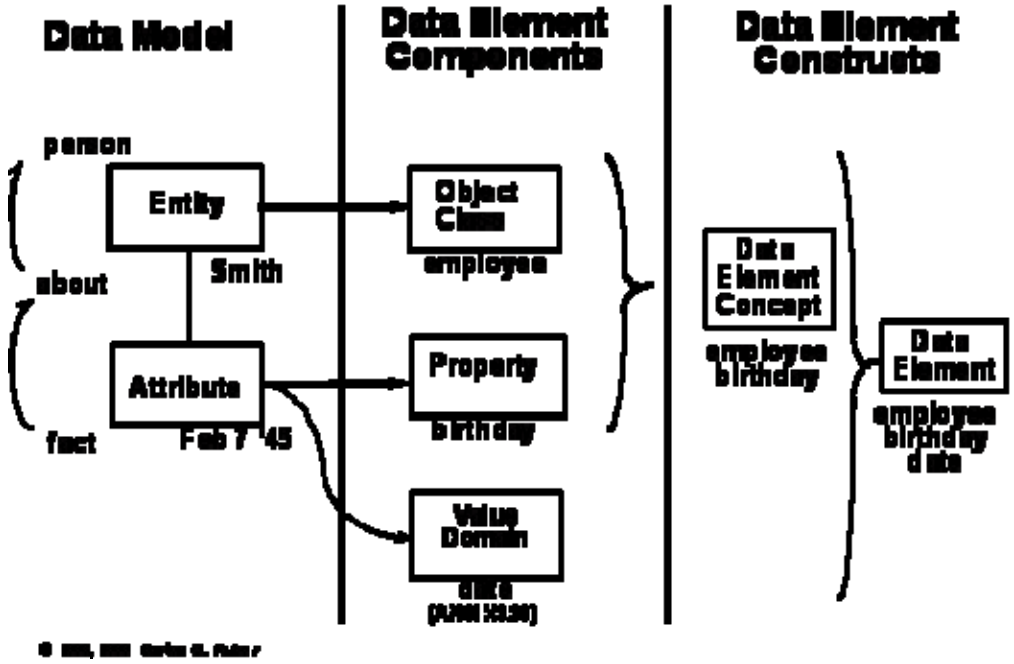

Figure B- 1 Data Element Structure

A *data element* is a composite of three components: *object class*, *property*, and *value domain*. The center column of Figure A2-1 illustrates these three components. An object class (e.g., person) is an abstraction of a real world entity (e.g., the person named Smith). A property (e.g., a particular kind of day, called birthday) is an abstraction of a type of information about the real world entity (the birth event of this particular Smith). A value domain is an abstraction of the physical form of that information (in this case: date, in ANSI X3.30 representational form, YYYYMMDD). Referring to Figure A2-1, the data element illustrated is “employee birthday date.” An instance of this data element is “19450207,” representing the 7 February 1945 birthday of some person named “Smith,” in accordance with the ANSI X3.30 standard.

A *data element concept*, also called *data concept*, refers to the essential meaning of the data element without any implementing value domain representations, in this case “employee birthday.” Such a data concept may be combined with appropriate value domains to specify different data elements, e.g., employee birthday may be combined with “code” to form the data element “employee birthday code,” where the explicit value domain for code is defined as:

employee birthday code	**birthday range**
“1”	before 1900
“2”	1900-1949
“3”	1950-2000
“4”	after 2000

An instance of that element would be “2”, identifying the range in which Smith’s birthday falls. Still another element “employee birthday Julian date” might represent the same concept in the form YYDDD, e.g., “45038”. Use of data concepts promotes standardization of data elements.

B.4 Logical Data Element Naming Guidelines

Careful formulation of the names (and other documenting meta-attributes) of data elements and their associated administered items promotes consistency of data element names and helps prevent development of inappropriate data element names (i.e., different names for the same data element or the same name for different data elements).

A number of general guidelines apply. The use of spaces, prepositions, and conjunctions is not recommended in preferred names. Although FDR allows the use of all characters from the US ASCII character set, punctuation marks and other symbols. Periods, underscores, parentheses, and hyphens are also not recommended for inclusion in preferred names unless specified by this convention. Primary words used in the preferred name are nouns. Abbreviations and acronyms are not recommended for use in the preferred name unless required to keep the name within maximum length parameters or if they are commonly used in the domain of discourse. When abbreviations or acronyms are used in the preferred name, they should be spelled out in the definition of the data element or data element component. Finally, duplicate words should be removed from a name unless doing so would affect its meaning.

Object Class Name: a concatenation of one or more words that communicates the essence of the object class. The words in the name are in initial capital letters with no spaces or special characters in or between them, thus:

ObjectClassName

Property Name: a concatenation of one or more words that communicates the essence of the property. A property reflects a fact, proposition, or observation about an object class. The words in the name are in initial capital letters with no spaces or special characters in or between them, thus:

PropertyName

Data Concept Name: a concatenation of object class name and property name separated by an underscore ("_"), thus:

ObjectClassName_PropertyName

A data element concept can be combined with alternative value domains to develop different data elements.

Value Domain Name: a concatenation of three parts that together communicate the essence of the value domain, ensure the uniqueness of the name within its context in FDR, and highlight opportunities for value domain reuse. The first part is the name of the *property* being represented by this value domain. The second part is a *value domain core term* or representation class. The third part is in the form *"-Rnnn"* where "-R" stands for "Representation" and "nnn" is a counter used to uniquely name different representations within the same representation class that may exist for a single data concept, thus:

PropertyName_CoreTerm-Rnnn

Data Element Name: a concatenation of data concept name and value domain name, with duplicate words removed from the name as required, thus:

DataConceptName_CoreTerm-Rnnn

Note that this is equivalent to ObjectClassName_PropertyName_CoreTerm-Rnnn.

Two examples follow.

Object Class:	Employee
Property:	Birthday
Data Concept:	Employee_Birthday
Value Domain #1:	Birthday_Date-R001 *(e.g., represented as YYDDD)*
Data Element #1:	**Employee_Birthday_Date-R001**
Value Domain #2	Birthday_Date-R002 *(as YYYYMMDD)*

Data Element #2: **Employee_Birthday_Date-R002**
Value Domain #3: Birthday_Code-R001 *(as date ranges)*
Data Element #3: **Employee_Birthday_Code-R001**

Object Class: Runway
Property: SurfaceTemperature
Data Concept: Runway_SurfaceTemperature
Value Domain#1: SurfaceTemperature_Quantity-R001 *(as whole degrees F)*
Data Element #1: **Runway_SurfaceTemperature_Quantity-R001**
Value Domain #2: SurfaceTemperature_Quantity-R002 *(as tens of degrees F)*
Data Element #2: **Runway_SurfaceTemperature_Quantity-R002**

B.5 Alternate Names

Alternate names are defined as single or multi-word designations for a data element or other administered item that differ from the preferred name but represent the same data element or administered item (i.e., they are not the names of other items with similar or slightly different definitions). Alternate names are the synonymous name(s) by which the item in question is known in this or other application environments or contexts.

Conventions for formulating an alternate name depend on the type of name it is and the context in which it is used; that is, the conventions and guidance for assigning preferred names discussed in Sections above do not apply to alternate names.

B.6 Value Domains and Conceptual Domains

What is a Value Domain (VD)?

ISO 11179 provides the following definition:

> **Value Domain:** a set of Permissible Values. NOTE: The Value Domain provides representation, but has no implication as to which Data Element Concept the Values may be associated with or what the Values mean. NOTE: The Permissible Values may either be enumerated or expressed via a description. [11179-3, section 3.3.140]
>
> > A *Value Domain* is associated with, and provides a representation for, a *Conceptual Domain*. An example of a *Conceptual Domain* and a set of *Value Domains* is ISO 3166, Codes for the representation of names of countries. For instance, ISO 3166 describes the set of seven *Value Domains*: short name in English, official name in English, short name in French, official name in French, alpha-2 code, alpha-3 code, and numeric code. [11179-3, section 4.12.1.5]

How do we decide if a VD is Enumerated or Non-Enumerated?

An <u>enumerated</u> value domain is a set of values that is described by listing its value/value meaning pairs. [*Enumerate* – to name one by one; to specify, as in a list (Webster's Dictionary).] A <u>non-enumerated</u> VD is a set of values that we cannot or do not ordinarily list but instead use an expression to describe it; for example, the set of FAA employee names. Similarly, if a set of values can be described simply as "degrees Fahrenheit between 1 and 30 expressed as integers", it would not add value to create an enumerated list like "1 = 1 degree F, 2 = 2 degrees F, etc." On the other hand, a set of integers from 1 – 30 in which each integer is a code with a meaning would be enumerated since it is best described by listing each code with its meaning.

What if a VD's Permissible Values have no Value Meanings?

Consider a value domain for a data concept called Airport_Name. If the values are simply textual names, the VD can be non-enumerated (i.e., described as character string, maximum length 60, etc.) unless it adds benefit to document the values as metadata by actually listing all the names. If the values are listed without meanings, the VD should still be related to an appropriate enumerated Conceptual Domain.

What if a VD's Permissible Values come from a list that is not maintained in FDR?

Consider a value domain that consists of 3-letter codes that stand for airports, like DCW or LAX. These codes and decodes are published in an FAA Order that is maintained by an FAA organization. Earlier FDR guidance was to make the VD enumerated and enter the name of the FAA Order or database containing the codes and decodes into the first row of the VD's permissible value/value meaning table.

What is a Conceptual Domain (CD)?

ISO 11179 provides the following definition:

> **Conceptual Domain:** a set of valid Value Meanings. NOTE: The Value Meanings may either be enumerated or expressed via a description. [11179-3, section 3.3.21]
>
> > A *Conceptual Domain* may specify a constraint such as "linear measure" as its *dimensionality*. When a *dimensionality* is specified, any *Value Domain* that is based on this *Conceptual Domain* shall specify a *Unit of Measure* that is consistent with this *dimensionality*. [11179-3, section 4.12.1.1]

A **conceptual domain** is to a value domain as a data element concept is to a data element. While a data element concept does not have a value domain, it does have a conceptual domain without specific physical representations.

Why do we need CDs?

Notice that while a value domain contains permissible values, the meanings of those values are contained in the *conceptual domain*, *not* the value domain. Being a global standard, ISO 11179 does this to assist with translating data from different systems or languages; e.g., situations where the values "AK", "02", "Аляска", and "The Last Frontier" all mean Alaska. The same is true for non-enumerated values; e.g., one system may represent a salary in Euros while another uses Dollars, but conceptually the values are both about money. In our FDR environment, CDs are especially useful as a means of *classifying* value domains and data concepts, and hence data elements, so that we can find, reuse, and create similar items more easily. They also help us manage commonly-used lists of values and value meanings.

When should we create a new CD?

Since CDs can be thought of as a classification scheme, the number of CDs we need depends on how detailed we want the classification scheme to be. Too few, and the scheme adds no utility to FDR. Too many, and the scheme is unwieldy and hard to maintain. For example, an enumerated CD's value meanings list may or may not need to be subdivided to create new CDs; if there is already a CD for the list of US States, do we need a separate CD for New England States? Such decisions are a matter of judgment to be discussed with the Registrar. If a user proposes a new CD, the Registrar will weigh the advantage of updating an existing CD vs. creating a new one to keep the classification scheme manageable.

How do we use CDs to create Value Domains and Data Elements?

Following are four scenarios describing how a user would create a data element by starting with a data concept, associating the data concept with the right conceptual domain, creating the value domain and associating it with the same conceptual domain, and checking for value domain reuse.

Consider a fictitious data concept named **Aircraft_Weight** which is being registered by the **Flight Object Community of Interest (this will be its Context)**. Suppose the concept is represented in various systems in four different ways: as a choice of a list of coded values (L=Light, M=Medium, H=Heavy); by an actual weight in pounds; as a choice of a list of terms (Heavy, Medium, Light, Ultralight); and as a free-form textual description (e.g., "Total weight not to exceed 15000 pounds, including cargo."). There will thus be four data elements to describe and name.

For the coded values representation:

1. The user enters the data concept in FDR and scrolls down the list of conceptual domains in FDR to find anything that looks like "List" or "List- Weight Categories". He finds and chooses the CD named

"List-Aircraft Weight Categories" because it suits his needs perfectly; in fact, this CD has three value meanings corresponding to ICAO's categorization in which aircraft with a maximum certificated take-off weight of 300,000 lb or more are classed as Heavy, those between 15,500 lb and 300,000 lb are classed as Medium, and those below 15,500 lb are classed as Light.

2. He then looks at the Standardized value domains already associated with that CD that are also in the FAA-Wide or Flight Object COI context. If he finds one that has the same exact permissible values, i.e., 3 upper-case letters L, M, and H, he can reuse that value domain to build his data element.
3. If he does not find a value domain he can reuse, he creates a new enumerated value domain in the Flight Object COI context and names it **Weight_Code-R001.** (If there is already a value domain in that context with the same name, he would name his new value domain **Weight_Code-R002**.) The new value domain will be associated with the List-Aircraft Weight Categories CD.
4. He now associates his data concept with his new value domain to make a new data element. The rule says to combine data concept plus value domain names to make the data element name. After trimming duplicate words, he names his data element **Aircraft_Weight_Code-R001**.

For the actual weight representation:

1. The user scrolls down the list of CDs to find anything that looks like "aircraft weight" or "weight". He sees List-Aircraft Weight Categories, but the non-enumerated CD named Quantities-Weight is a better match, so he associates his concept with that CD.
2. Ideally, he will look at all the existing standardized value domains associated with the CD Quantities-Weight to find one he can reuse or he may decide to create a new one. There happen to be 292 existing value domains named "Weight_Quantity-Rnnn" associated with this CD, so he goes ahead and creates a non-enumerated value domain in the Flight Object COI context and names it **Weight_Quantity-R293**.
3. Using the same rule as before, he names his data element **Aircraft_Weight_Quantity-R293**.

For the choice of terms representation:

1. The user scrolls down the list of CDs to find anything that looks like weight categories. He sees the CDs named List-Aircraft Weight Categories, Quantities-Weight, and Text-Descriptions, and chooses List-Aircraft Weight Categories. He then sees that there are only 3 entries in the CD's list, none having to do with "Ultralight". The addition of this item to the existing CD would need to be coordinated with the FDR Registrar.
2. He then looks to see if there are any other potentially reusable value domains associated with that CD that have to do with aircraft weight categories. He finds only the one that he created in the first scenario, so he creates a second enumerated value domain called **Weight_Code-R002**.
3. Using the same rule as before, he names his data element **Aircraft_Weight_Code-R002**.
4. Note that although the terms Heavy, Medium, Light, Ultralight may not be considered "codes", they are in fact valid values that have value meanings (definitions) drawn from the list in the CD List-Aircraft Weight Categories. An argument could be made to use the core term "Identifier" or "Text" rather than "Code" in the names of the value domain and data element.

For the free-form text representation:

1. The user scrolls down the CD list and finds nothing except the CD named Text-Descriptions that looks like what he wants, so he chooses that. He would not choose List-Aircraft Weight Categories because his entries are free-form text and not enumerated values.
2. There are a great many value domains associated with the Text-Descriptions CD, but none named "Weight_Text-Rnnn". He therefore creates a non-enumerated value domain and names it **Weight_Text-R001**.
3. Using the same rule as before, he names his data element **Aircraft_Weight_Text-R001**.

In summary, the user has created and named four data elements, as follows:

Aircraft_Weight_Code-R001

Aircraft_Weight_Quantity-R293

Aircraft_Weight_Code-R002

Aircraft_Weight_Text-R001

B.7 Value Domain Core Terms

The following is a "generic" list of core terms available for general use and it is useful for creating unique Value Domains. Refer to section B.4 above for further details. Additional Value Domains may also be found in the FDR.

amount-dollar: A numeric quantification of a monetary value expressed in monetary units of U.S. dollars and cents in the form "$$$$(.¢¢)" where "$$$$" represents dollars to whatever number of significant digits is required and optional "¢¢" represents the number of cents. For non-monetary numeric values, use the "quantity" value domain term.
code: A string of one or more characters or symbols that is substituted for a specific meaning. A code is often a simpler or shorter term which can be related to the original meaning; e.g. Massachusetts identifies a specific state, and MA is a code for Massachusetts. Other examples are "LAX" (Los Angeles International Airport) and "ORD" (Chicago O'Hare International Airport). See also **identifier**.[7]
The explicit representations for certain codes are as follows:

code-states; States of the United States: If used without modifiers, the value domain term is expressed per ANSI X3.38, *Codes–Identification of States, the District of Columbia, and the Outlying and Associated Areas of the United States.* Note that these codes are interchanged in the two alpha character format option of the standard, regardless of their display/report formats.

---

7 The distinction between code and identifier is not always clear-cut. For example, LAX identifies a specific three-dimensional point, namely the highest point on a certain runway at LA airport, and in air traffic control usage it represents Los Angeles International Airport, in the sense that LAX implies that airport. However, usage as code vs. identifier depends upon who is using it. If it is used by a passenger to describe a desired airline reservation, then it is being used as a code; but if it is used by an air traffic controller or pilot, then it is being used as an identifier. A flight plan can identify a destination point with the understanding that the tolerance for arriving at that point is much larger than a few centimeters. When a flight plan identifies LAX, most runways at the airport would probably meet the tolerance criterion, but the airport parking lot would not. So one finds oneself lost in the minutiae of making a code-vs.-identifier decision based upon whether a code for the long name of the airport, plus the tacit assumption that it means a runway, is different from an identifier of a specific point with a tolerance around it, such that reachable-by-taxiing-runways are included, whereas other points within the airport are not.

A way of distinguishing a code from an identifier may be to recognize that a processing step for coding, likewise a processing step for decoding, occurs when a code is used, and does not occur when an identifier is used. For example, LAX used as an identifier of a fix can be looked up in FAA Order 7350.7. Its latitude and longitude can also be looked up. LAX is a shorter, simpler representation of that latitude/longitude pair, so it fits the mathematical definition of code. The decoding process is the looking up, and the looking up is the indirection.

In fact, one can directly represent Los Angeles International Airport with its name. In contexts where needed assumptions are true, one can represent it by LAX. One might also represent it by its picture, by the numerical latitude and longitude of some runway intersection, by a description of its airspace boundaries, or by its inter-facility address as seen from its parent Air Route Traffic Control Center (this last will have both coded and decoded forms). There are many means of representation, not all of them codes. *(Comment provided by Therese Smith, Air Traffic Software Architecture, Inc. and paraphrased here)*

code-countries; Countries of the World: If used without modifiers, the value domain term is expressed per ISO/IEC 3166, *Codes for the Representation of Names of Countries*. Note: Country code is always interchanged in the two alpha character format option, regardless of any display/report formats.

code-gender; Human Sex: If used without modifiers, the value domain term is expressed per ISO/IEC 5218, *Representation of the Human Sexes*. Note: only three of the four codes for representation of human sexes should be used: "0" for Unknown, "1" for Male, and "2" for Female.

date: An identification of a particular Gregorian calendar day expressed by its calendar year, month, and ordinal numbered day within the month. If used without modifiers, the value domain term is expressed per ANSI X3.30, *Representation of Date for Information Interchange* in the form YYYYMMDD, where YYYY represents a calendar year in the Gregorian calendar, MM represents a month within such a year, and DD represents a day in such a month. This value domain specification is the same as that specified in ISO/IEC 8601-2000, *Data elements and interchange formats—Information interchange-Representation of dates and times,* Clause 5.2, Dates, Subclause 5.2.1.1, Complete Representation—Basic format.

date-time-local: A local date and time at a particular location.

date-time-UTC: The date and time in accordance with the date and time scale maintained by the Bureau International des Poids et Mesures (International Bureau of Weights and Measures) and the International Earth Rotation Service (IERS), which forms the basis of a coordinated dissemination of standard frequencies and time signals and is denoted as Universal Coordinated Time (UTC). If used without modifiers, the value domain term is expressed in the form YYYYMMDDhhmmss(.s)Z, where YYYY is year, MM is month, DD is day, hh is hour, mm is minutes, ss is seconds, (.s) represents seconds optionally to whatever number of significant decimal digits is required, and Z is a literal meaning Zulu.

degrees: An angular measure.

elevation-AGL: The height or vertical distance of a level, a point or an object considered as a point, on, above, or below the surface of the earth, measured from the earth's surface.

elevation-MSL: The vertical distance of a level, a point or object considered as a point, on, above, or below the surface of the earth, measured from the earth's mean sea level datum.

grid: A finite collection of (usually uniformly spaced) points.

identifier: A string of one or more characters or symbols that directly and uniquely designates a specific object or entity but has no readily definable meaning; e.g., serial number, stock number. An identifier is different from a code in that a code is a substitute for a specific meaning. See **code**.

indicator: A special binary code or "flag," such as Y/N, on/off, T/F.

image: A graphical or pictorial item, e.g., a map, diagram or other graphic, picture, video, movie, or icon. The explicit value domain for each type of image is specified with the appropriate suffix, e.g., image-JPEG, image-GIF, etc.

latitude: The angular distance of a point from the earth's equator, north or south. If used without modifiers, the value domain term is expressed in the form DDMMSS(.s)[N/S], where DD is degrees, MM is minutes, SS is seconds, (.s) is decimal seconds optionally to whatever number of significant digits is required, and [N/S] is direction North or South, e.g., "753440.3428N."

location: A geographical point on, under, or above the surface of the earth. If used without modifiers, the value domain term is expressed per ISO/IEC 6709, *Standard Representation of Latitude, Longitude, and Altitude for Geographic Points* in the sequence of latitude, longitude, and optional altitude in the form [+/-]DDMMSS(.s)[+/-]DDDMMSS(.s)([+/-]999.9), with no spaces, where items enclosed in parentheses are optional, [+/-] indicates a choice of plus or minus sign, DD or DDD is degrees, MM is minutes, SS is seconds, (.s) is decimal seconds of either latitude or longitude to whatever number of significant digits is required; and [+/-]999.9 is the height above or below sea level in meters and decimal meters to whatever number of significant integer or decimal digits is required.

longitude: The angular distance between a given point and the zero meridian passing through Greenwich, England, east or west. If used without modifiers, the value domain term is expressed in the form DDDMMSS(.s)[E/W], where DDD is degrees, MM is minutes, SS is seconds, (.s) is decimal seconds optionally to whatever number of significant digits is required, and [E/W] is direction East or West, e.g., "1354350.9809W."

magnetic-variation: The angular difference between true north and magnetic north as determined from an epoch year description of the earth's magnetic field at a particular point. If used without modifiers, the value

domain term is expressed in degrees, decimal degrees to tenths, and direction East or West of the Zero variation line, in the form DD.d[E/W]; e.g., “4.0W”.

number: A non-computational string of one or more digits used to designate an item, e.g., a telephone number, street number, apartment number, or social security number.

percent: A ratio of two quantities expressed in numeric format as a decimal number multiplied by 100.

pressure: A measure of force exerted against an opposing body; i.e., thrust distributed over a surface, expressed in units of force per unit of area.

> **pressure-barometric**: The force exerted per unit of area by the atmosphere as a consequence of gravitational attraction upon the “column” of air lying directly above the point in question, measured with a barometer or barograph, ordinarily expressed in inches of mercury.

quantity: A non-monetary numeric value subject to computational manipulations.

rate: A quantity that represents the ratio of one measurable unit to another measurable unit, e.g., miles per hour, gallons per hour, dollars per day.

sound: An audio sequence with an explicit beginning and end. The explicit value domain for each type of sound is specified by a suffix, e.g., sound-wav.

temperature: A quantity that represents the measure of heat in an object.

text: A string of characters or symbols (formatted or unformatted), generally in the form of words; e.g., the name or description of a street, the contents of a document or message, etc.

time-local: A local clock time at a particular location.

time-ordinal: A quantity of time relative to a specific start or reference time.

time-period: A portion of time between two time-points.

time-UTC: A time of day in accordance with the time scale maintained by the Bureau International des Poids et Mesures (International Bureau of Weights and Measures) and the International Earth Rotation Service (IERS), which forms the basis of a coordinated dissemination of standard frequencies and time signals and is denoted as Universal Coordinated Time (UTC). If used without modifiers, the value domain term is expressed in the form hhmmss(.s)Z, where hh is hour, mm is minutes, ss is seconds, (.s) represents seconds optionally to whatever number of significant decimal digits is required, and Z is a literal meaning Zulu.

year: A specific year in the Gregorian calendar. If used without modifiers, the value domain term is expressed as four digits in the form YYYY.

APPENDIX C – Writing Good Definitions

C.1 Scope

This appendix has been provided to aide information stewards and data architects/modelers to produce good written definitions for their data. The purpose of a data element definition is to define a data element with words or phrases that describe, explain, or make definite and clear its meaning. *Precise* and *unambiguous* data element definitions are one of the most critical aspects of ensuring data shareability. When two or more parties exchange data, it is essential that all be in explicit agreement on the meaning of that data.

C.2 References

a. ISO/IEC 11179-412 - ISO/IEC 11179-4[8] provides a guide for writing good data element definitions. There are mandatory **rules** with which all definitions must comply, and there are **guidelines** that should be followed when writing a definition. Note the difference between rules and guidelines: compliance with the rules can be objectively tested, whereas compliance with the guidelines can only be evaluated subjectively. Many of the rules and guidelines cited below are abstracted from this document.
b. Although ISO/IEC 11179-4 rules and guidelines pertain to data elements and other administered items like data element concepts and value domains, they can also be applied when writing definitions for data constructs such as entities, relationships, attributes, object types (or classes), objects, segments, composites, code entries, messages, classification scheme items, XML tags, etc.

C.3 Definitions

Definition: A word or phrase expressing the essential nature of a person or thing or class of persons or things; an answer to the question "what is x?" or "what is an x?"; a statement of the meaning of a word or word group. [Webster's Third New International Dictionary of the English Language Unabridged, 1986]

C.4 Rules for Writing Good Definitions

A data element definition *must*:

a. Be stated in the singular.
b. State what the concept is, not only what it is not (i.e., never exclusively in the negative).
c. Be stated as a descriptive phrase or sentence(s).
d. Contain only commonly used abbreviations.
e. Be expressed without embedding definitions of other data elements or underlying concepts.

Descriptions and examples of each rule are provided below. Note that the data elements used in the examples have been named according to the Federal Data Registry naming conventions.

1. State it in the singular.
The concept expressed by the definition must be stated in the singular. (An exception is made if the concept itself is plural.)

8 ISO/IEC FDIS 11179-4, Part 4: Rules and guidelines for the formulation of data definitions

Example: “Article_Reference_number”

Good: A reference number that identifies an article.
Poor: A reference number that identifies articles.
Reason: The poor definition uses the plural word "articles," which is ambiguous since it could imply that an "article number" refers to more than one article.

2. State what the concept is, not only what it is not.
A definition cannot be constructed exclusively by saying what the concept is not.

Example: “Freight_Cost_amount”

Good: Cost incurred by a shipper in moving goods from one place to another.
Poor: Cost not related to packing, documentation, loading, unloading, and insurance.
Reason: The poor definition does not specify what is included in the meaning of the data.

3. Use a descriptive phrase or sentence.
A phrase or sentence is necessary to describe the essential characteristics of the concept. Simply stating the name as a synonym, or restating it with the same words, is not sufficient. If more than one descriptive phrase is needed, use complete grammatically correct sentences.

Example: “Weather_Forecast_text”

Good: An estimation or calculation of future weather conditions.
Poor: A weather prediction.
Reason: The poor definition is just a synonym for the name of the concept.

4. Use only commonly understood abbreviations.
Understanding the meaning of an abbreviation or acronym is usually confined to a certain environment. In other environments, the same abbreviation can cause misinterpretation or confusion. Exceptions may be made for common abbreviations such as “i.e.” and “e.g.” or if an abbreviation is more readily understood than the full form and has been adopted as a term in its own right, such as RADAR (radio detecting and ranging). When an acronym is first used in a definition, it should be expanded.

Example: “elevation-MSL”

Good: The vertical distance of a point or a level on, above, or below the surface of the earth, measured from the earth’s mean sea level (MSL) datum.
Poor: The vertical distance from MSL to a specific point.
Reason: The poor definition is unclear because the acronym MSL is not commonly understood and some users may need to determine what it represents. Without the full word, finding the term in a glossary may be difficult or impossible.

5. Avoid embedded definitions.
The definition of a second concept should not appear in the definition proper of the primary concept. Definitions of terms should be provided in an associated glossary. If the second definition is needed, it may be appended.

Example: “Accident_AircraftDamage_code”

Good: A code that designates the level of damage sustained by the aircraft as a result of the accident.
Poor: A code that designates the level of damage sustained by the aircraft as a result of the accident. An aircraft accident is an occurrence associated with the operation of an aircraft

that takes place between the time any person boards the aircraft with the intention of flight and the time all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage.

Reason: The poor definition contains a concept definition, which should be included in a glossary.

C.5 Guidelines for Writing Good Definitions

Highly recommended guidelines are principles that should be followed when writing a data element definition.

A data element definition *should*:

a. State the essential meaning of the concept.

b. Be precise and unambiguous.

c. Be concise.

d. Be able to stand alone.

e. Be expressed without embedding rationale, functional usage, domain information, or procedural information.

f. Avoid circular reasoning.

g. Use the same terminology and consistent logical structure for related definitions.

h. Be appropriate for the type of metadata item being defined.

Descriptions and examples of each guideline are provided below. Note that the data elements used in the examples have been named according to the FDR naming conventions.

1. State the essential meaning.
Include all primary aspects of the concept, but avoid non-essential characteristics.

Example. “Invoice_Total_amount”

Good: The total sum charged on an invoice.
Poor: The total sum of all chargeable items mentioned on an invoice, taking into account deductions on one hand, such as allowances and discounts, and additions on the other hand, such as charges for insurance, transport, handling, etc.
Reason: The poor definition includes extraneous material.

2. Be precise and unambiguous.
The exact meaning and interpretation should be apparent from the definition. A definition should be clear enough to allow only one possible interpretation.

Example: “Shipment_Receipt_date”

Good: The date on which a shipment is received by the receiving party.
Poor: The date on which a specific shipment is delivered.
Reason: The poor definition does not specify what determines a "delivery." "Delivery" could be understood as either the act of unloading a product at the intended destination or the point at which the intended customer actually obtains the product. It is possible that the intended customer never receives the product that has been unloaded at his site or the customer may receive the product days after it was unloaded at the site.

3. Be concise.
The definition should be brief and comprehensive. Extraneous qualifying phrases such as “terms to be described” or “for the purposes of” are to be avoided.

Example: "Casefile_NASChangeProposal_identifier"

Good: A unique identifier assigned to a case file by the National Airspace System Configuration Control Board.
Poor: The case file NCP identifier is an identifier assigned to a case file by the National Airspace System Configuration Control Board for the purpose of NAS CCB administrative procedures or for use in retrieving case file information from the Federal Data Registry.
Reason: In the poor definition, the name of the data element is repeated unnecessarily, and the phrases after "…Control Board" are extraneous qualifying phrases.

4. Make it stand alone.
The meaning of the concept should be apparent from the definition. Additional explanations or references should not be necessary to understand the meaning of the definition.

Example: "Accident_LocationCity_name"

Good: Name of the city nearest to the accident site.
Poor: See "event site" in FAA Order 8020.11.
Reason: The poor definition does not stand alone, but requires the aid of a second definition (event site) to understand the meaning of the first.

5. Express it without embedding rationale, functional usage, domain information, or procedural information.
Reasons as to why the definition is expressed a certain way should not be included in the definition. Functional usage (e.g., "this data element should not be used for…") or procedural aspects (e.g., "this element is used in conjunction with element X…") are more properly handled in the FDR as comments or related data references.

Example: "Accident_MidairCollision_indicator"

Good: A code that indicates whether or not the accident involved a midair collision between two aircraft.
Poor: A code that indicates whether or not the accident involved a midair collision between two aircraft. This element is used to count collisions in the air, not on the ground and not with objects (towers).
Reason: Remarks about functional usage (i.e., "this data element is used to count…") should be omitted from the definition. If this information is needed, it should be entered as a comment.

6. Avoid circular reasoning.
Two definitions should not be defined in terms of each other. A definition should not use the definition of another concept as its definition.

Example: "Employee_Identification_number" and "Employee" (object class)

Poor: Employee_Identification_number – a number assigned to an employee.
Poor: Employee – a person who has been assigned an employee identification number.
Reason: Each definition refers to the other for its meaning. The meaning is not given in either definition.

7. Use the same terminology and consistent logical structure for related definitions.
Use common terminology and syntax (i.e., consistent logical structure) for similar or associated definitions to facilitate understanding.

Example: "Goods_Dispatch_date" and "Goods_Receipt_date"

Good: Goods_Dispatch_date – The date on which goods were dispatched by a given party.
Goods_Receipt_date – The date on which goods were received by a given party.
Poor: Goods_Dispatch_date – The date on which goods were dispatched by a given party.
Goods_Receipt_date – The date on which the customer received the merchandise.
Reason: Users may wonder whether some difference is implied by the use of synonymous terms and variable syntax.

8. Make it appropriate for the type of metadata item being defined.
Each type of metadata item in the FDR (e.g. data element concept, data element, conceptual domain, value domain) plays a different role, and this should be reflected in the definitions.

Examples:

Data element concept: "Job Grade Maximum Salary Amount"
Definition: The maximum salary permitted for the associated job grade.
Note: The data element concept makes no reference to a specific value domain.

Conceptual Domain: "Monetary Amount"
Definition: An amount that may be expressed in a unit of currency.
Note: The definition refers to a "dimensionality" of currency, but not to a specific currency.

Data element 1: "European Job Grade Maximum Salary Amount"
Definition: The maximum salary permitted for the associated job grade expressed in Euros.

Data element 2: "U.S. Job Grade Maximum Salary Amount"
Definition: The maximum salary permitted for the associated job grade expressed in US dollars.
Note: Data element definitions may refer to explicit value domains, since this may be all that distinguishes two data elements.

Value Domain 1: "Amount in Dollars"
Definition: A numeric quantification of a monetary value expressed in units of U.S. dollars and cents in the form "$$$$.¢¢" where "$...$" represents dollars to whatever number of digits is required and "¢¢" represents the number of cents.

Value Domain 2: "Amount in Euros"
Definition: A numeric quantification of a monetary value expressed in units of euros and cents in the form "€€€€.¢¢" where "€€€€" represents euros to whatever number of significant digits is required and "¢¢" represents the number of cents.

C.6 Other Good Practices

1. Begin a data element's definition by stating its representation class.
Since a data element always includes representation, begin the phrase that defines the data element by stating the representation class for the data element and its value domain. The definite article "the" is used because the definition refers to a specific data value. For example,

Name: The name of....
Code: The code that represents....
Text: The text that describes (or defines)....
Number: The number assigned by (Dun & Bradstreet, Chemical Abstracts Service, the state) to identify a (business establishment, chemical substance, legislative district)....
OR
The number that represents....
Quantity: The (sum, dimension, capacity, amount) of.... Note that instead of repeating the term "quantity" in the definition, more specific terms are used to describe the type of quantity for

which the data element is applicable. This avoids the wordiness of a phrase like "The quantity that indicates the sum of...."

The definition should not begin with an expression such as “term used to describe” or “term denoting,” nor should it take the form “is...,” “means...,” “one of...”

2. Cite the source of the definition
If the definition has been taken from another document, add a reference to it in square brackets after the definition, e.g., [ISO 690].

APPENDIX D – Outline of Working Group Terms of Reference

(Name of Working Group)
Proposed Terms of Reference

(Once approved by FDGB, "Proposed" will be removed)

(Date)

Background

Provide a one-paragraph summary of the relevant issue(s) that are the basis for establishing a Working Group.

Scope

Provide a concise statement of the problem and work that will be pursued by the Working Group with appropriate boundaries to the problem. Include approximate time frame for the work of the Working Group.

Working Group Action Plan

Provide, in summary form, the task elements that will be the basis for the Working Group's activities over the term of the Working Group's charter.

Product Schedule

State the intended products, such as case file package, briefings, reports, etc., that will be produced and delivered by the Working Group. Specify the approximate date of delivery for each item.

Working Group Membership

Identify the Organizations that will provide members, and the names of those individuals. Identify the Chairperson(s) for the Working Group.

Note: Terms of Reference will be a FDGB agenda item, and the minutes of the FDGB /meeting addressing the creation of a Working Group will explicitly record the conclusions. The approval of the ToR will be considered a formal recommendation of the FDGB, thereby requiring the signatures of the Co-Chairs.

THIS IS A SAMPLE ONLY:

Aircraft Categorization and Identification Standard Working Group
Terms of Reference

July 26, 2001

Background

Currently various aviation organizations provide a system in which an aircraft is identified or grouped with similar aircraft. For example, International Civil Aviation Organization (ICAO) Document 8642/28, *Aircraft Type Designators,* lists aircraft type designators used by air traffic control systems throughout the world. The Federal Aviation Administration (FAA) lists approved aircraft type designators in FAA Order 7110.65, *Air Traffic Control.* National aviation authorities (NAA) register aircraft; however, these aircraft registries do not use the same identification systems. Aircraft accident investigators also identify aircraft involved in aircraft accidents. The aircraft identification system used by an aircraft accident investigation organization is not necessarily the same as the aircraft identification system used by that country's NAA.

A standard format in which an aircraft is identified or grouped with similar aircraft responds to Recommendation 1.8.3 of the White House Commission on Aviation Safety and Security. This recommendation directed the FAA to “work with the aviation community to develop standard databases of safety information that can be shared openly.”

A grouping based on the aircraft manufacturer, make, model, series, or category (e.g., fixed wing) assists in the air traffic control, aircraft registration, aircraft certification, accident and incident investigation, safety analysis, and other functions. In addition, standards to uniquely identify an individual aircraft would also assist these functions. Existing aircraft unique identification methods (i.e., aircraft tail number and aircraft serial number) fail the exclusivity test—i.e., duplicate serial numbers and registration numbers appear for more than one aircraft.

Many aviation functions use standardized aircraft groupings and individual aircraft identifiers:

Accident/Incident Investigation	Airworthiness Directives
Air Traffic Control	Climb and Descent Instructions
Aircraft Certification	Flight Planning
Aircraft Maintenance	Personnel Licensing
Aircraft Manufacturing	Runway Selection
Aircraft Registration	Safety Analysis
Aircraft Separation	Safety Inspection
Airport Planning	Search and Rescue

Many types of organizations use standard aircraft groupings and individual aircraft identifiers:

Air carriers	Aviation industry foundations, associations, and similar organizations
Air traffic control providers	Commercial Airline Guide Companies
Aircraft insurers	Government organizations that certify and inspect aircraft
Aircraft vendors	Government organizations that register aircraft
Aviation application developers	Accident investigation boards
Aviation historical societies	Manufacturers of new aircraft
	Conformers that modify existing aircraft

More uniform standard aircraft groupings and individual aircraft identifiers will:

- Overcome difficulties in merging data from diverse information systems (e.g., international and domestic sources or public and private sources).
- Reduce costs to merge and transform aircraft data.
- Enlarge the range and depth of aircraft information available for analysis.
- Reduce duplicate or multiple identifiers for the same aircraft, which increases the integrity of information available.
- Establish more useful and meaningful data that is defined and managed consistently.

Scope

The scope of this effort is to develop data standards (including lists of valid values) for aircraft categories and identifiers that are used in National Airspace System (NAS) operations, aircraft registration and certification, accident and incident investigation, safety analysis, and other functions. At a minimum, the following standards will be developed:

- Aircraft manufacturer
- Aircraft make
- Aircraft master model
- Aircraft model
- Aircraft master series
- Aircraft series
- Aircraft category (such as rotorcraft)
- Aircraft sub-category (such as helicopter or gyroplane)
- Unique aircraft identifier
- Aircraft serial number

Types of aircraft that the Working Group will address include:

- Any aircraft built for civilian use whether that aircraft is still in active service or not.
- Military aircraft that meet one of the following criteria:
    1. Excessed or released by military organizations for civilian use.
    2. Modified by manufacturers or others for civilian use.
    3. Stored or display as of part of a museum or historical collection.
    4. Involved in an aviation accident or incident that (a) was investigated by a civil organization using ICAO international standards and recommended practices for Aircraft Accident and Incident Investigation (Annex 13) and (b) where the authorities obtained and released the manufacturer, model, and serial number of the aircraft.
    5. Registered by a military organization with a civilian authority such as the FAA.

The aircraft identifiers and categories established by this Working Group will be presented to the NAS Configuration Control Board (CCB). The Working Group intends for these standards to become an FAA-wide standard adopted for all new FAA systems.

Action Plan

The Working Group members will:

- Determine if additional organizations and personnel should be contacted as a source of information.
- Review products developed by the International Aircraft Categorization and Identification Standard Sub-Team of the Commercial Aviation Safety Team (CAST)/ICAO Common Taxonomy Team.
- Research and review other efforts to establish an aircraft identifier or categories. Examples of other efforts include products developed or employed by:
    - Safety Performance Analysis System (SPAS)
    - FAA's Civilian Aviation Registry, Aircraft Registration Branch (AFS-750)
    - FAA's Office of System Safety (ASY)
    - Air Traffic Control Organizations (e.g., FAA's Air Traffic Services (ATS) or Eurocontrol)
    - Bureau Veritas
    - Transport Canada
- Determine if any modifications are necessary to the products developed for other standardization efforts.
- Determine the FAA offices that will develop and/or maintain the identifiers and categories.
- Develop additional items necessary for presenting the proposal to the NAS CCB.

Product Schedule

- Register proposed data elements that record standard aircraft groupings and individual aircraft identifiers with associated data models, business rules, and specific valid values in the Federal Data Registry (FDR).
- Any other material required for NAS CCB.
- Register *initial* data elements in the FDR by September 28, 2001.

Membership

NAME	ORGANIZATION
Jana L. Hammer	AFS-750
Richard Y. Jordan	VNTSC
Deborah Kane	Advanced Management Technology Inc.
Chris Metts	ATP-110
Patrick Millspaw	ATP-110
Joseph Mooney	AAI-220
Ava Thompson	AFS-751
Robert Toenniessen	ASY-100

Approval

FAA Data Governance Board	Routing Symbol	Signature	Date
Co-Chair			
Co-Chair			
Executive Secretary			
FAA Data Registrar			

APPENDIX E – Proposal Package Sample

E.1 Scope

This appendix serves to provide a sample of the paperwork packages that need to be prepared to receive approval for standardization of new data items. A sample has been provided of both the FAA Data Governance Board Change Proposal Form and the Case File with all of its component parts.

E.2 FAA Data Governance Board Change Proposal Form

The FDGB change proposal form and associated instructions on how to fill out this form are available on the Internet at the http://www.fdr.gov/fdr/Home.jsp web site. This form includes 3 parts. The first part describes and identifies change. The second part captures all comments and resolution provided as the result of FDGB review. The last part is the decision record which captures the approval signatures and assigned actions. The completed forms are kept by the FDGB Executive Secretary

The FDGB change proposal number can be requested from the FDGB Executive Secretary. And example of FDGB change proposal form is shown below.

FAA Data Governance Board
Change Proposal

1. Date Submitted:		**2. Change #** *(Assigned by Registrar)***:**	
3. Submitter's Name			
4. Submitter's Organization:			
5. Phone #:		**6. Email:**	
7. Priority: ☐ **Normal** ☐ **Urgent**			
8. Justification:			
9. Affected Item: ☐ **FDR Content** ☐ **User Interface/Portal** ☐ **Documentation/Conventions** ☐ **FDR HW/SW** ☐ **Other** **Specify Other:**			
10. Description Of Problem:			
11. Proposed Change:			
12. Impacts:			
13. Benefits:			
14. Manager/FAA Sponsor Name:			
15. Manager/FAA Sponsor Organization:			
16. Manager/FAA Sponsor Phone #:		**17. Manager/FAA Sponsor Email:**	

FAA Data Governance Board
Change Proposal Evaluation/Resolution

Change #:			
18. Evaluator's Name & Organization:			
19. Phone #:		**20. Email:**	
21. ☐ **Concur with no comment**		☐ **Comment**	
22. Comment:			
23. Resolution:			

FAA Data Governance Board
Change Proposal Decision Record

24.	☐ **Approved**		☐ **Disapproved**	☐ **Hold**	
25. Co-Chairperson's Signature & Date:					
26. Cost:		**27. Source:**		**28. Schedule:**	
29. Actions to be taken/Reason for Disapproval:					
30. Actionee's Name & Organization:					
31. Date Completed:					

E.3 Case file Development

Case file development is a sequence of activities to compile and package the essential data and information about a set of candidate data elements or concepts. The following are typical components of a case file package:

- Case file/NCP form & Work Sheet (Form 1800-2), mandatory
- Proposed Data Standard, mandatory
- Legacy Data Assessment, if applicable
- Data Requirements Documentation, mandatory
- Data model report, highly recommended. Models may be represented in any standard notation, such as Entity-Relationship Diagram (ERD) or Unified Modeling Language (UML).

E.3.1 CASE FILE/NCP FORM 1800-2

The case file/NCP form and associated instructions on how to fill out this form are available on the Internet at the Configuration Management web site.

The case file number can be requested from the FDGB Executive Secretary. An example of a case file/NCP form is shown below.

CASE FILE/NAS CHANGE PROPOSAL (PLEASE TYPE OR PRINT NEATLY)

Page 1 of 2

1.Case File Number	2. FOR CM USE	Case File Received Date	NCP Issuance Date	NCP Number
SD100-NAS-004				

3. Scope of Change

☐ Local ☒ National
☐ Test

4. Reason For Change

☐ Safety ☐ Technical Upgrade ☐ Systems Interface
☐ Requirements Change ☐ Design Error ☐ Parts Unavailability
☒ Baseline ☐ Other

5 Priority

☒ Normal
☐ Time-Critical
☐ Urgent

6. Justification of Time Critical/Urgent Priority
N/A

7. Supplemental Change Form
☐ ECR/ECP ☐ TES ☒ N/A

7a. Supplemental Change No._____

7b. Supplemental Change Initiation Date: _____

8. Case File Originator	9. Originator's Organization	10. Telephone Number	11. Case File Initiation Date
C. Uri	**ASD-103**	**202-385-7252**	**5/12/2003**

12. Type of Document Affected
☐ CPFS ☐ SPEC ☐ MTBK ☒ STD
☐ TI ☐ DWG ☐ IRD/ICD

13. Baseline Document Number(s)
FAA-STD-060, REV A

14. CI Subsystem Designator	15. FA Type	16. CI Component Designator
N/A	**N/A**	**N/A**

17. Facility Identifier (FACID)	18. Facility Code (FACCODE)	19. Cost Center Code	20. System Software Version
N/A	**N/A**	**N/A**	**N/A**

21. Title
Baseline and add the attached weather data elements to FAA-STD-060, Rev A, Appendix C

22. Description: (a) identification of problem, (b) proposed change, (c) interface impact, (d) cost estimate (e) funding source (f) benefits/risks,
(g) Schedule (h) Other (e.g. logistics, quality, etc.)

(a) FAA Order 7900.5B, Surface Weather Observing, prescribes aviation surface weather observing procedures and coding practices for both manual and automated observations. These procedures and practices provide a framework for identifying surface meteorological phenomena of importance to aviation and reporting their occurrence. In support of the NAS Information Architecture Committee's continuing activity to develop and configuration manage NAS data exchange standards, members of ASD-100's weather functional analysis team used FAA Order 7900.5B and NAS-SR-1000 (excerpt attached) as a source for specifying the attached data elements associated with surface weather observations.

(b) The associated metadata that has been developed for each data element will be registered in the Federal Data Registry as an approved, configuration managed standard. These standards can then be used to develop future IRDs/ICDs that include requirements for the exchange of surface weather observation data.
ARS-20 is being proposed as data steward for these data elements since this organization is responsible for maintaining FAA Order 7900.5B and for negotiations with the National Weather Service.
Informative attachments include an excerpt of NAS-level requirements for the weather information, as well as a section of a UML model that shows an approach toward developing candidate data elements for standardization.

(c) These data elements are currently being exchanged in the NAS and are already "de facto" FAA-wide standards for collecting manual and automated surface weather observations, and for the generation of routine and special aviation weather reports (METAR and SPECI), therefore no change to existing software is required. Standards will apply to new systems development.
(d).Four person-months to develop the standards.

(e) ASD-100

(f) Data standardization reduces the cost, complexity, and overall resources expended on the development and maintenance of software and computer systems.

(g) N/A

(h) N/A

Blocks 1 through 22 are to be completed by originator and/or the NCP coordinator. If a block is not applicable, write n/a. Attach additional sheets if
necessary. See current revision of NAS-MD-001 for detailed completion instructions.

FAA FORM 1800-2 (5-99) Supersedes Previous Edition
NSN:0052-00-801-6005

Case File Number **SD100-NAS-004**	NCP Number	Page 2 of 2

23. Name and Title of Originator's Immediate Supervisor (Type/Print Clearly) **S. Bradford, ASD-103**	Signature	Date

24. Facility/SMO Review (AT/AF)					25. Regional Review				
Name	Routing Symbol	Date	Concur	Non-Concur	Name	Routing Symbol	Date	Concur	Non-Concur
			☐	☐				☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
			☐	☐				☐	☐
			☐	☐	☐ Recommend Approval ☐ Disapprove (Enter into CM/STAT. Forward to Prescreening) (Return to Originator)				
			☐	☐					
Routing Symbol	Signature				Routing Symbol	Signature			

Date		Date	
Routing Symbol	Signature	Routing Symbol	Signature
Date		Date	
24a. Comments		Routing Symbol	Signature/Configuration Mgr/NCP Coordinator/ Reg Exec Sec
		Date	
		25a. Comments (Attach additional sheets if necessary)	

26. **PRESCREENING**

Prescreening Office FDGB

Prescreening Comments:

(Attach additional sheets if necessary)

Reviewers	Routing Symbol	Date	Concur	Non-Concur	☐ Recommend Approval ☐ Recommend Disapproval ☐ New Requirement (Return original to originating office through the Regional NCP Coordinator)	
					Routing Symbol	Signature
Recommended Must Evaluators ARS-20					Date	

27. **For Internal Configuration Management Use Only**

FAA FORM 1800-2 (5-99) Supersedes Previous Edition
NSN:0052-00-801-6005

E.4 Proposed Data Standard

The NAS CCB data standard specifications are mandatory and are the most important piece of the case file package since they contain metadata about the individual data standards proposed by the case file. When NAS CCB data standards are approved, these specifications become part of FAA-STD-060, *Data Standard for the National Airspace System*. Developers are required to comply with the specifications when they build the interfaces between future applications that share the standardized data elements. Each data standard specification consists of a subset of the metadata attributes listed in Appendix A of FAA-STD-060 Rev B. NOTE: the actual report is generated from the Federal Data Registry and an electronic copy is available on the FDR Portal. A hard copy of the report is maintained in the Document Control Center, DOCCON, by the NAS Enterprise Configuration Management Branch (ATO-W). FAA-STD-060 Rev B needs to be updated to reflect the recent updates in ISO 11179.

At this time the scope of FAA-STD-060 is limited to NAS CCB data standards and does not include the FDGB data standards. FAA-STD-060 scope can be expanded to include all data standards once the FDGB agrees.

E.5 Legacy Data Assessment

This section details the proposed data standard's relationship with or potential impacts on those other similar data elements in use in associated systems. The owners of these systems are stakeholders in the data standardization process.

The case file initiator (Working Group or individual) is expected to conduct as part of the research effort a broad search across a majority of the FAA systems to determine what equivalent data elements are in use by the various systems. This search may extend to international registries.

The following table is a sample that can be used to demonstrate the type of information needed. The left column shows the proposed standard data element by its preferred name.

Example Related Data Report

Proposed Standard	Legacy Information	
Data Element Name	**Legacy Data Element Name**	**Associated Systems**
Airport_Location_identifier-ICAO	Airport-ID	System A Interface Requirements Document (IRD)
	AIRPORT	System A
	Airport_Identification	System B IRD
	Apt_ID	System C
	APT_ID	System D IRD
	APT_IDENT	System E
	Facility_ID	System F IRD
	FAC_ID	System F
	Facility_Identification	System G
	AERODROME	System H

E.6 Data Requirements Documentation

Documentation of the requirement for establishing one or more data standards is a detailed activity that can be performed by searching the NAS Architecture, Capital Investment Plan, NAS-SR-1000, FAA Orders, Federal Aviation Regulations, FAA Standards, and other forms of user needs documentation that aid in creating the requirements picture. The following are samples of requirements documentation.

Example 1:

Data Elements in NCP 23039	Data Element Requirements References
DE03 Airport_Location_identifier-ICAO Unique location identifier that is formulated in accordance with rules prescribed by ICAO and assigned to the location of an aeronautical fixed station.	14 CFR Part 91 The point of departure. 14 CFR Part 91 (6) The point of first intended landing and the estimated elapsed time until over that point. 14 CFR Part 91 (2) An alternate airport, except as provided in paragraph (b) of this section. 14 CFR Part 91 (3) Pertinent aeronautical charts. Charts are any or all of: Sectional Aeronautical Charts, Terminal Area Charts, Regional Airport/Facility Directory, IFR Low-altitude En Route Charts, Instrument Approach Charts. FAA Order 7110.65 6. Point of departure. FAA Order 7110.65 8. Destination airport and clearance limit if other than destination airport.

Example 2: Requirements in Case File for NCP 24950, Weather Data Elements

3.1.1.A. The NAS shall acquire and maintain weather information covering the area of NAS responsibility for both domestic and foreign operations. Weather information shall include current, trend, and forecast weather and shall include surface and atmospheric weather at all altitudes affecting flight planning, efficiency, and safety.

3.1.1.A.2. The NAS shall acquire and maintain current surface aviation weather observations.

3.1.1.A.2.a. The content of surface observations shall include at least the following elements:

(1) Cloud layer height and amount
(2) Visibility
(3) Precipitation occurrence, type and amount
(4) Temperature
(5) Dew point
(6) Wind speed, direction, and peak gusts
(7) Altimeter setting and density altitude
(8) Obstruction to visibility
(9) Lightning or thunderstorms
(10) Runway visual range
(11) Snow depth and runway surface condition

E.7 Logical Data Model

Data modeling is an important part of gaining an understanding of the nature of the proposed data elements and how they interrelate. A logical data model may also become a starting point for creating a physical model to analyze systems engineering issues that are not presently a standardization concern but represent evolutionary change in information flows. Models may be represented in any standard notation, such as Entity-Relationship Diagram (ERD) or Unified Modeling Language (UML). See the FAA Data Modeling Process document for more information.

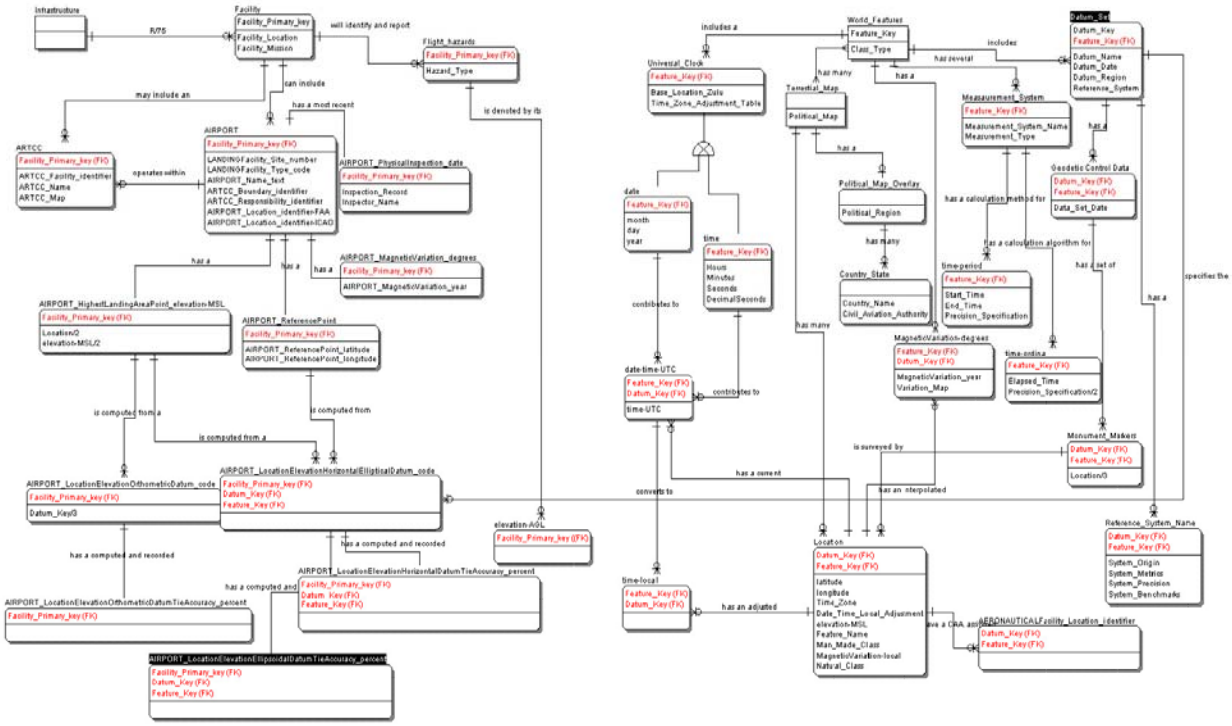

Figure E- 1 Example Logical Data Model