AIRM Primer

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Abstract

Within the European SESAR programme, the ATM Information Reference Model (AIRM) was developed with the aim to ensure semantic interoperability for the modernised European ATM Network. In other words, the AIRM is used as a common reference for the development of different information and data models throughout ATM. The AIRM represents civil, military and civil-military information constructs relevant to ATM.

Moreover, the need for development of an AIRM is identified by the ICAO Global Air Navigation Plan (GANP). Therefore, in addition to its role in the European ATM information and services developments, the SESAR AIRM constitutes a significant input to global interoperability initiatives.

The AIRM Primer is the entry point into the SESAR AIRM. It provides an introduction to the AIRM and sets it and each of its components into context. It also outlines those documents that support the development, governance and usage of AIRM.

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Intellectual Property Rights (foreground)

This deliverable consists of SJU foreground.

It is made available subject to the BSD license found in Appendix A.

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Executive summary

The System Wide Information Management (SWIM) concept [3] is about connecting ATM stakeholders, ensuring that the various pieces of information are made available to all those who need them via interoperable information services and distributed systems. The information in the ATM domain is provided by a large number of different stakeholders and is made available to the whole ATM community. Therefore, the information needs to be clearly defined and well understood between its senders and receivers. The European Interoperability Framework (EIF) [5] defines semantic interoperability as concerning the "Precise meaning of exchanged information which is preserved and understood by all parties". This need for semantic interoperability requires a detailed definition of the information both at the conceptual level as well as at the level of the data that is exchanged between systems. This is the role of the AIRM, i.e., the main benefit of the AIRM is ensuring semantic interoperability within ATM.

For example, when a user receives information about a 'runway' from one provider it will contain the same types of information as another set of 'runway' information provided by another provider. This enables users to seamlessly combine and process information from more than one provider and make decision based on the result of the processing.

The SESAR ATM Information Reference Model (AIRM) constitutes a semantic baseline for definition of global and European ATM information in general and in particular supports current state-of-the-art interoperability developments that are using information services within SWIM.

In particular, the AIRM represents civil, military and civil-military information constructs relevant to ATM. This means that information constructs from the AIRM can be used, for example, as the information elements that are exchanged between nodes in process models or as the semantic reference for the definition of the message of a service.

The AIRM has several components in order to achieve its aims in supporting its stakeholders. The **AIRM Foundation Library** contains reusable building blocks originating from international standards such as ICAO, ISO, W3C; those building blocks contain definitions of primitive and other data types, for re-use in the AIRM as well as in its compliant models. The **AIRM Information Model** provides a reference model for the SESAR information concepts for operational experts. Moreover, it contains entities and semantic relationships relevant to the ATM operational discourse and concerns. The **AIRM Consolidated Logical Data Model** provides a reference model of the ATM data concepts for service architects and system implementers; it contains the data elements necessary to model the shared information of ATM. The **AIRM Constraints Model** provides the business driven constraints which have an impact on the AIRM Information Model and/or the AIRM Consolidated Logical Data Model. The tool for semantic alignment of different data/information models are the AIRM Compliance Framework criteria/requirements.

In addition, there are several supporting documents such as a rulebook, governance handbook, AIRM guidance for writing constraints as well as this document.

1 Introduction

1.1 Purpose of the document

This AIRM Primer is the entry point into the SESAR ATM Information Reference Model (AIRM). It has the purpose of providing an introduction to the AIRM, explaining its structure and what activities the AIRM is expected to support. It has a chapter on each of the AIRM's components, including a description, details on how the component is organised and an example of the content. Finally, it introduces the AIRM Compliance Framework as the way of using the AIRM. Throughout the document, reference is made to a number of supporting documents; these are included in Appendix B for convenience.

1.2 Intended readership

The target audience for the document is:

- ATM operational experts involved in ATM information harmonisation/consolidation activities;
- ATM information architects and data modellers;
- Developers of services with a need for exchanging ATM information; and
- Developers of information systems with a need for exchanging ATM information.

1.3 Acronyms and Terminology

1.3.1 Terminology

Term	Definition
Information Model	An information model is a model of the information about the concepts in the universe of discourse, relevant to the architecture effort.
Interoperability	The ability of information and communication technology (ICT) systems and of the business processes they support to exchange data and to enable the sharing of information and knowledge.
Logical Data Model	The logical data model is a specification of business/operational information requirements as a formal data structure, where relationships and classes (entities) are used to specify the logic which underpins the information.
Physical Data Model	The physical data model specifies how the logical data model will be instantiated in a particular product or service. It takes into account implementation restrictions and performance issues whilst still enforcing the constraints, relationships and typing of the logical model.
Reference Model	A reference model is an abstract framework for understanding significant relationships among the entities of some environment. It enables the development of specific reference or concrete architectures using consistent standards or specifications supporting that environment. A reference model consists of a minimal set of unifying concepts, axioms and relationships within a particular problem domain, and is independent of specific standards, technologies, implementations, or other concrete details.
Semantic Interoperability	An aspect of interoperability which ensures that the precise meaning of exchanged information is preserved and understood by all parties.

1.3.2 Acronyms

Acronym	Definition
AIRM	ATM Information Reference Model
AIXM	Aeronautical Information Exchange Model
AMDB	Aerodrome Mapping Database
ATM	Air Traffic Management
BSD	Berkeley Software Distribution
CCB	Change Control Board
CLDM	Consolidated Logical Data Model
EIF	European Interoperability Framework
EU	European Union
EUROCAE	European Organisation for Civil Aviation Equipment
GANP	ICAO Global Air Navigation Plan
ICAO	International Civil Aviation Organization
ISO	International Standards Organization
NAF	NATO Architecture Framework
NATO	North Atlantic Treaty Organisation
OMG	Object Management Group
RTCA	Radio Technical Commission for Aeronautics
SBVR	Semantics of Business Vocabulary and Business Rules
SESAR	Single European Sky Air Traffic Management Research
SJU	SESAR Joint Undertaking
SWIM	System Wide Information Management
UML	Unified Modelling Language
WMO	World Meteorological Organization
XM	Exchange Model

1.4 Adoption

This section describes external documents and other artefacts that, through reference in this text, provide provisions that are considered as normative of this document. For dated references,

subsequent amendments to, or revisions of, any of these publications do not apply. For each publication a description **how** it has been adopted/used in this set of documents is also provided.

Note: If a reference is expressed with a date then only that version, of the reference, is valid since it is not possible to guarantee that newer versions, of referenced document, does not adversely impact this document.

1.4.1 Normative

The following publications, documents and artefacts are considered as normative:

- NATO Architecture Framework (NAF), v3, see [1]
- OMG Unified Modelling Language (UML), v2.1, see [2]
- OMG Semantics of Business Vocabulary and Business Rules (SBVR), v1.0 see [6]

1.5 Reading instructions

If you are interested in a high-level overview of the AIRM then it is recommended that you read this entire document.

If you are an expert in modelling then it is recommended to read the AIRM Foundation Rulebook and the AIRM Compliance Framework in addition to all the AIRM model descriptions contained in this Primer.

For service modellers and implementers it is recommended to read the AIRM Primer in conjunction with the AIRM Compliance Framework.

2 Introduction to the AIRM

2.1 Why is there an AIRM?

The System Wide Information Management (SWIM) concept [3] is about connecting ATM stakeholders, ensuring that the various pieces of information are made available to all those who need them via interoperable information services and distributed systems. The information in the ATM domain is provided by a large number of different stakeholders and made available to the whole ATM community. Therefore, the information needs to be clearly defined and well understood between its senders and receivers. The European Interoperability Framework (EIF) [5] defines semantic interoperability as concerning the "Precise meaning of exchanged information which is preserved and understood by all parties". This need for semantic interoperability requires a detailed definition of the information both at the conceptual level and at the level of the data that is exchanged between systems. This is the role of the AIRM, i.e., the main benefit of the AIRM is ensuring semantic interoperability within ATM.

2.2 What is the AIRM?

The need for development of an AIRM is identified by the ICAO Global Air Navigation Plan (GANP). The ICAO Information Management Panel [4] envisages that this will provide "*a structured, traceable, unified, harmonised, common, digital reference representation based on standard modelling notation*" containing "*the ATM data elements which require information interoperability*".

Although this statement applies to the development of an AIRM at ICAO, the same applies to the SESAR AIRM. The SESAR AIRM acts as a **common reference** for the other models developed as part of SWIM research and development, and deployment. As a **reference model**, it is independent of specific implementation standards, technologies, implementations, or other concrete details. To put it the other way around, the AIRM is *not* a physical data model for persistence.

2.3 What does the AIRM support?

The SESAR AIRM constitutes a significant input to global and European ATM information and services interoperability developments. Therefore, the AIRM intends to:

- Ensure **semantic interoperability** between systems and services within the European ATM Network;
- Be used as a tool to promote ATM information standards worldwide;
- Provide a base for harmonisation, consolidation, review and change management activities for various initiatives and realisation efforts related to ATM information;
- Provide a base for the harmonisation of models used in implementations and in communities of interest.

The key phrase is "semantic interoperability". The European Interoperability Framework (EIF), defines semantic interoperability as concerning the "Precise meaning of exchanged information which is preserved and understood by all parties" [5].

This means ensuring exchanged information/data share the same meaning at both their origin and their destination. It ensures that the meaning of information is not lost or altered as it travels through SWIM. This enables systems to combine and process information received from many different sources. For example, when a user receives information about a 'runway' from different providers he is able to seamlessly process the information and, depending on the application context, add and combine information from other SWIM compliant information sources. This, in turns, allows him to establish "situational awareness" and make efficient decisions based on this awareness.

Reference: AIRM Strategy [10]

2.4 What does the AIRM contain?

The AIRM contains *"elements which require information interoperability"*. It represents civil, military and civil-military **information/data constructs** relevant to **ATM**. An example of the content is given in *Figure 1*.
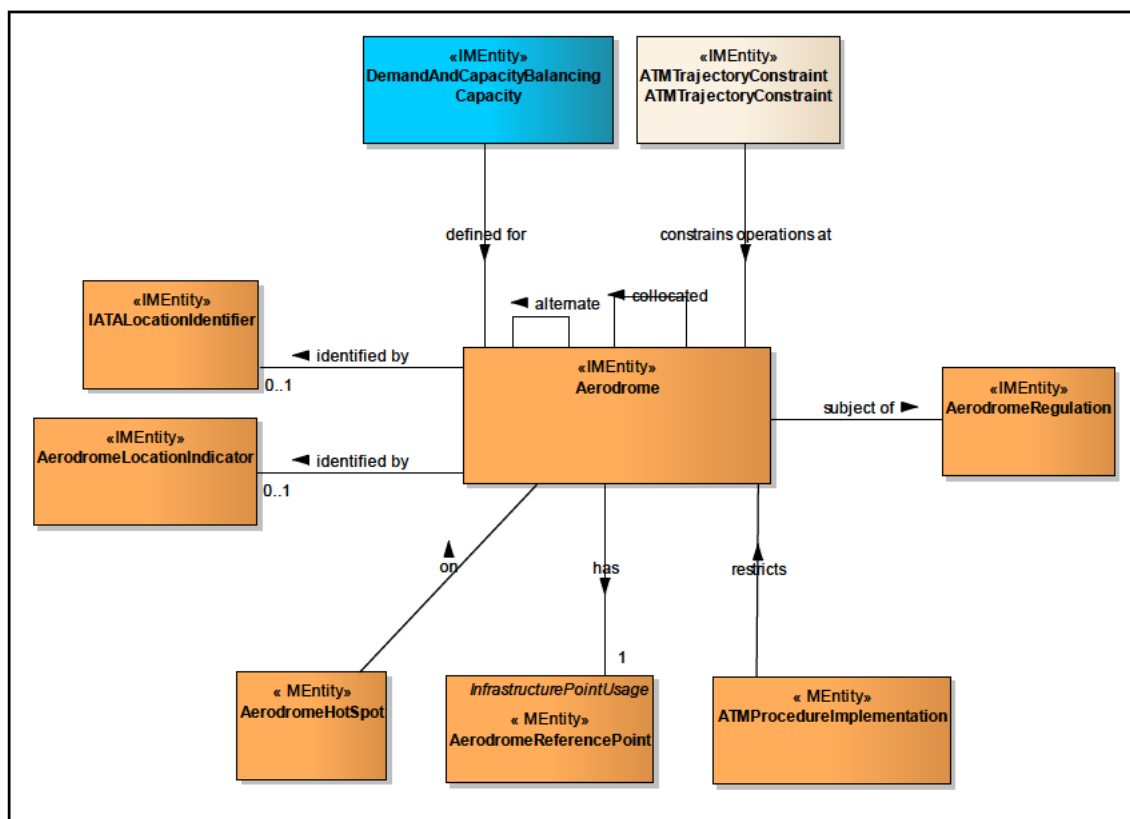

Figure 1: Example AIRM content

The information constructs have been harvested from the main drivers (see *Figure 2*) such as ICAO publications, information exchange requirements, existing community of interest standards, and the various concepts of operations being developed during the modernisation of the European ATM Network.
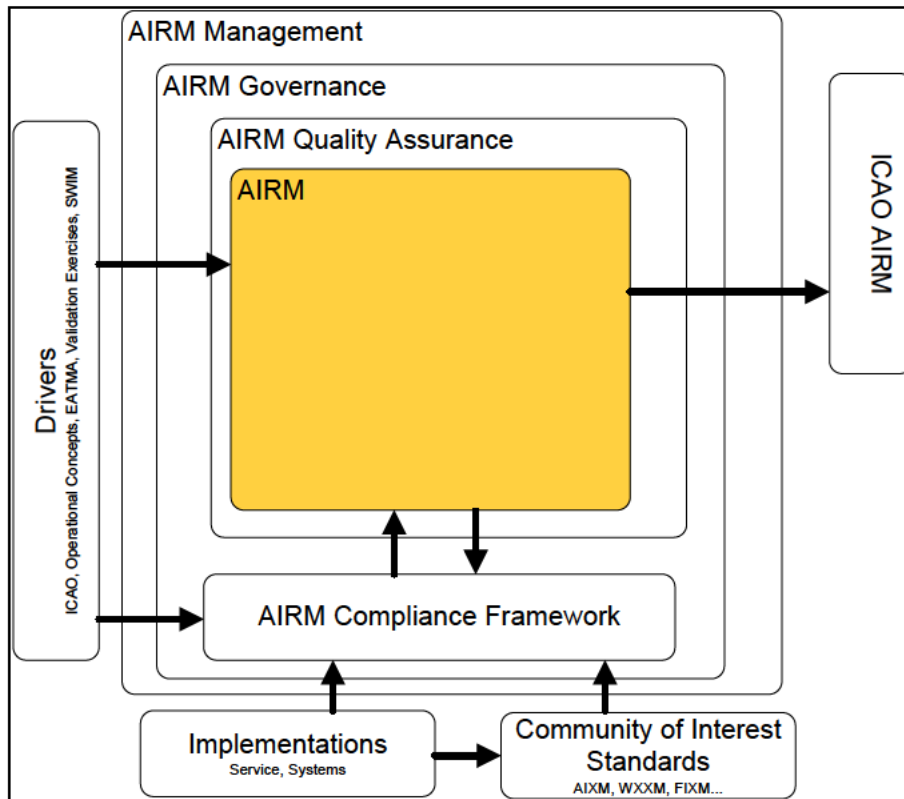
Figure 2: SESAR AIRM Landscape

2.5 How is the AIRM used?

An example use of the AIRM as a common reference is illustrated in *Figure 3*. The example makes use of the AIRM Compliance Framework which has been created in order to guide the use of the AIRM and promote the alignment of the various "compliant" service messages and information exchange models.
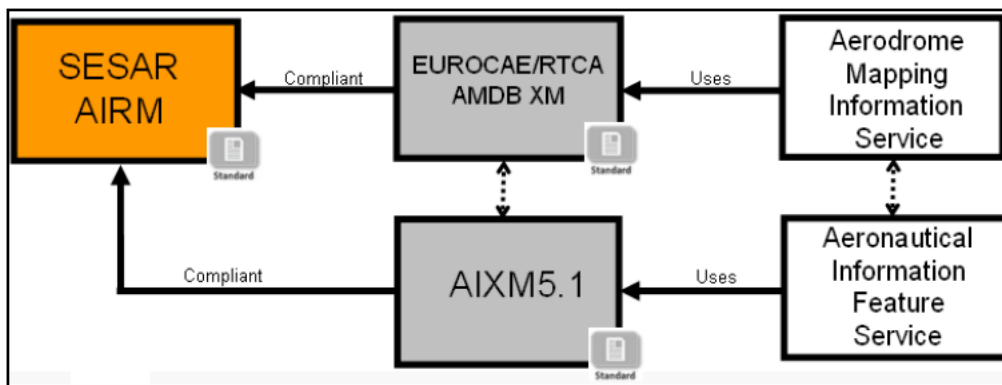

Figure 3: Interoperable Datasets and Services

Figure 3 shows two models which are compliant with the SESAR AIRM: The Aeronautical Information Exchange Model (AIXM 5.1); and the "AMDB XM" developed by the European Organisation for Civil Aviation Equipment (EUROCAE) in support of aerodrome maps. By ensuring that both models comply with the semantics of the AIRM, it is possible to exchange datasets and ensure that the data contained in one dataset can be integrated with the data in the other dataset.

However, this is not the only usage of the AIRM. SWIM relies on interoperable services as the means to exchange information. This means that "semantic interoperability" must be considered by service developments.

An example of an interoperable service based upon international standards and modelling notations is the Aerodrome Mapping Information Service (AMIS). This service allows a consumer to access and download aerodrome map data in a format consistent with the EUROCAE specification. In addition, a second service that is being developed within SESAR, the Aeronautical Information Feature Service (AIFS), also makes use of a model that has been shown to be compliant with the SESAR AIRM: AIXM 5.1.

Figure 3 illustrates only one example usage. In addition to acting as the reference for the definition of service message content, the information constructs from the AIRM can be used as:

- The standardised and reusable information elements for the identification and description of the information exchange requirements between information providers and consumers in process models;
- The base for an ATM domain model;
- A (semantic) reference for coordination between ATM domains and linking models from different ATM domains;
- The reference for the definition of the message content (information content) of a standardised interface between functional blocks of an ATM system; and
- An input to global standardisation efforts.

It is important to remember that not all of the AIRM needs to be used in these examples. Indeed most examples will be interested in a specific sub-set of the AIRM. For example, a service that is only interested in aerodromes needs only to extract the relevant information constructs from the AIRM to help define its payload.

Reference: AIRM Compliance Framework [9]

2.6 How is the AIRM managed and produced?

Figure 2 illustrates some key processes which are used to control the evolution of the AIRM: Management, Governance and Quality Assurance. The overall evolution of the AIRM is outlined in an AIRM Strategy document.

In theory, it is possible to say that no model is ever correct. This relates to the nature of abstraction itself. But models are very powerful collaboration means when related to clear objectives and built with usability in mind, thus achieving the quality needed and bringing the expected added-value.

Consequently, the (obvious) intention is to build high quality SESAR AIRM UML models. Therefore, an AIRM Quality Assurance Handbook has been created to outline what "high quality" means in connection with the SESAR AIRM.

AIRM Governance describes the process by which decisions (including general quality improvements) are reached about how changes are integrated and made consistent. The process involves a variety of stakeholders with different priorities, interests and viewpoints; it aims to reach decisions that take account of these viewpoints in a manner that is both fair and effective.

Reference: AIRM Strategy [10], AIRM Governance Handbook [7], AIRM Quality Assurance Handbook [8]

2.7 How do I get involved?

If you would like to find out about the AIRM please contact swim@sesarju.eu.

3 Overview of the AIRM Components

3.1 The AIRM Product Structure

In addition to this document (the AIRM Primer) the components are:

- **AIRM Information Model**. The AIRM Information Model provides a reference model for the SESAR information concepts for operational experts. It contains entities and relationships relevant to the ATM operational discourse and concerns.
- **AIRM Consolidated Logical Data Model**. The AIRM Consolidated Logical Data Model provides a reference model of the SESAR data concepts for service architects and system implementers. It contains the information elements necessary to model the shared information of ATM.
- **AIRM Foundation**. The AIRM Foundation consists of a Rulebook and a Library. The AIRM Foundation Rulebook provides principles, rules and recommendations for modellers creating contributions to the AIRM or developing and maintaining the AIRM. The rules are intended to be used for model construction, consolidation, validation, verification, conformance and quality checks purposes. The AIRM Foundation Library contains UML packages to support the Foundation Rulebook.
- **AIRM Glossary**. The AIRM Glossary provides a simple dictionary of general terms and definitions that are used in AIRM models.
- **AIRM Constraints Model**. The AIRM Constraints Model provides the business driven constraints which have an impact on the AIRM Information Model and/or the AIRM Consolidated Logical Data Model.
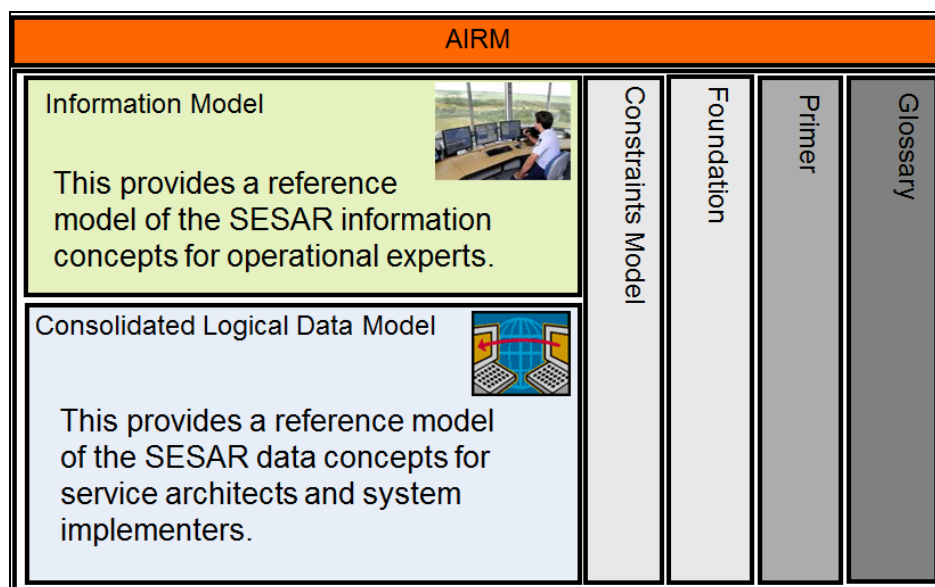

Figure 4: AIRM Product Structure

3.2 Why this structure?

This is a complex structure. However, it must be remembered that the AIRM has been structured to satisfy the needs of several different audiences.

With this in mind, the AIRM takes a layered approach to modelling the information constructs, moving from a "top-down" ATM-wide model to a model focussed solely on the information that is exchanged by users and providers of information.

As summarised in *Table 1*, the AIRM Information Model is aimed at operational experts. This means it is at a high-level abstraction and hides the details of an often complex logical data model in order to

facilitate the communication of it to those who are not familiar with the techniques involved in data modelling.

On the other hand the AIRM Consolidated Logical Data Model does not shy away from such details. It allows analysis of a system's data definition aspect, without consideration of implementation specific or product specific issues.

	AIRM Information Model	AIRM Consolidated Logical Data Model
Purpose	Operational discourse	Semantic interoperability Constitute the reference for SESAR data concepts at a logical level
Audience	Operational experts	Service and system architects Service and system implementers
Scope	ATM wide	Information that is/will be exchanged between systems or over services
Tracing	Operational information requirements	AIRM Information Model

Table 1: Model and Use Matrix

3.3 Unified Modelling Language

The AIRM Information Model, the AIRM Consolidated Logical Data Model, the AIRM Foundation Library and the AIRM Constraints Model are represented using the Unified Modelling Language's (UML) class diagrams [2] UML is a standardised modelling notation and has been used to add formalism and consistency to the AIRM models.

3.4 AIRM UML Models

The following figure (*Figure 5*) captures the key relationships between the different UML models in the AIRM.
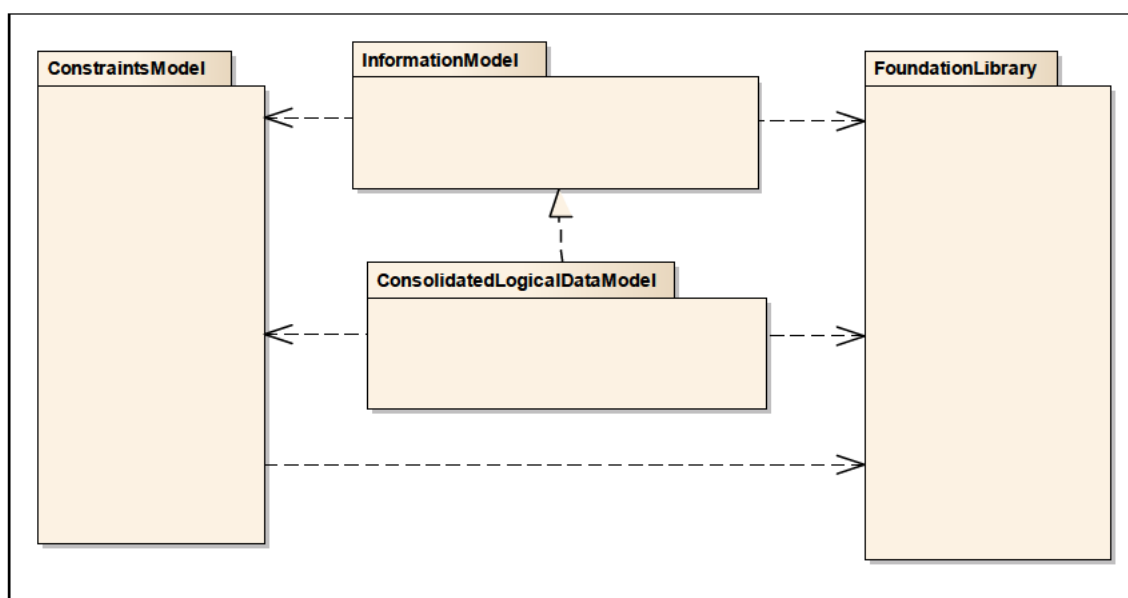

Figure 5: AIRM UML Model Relationships

The concepts captured in the AIRM Information Model are realised as formalised data in the Consolidated Logical Data Model. This realisation can include, for example, compressing many similar entities into a more abstract form or splitting an entity into two entities. This is done with a view to creating a language that can be used by system developers and service architects alike.

In return, the entities within the Consolidated Logical Data Model trace back to entities within the Information Model expressing the semantic correspondence between elements of the two models.

The Foundation Library is obviously the base layer and is used by the Consolidated Logical Data Model and the Information Model. In addition, the characteristics of an entity/property may be dependent on a constraint captured in the Constraints Model.

4   AIRM Foundation Rulebook

4.1 Description

The AIRM Foundation Rulebook provides principles, rules and recommendations for modellers creating contributions to the AIRM or developing and maintaining the AIRM. The rules are intended to be used for model construction, consolidation, validation, verification, conformance and quality checks purposes.

4.2 Organisation

The AIRM Foundation Rulebook is a document with sections detailing the:

- AIRM Modelling Environment
- Content of the AIRM components
- AIRM Meta-model
- Model elements
- Definition conventions
- Diagram conventions
- Intellectual Property Rights
- Compliance

4.3 Examples

Rules are written as a series of statements using the operative verb "shall". This means that they are mandatory. Recommendations use the operative verb "should" which means they are not mandatory but compliance is strongly advised. Principles tend to use a more general wording.

An example rule is illustrated in *Figure 6*.

AIRM_Rule 21
Entities shall be stereotyped as <<CLDMEntity>> in the AIRM Consolidated Logical Data Model and as <<IMEntity>> in the AIRM Information Model.

Figure 6: Example of an AIRM Rule

The AIRM Foundation Rulebook is augmented by a number of best practices which are aimed at ensuring the developers understand the rulebook in the same way and thus produce a high quality and consistent AIRM.

4.4 Further Information

Reference: AIRM Foundation Rulebook, http://im.eurocontrol.int/wiki/index.php/AIRM_Patterns

5 AIRM Foundation Library

5.1 Description

The AIRM Foundation Library contains UML packages to support the Foundation Rulebook and to ensure that basic elements are defined based on consistent reuse of international standards. The library makes use of international standards and specifications. For example, the UML includes primitive data types, "constructed" data types and terms coming from ICAO. These can be used in the AIRM. For example, the AIRM Foundation Library is used within the AIRM Consolidated Logical Data Model to:

- Define attribute value types; and
- Construct aviation specific types.

5.2 Organisation

The AIRM Foundation Library is organised in a series of packages (see *Figure 7*) containing elements imported from international organisations:

- **ICAO**. This includes the terms and definitions from ICAO annexes and docs.
- **ISO**. This includes the types from the ISO standards including basic types such as Integer, Boolean and CharacterString.
- **WMO**. This includes the terms and definitions from WMO documents.
- **EU**. This includes the terms and definitions from European Union regulations.
- **Abbreviations**. This includes the abbreviations used in the AIRM.

In addition the library contains packages created by the AIRM developers from multiple sources but which are essential in the development of the AIRM:

- **AIRM Standards Profile**. This lists the standards which are acceptable sources for modelling the AIRM.
- **AIRM Compliance Framework**. This includes the model constructs in support of the AIRM Compliance Framework.
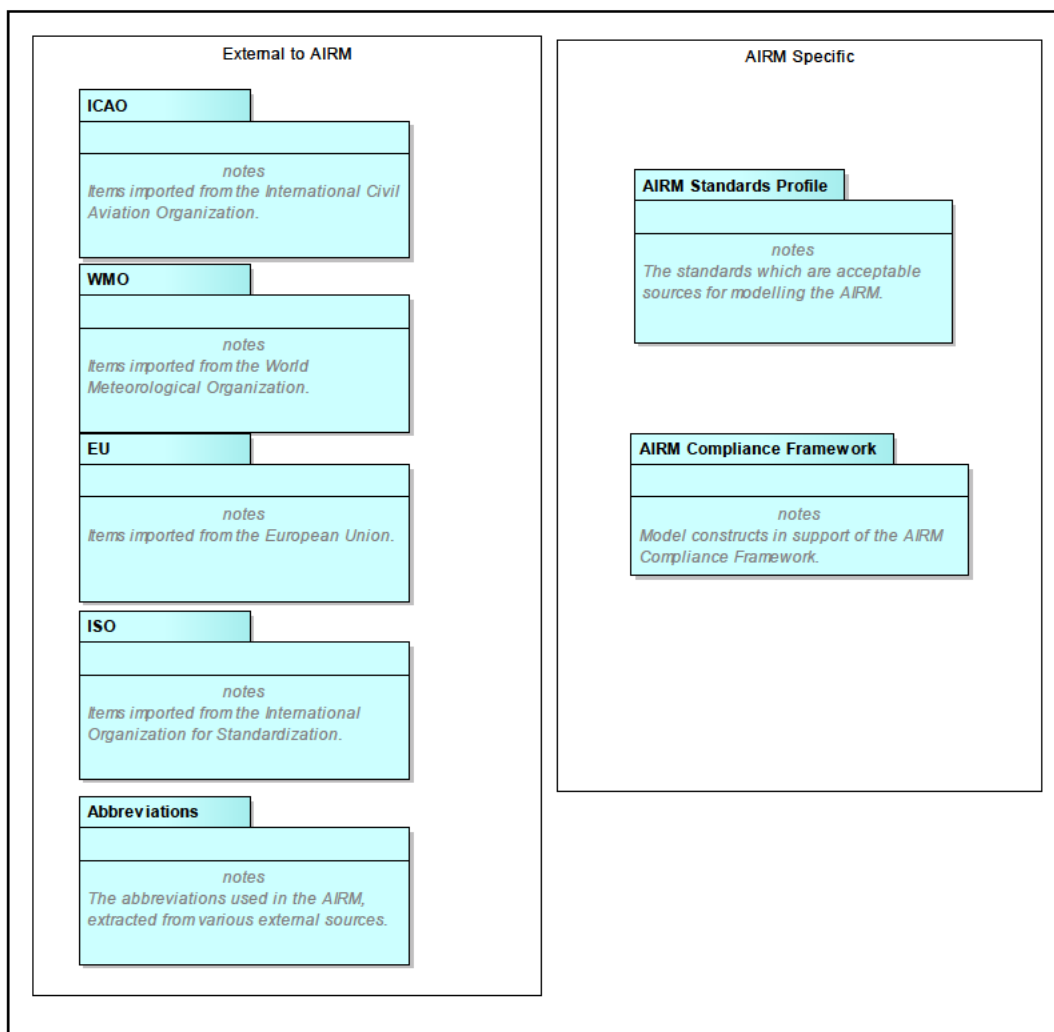
Figure 7: Extract of AIRM Foundation Library

The library is large and contains over 2000 definitions, so a series of diagrams has been created within the AIRM in order to display the most commonly used types.

5.3 Examples

An example term and definition found in the ICAO package of the Foundation Library is shown in *Figure 8*. In addition to the term and definition, the example shows how additional information is recorded such as a "Definition:Source". This best modelling practice is applied to all components of the AIRM allowing it to manage the source of definitions.
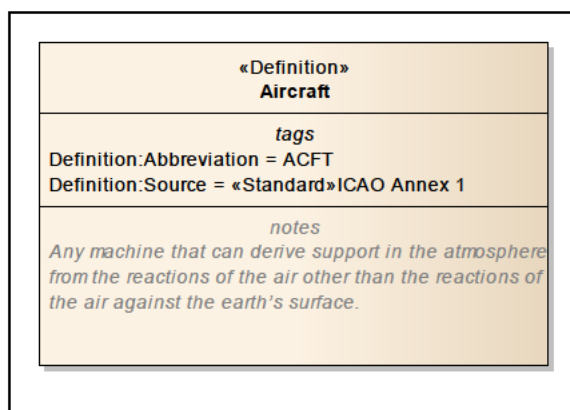
Figure 8: Example term and definition

The small example in *Figure 9* shows how the entities and data types in the Consolidated Logical Data Model make use of the ISO package of the Foundation Library.

The Aerodrome entity has, for example, the following properties:

- designator. This uses CharacterString from the AIRM Foundation Library as its type
- lowestTemparature. This uses ValTemperatureType from the AIRM DataTypes package.

In turn, the ValTemperatureType makes use of the Foundation Library.

- It inherits from the Measure type. This means that its value is a Number.
- It has a property, uom, which uses CodeUomTemperatureType as its type. This is a codelist and is a specialisation of the CharacterString type found in the Foundation Library.

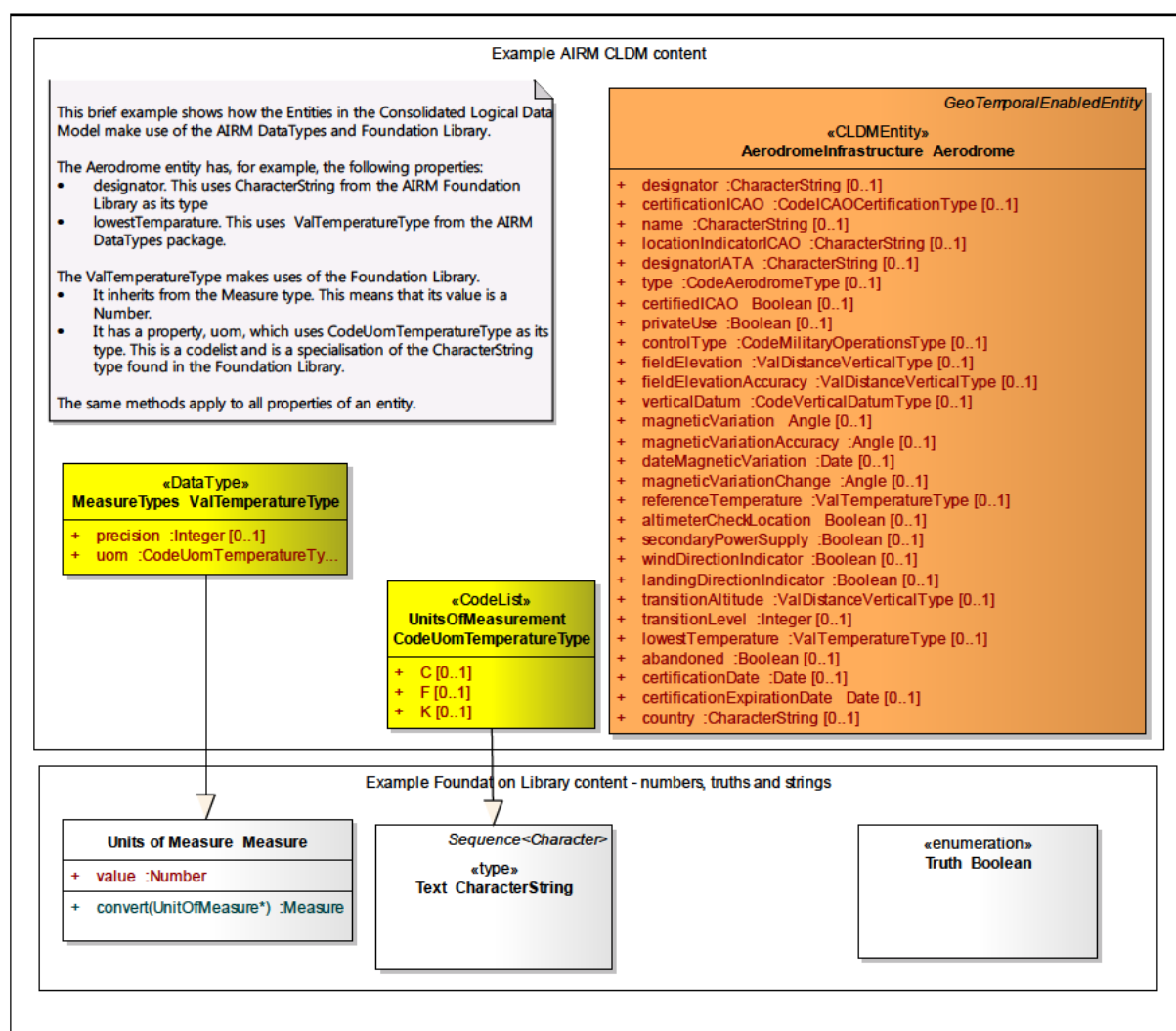*Figure 9: Usage of the ISO Foundation*

5.4 Further Information

Reference: AIRM Foundation Library, http://im.eurocontrol.int/wiki/index.php/AIRM_Foundation

6   AIRM Information Model

6.1 Description

The AIRM Information Model provides a reference for the SESAR information concepts for **operational experts**. It contains entities and relationships relevant to the ATM operational discourse and concerns in correspondence with the AIRM glossary. It can be used, for example, in disambiguating terms used in operational documents and developing information exchange requirements.

6.2 Organisation

The AIRM Information Model is represented using UML. It is organised in a series of colour-coded subject fields. A subject field is a field of specific knowledge. These are depicted in *Figure 10* below.

The *Flight* subject field describes concepts about a specific flight and its trajectory. It is defined as an entity using a definition extracted from ICAO Annex 13. However, as a flight is enabled by ATM operations and uses infrastructure, it is linked to the relevant entities from related subject fields. For example, the information relevant to the *Flight* subject field would typically include the information concept of aerodrome whose Annex 15 definition is included in the *BaseInfrastructure* subject field, and potentially also includes a meteorological report that is defined by Annex 3 and defined as part of the *Meteorology* subject field.

The *AirTrafficOperations*, *Surveillance*, *Meteorology* and *Environment* subject fields describe concepts about the operations that are necessary for safe, efficient and environmentally friendly flights.

The *BaseInfrastructure* (where for example the "aerodrome" concept is found), *AirspaceInfrastructure* and *Aircraft* subject fields describe concepts about the infrastructure of ATM. The infrastructure exists even if no operations are actually conducted.

The *Stakeholders*, and the *Common* subject fields are of a transversal nature. For example information on stakeholders and the activities they perform.
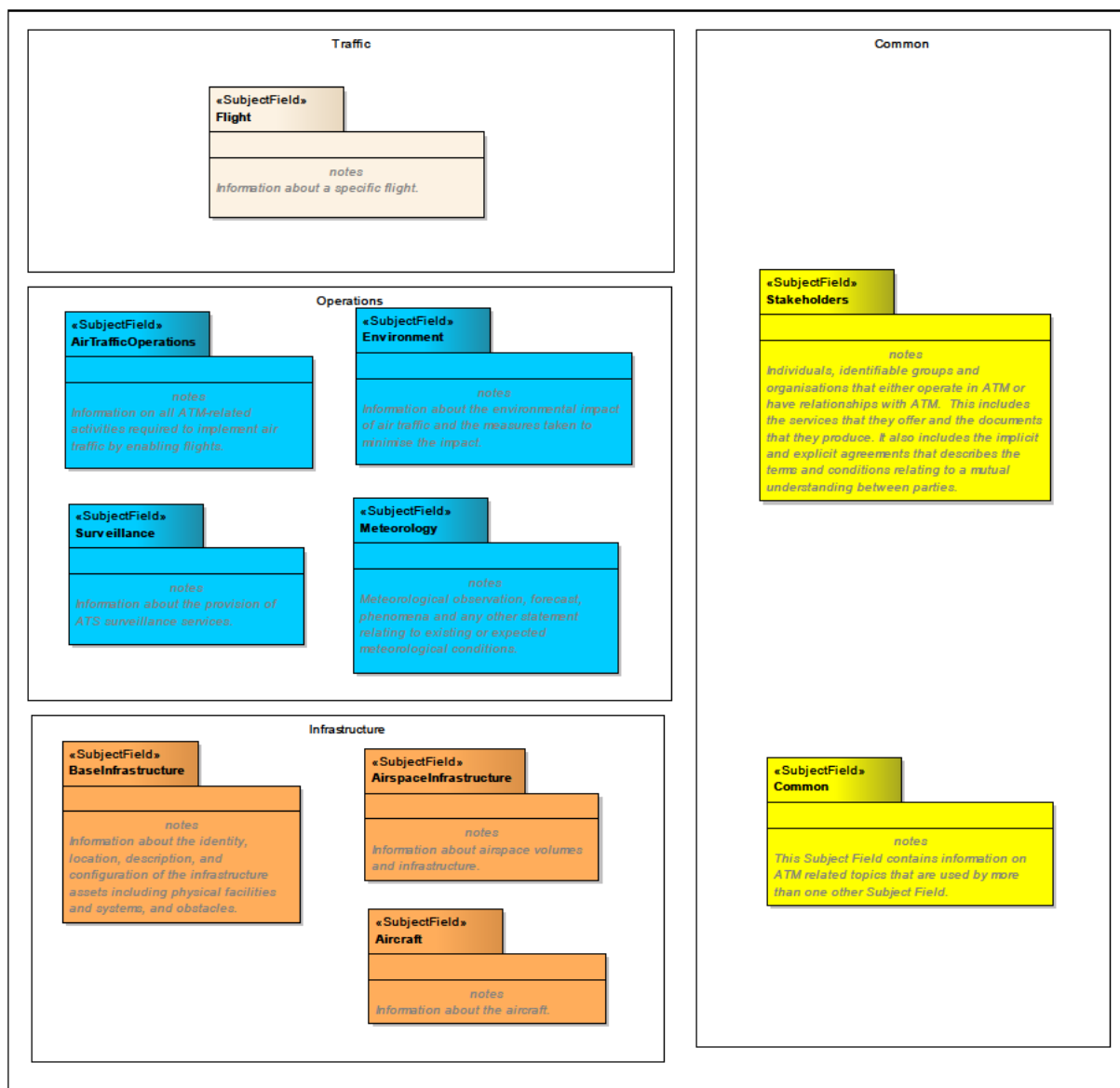
Figure 10: AIRM Information Model: Subject Fields

6.3 Example

Each subject field contains a number of entities and is represented by a series of diagrams. The focus is on the capture of the operational language in terms of relationships between the entities (*Figure 1*). To support a more analytic/taxonomy view of the concepts of the operational language, diagrams providing definition hierarchies in terms of UML specialisations are also provided (*Figure 11*).
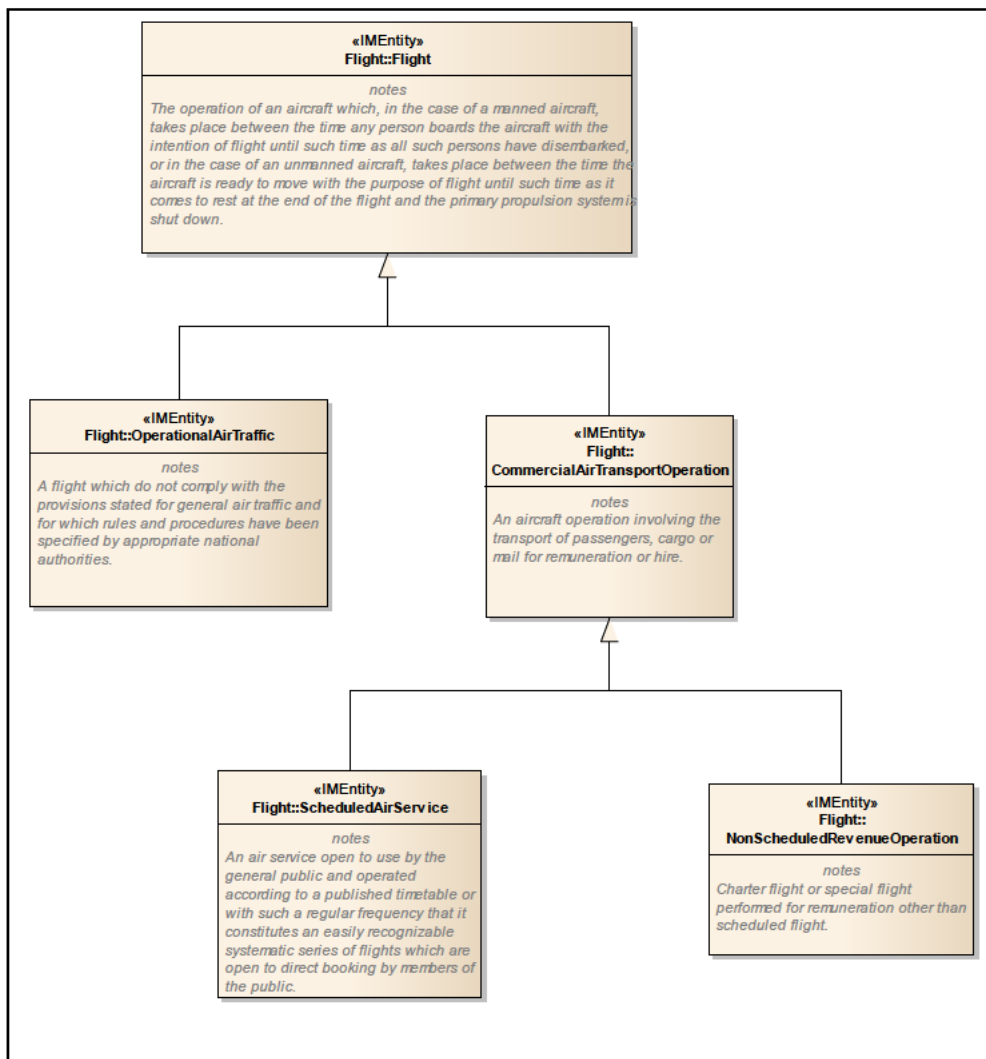
Figure 11: Example hierarchy

6.4 Further Information

Reference: AIRM Model, http://im.eurocontrol.int/wiki/index.php/AIRM_Information_Model

7 AIRM Consolidated Logical Data Model

7.1 Description

The AIRM Consolidated Logical Data Model provides a (semantic) reference model of the SESAR data concepts for **service architects and system implementers**. It contains the information elements necessary to model the shared information of ATM. It can be used in order to construct "derived" logical data models and, indeed, exchange models or physical data models. As such, it can be used to create a model that can be used to build services and operations.

It is important to understand that the AIRM Consolidated Logical Model takes a cross-subdomain view. Consequently, in many cases it will contain a much more detailed representation of the exchanged information than is required in a sub-domain specific information exchange context. The use in creating a derived model will usually require restricting the AIRM structures.

7.2 Organisation

The AIRM Consolidated Logical Data Model is represented using UML. It is best to think of it in groupings:

- **Abstract**. This package contains generic abstract types that can be used to add extra meaning to the entities within the Consolidated Logical Data Model.
- **Subject Fields**. A subject field is a field of specific knowledge. The subject fields in the Consolidated Logical Data Model correspond to those captured in the AIRM Information Model
- **DataTypes**. A data type is a classification identifying one of various types of data. Common data types may include: integers, booleans, alphanumeric strings.

The following figure (*Figure 12*) illustrates the relationship between these groupings. Subject Fields are dependent on DataTypes and a realisation of the Abstract.
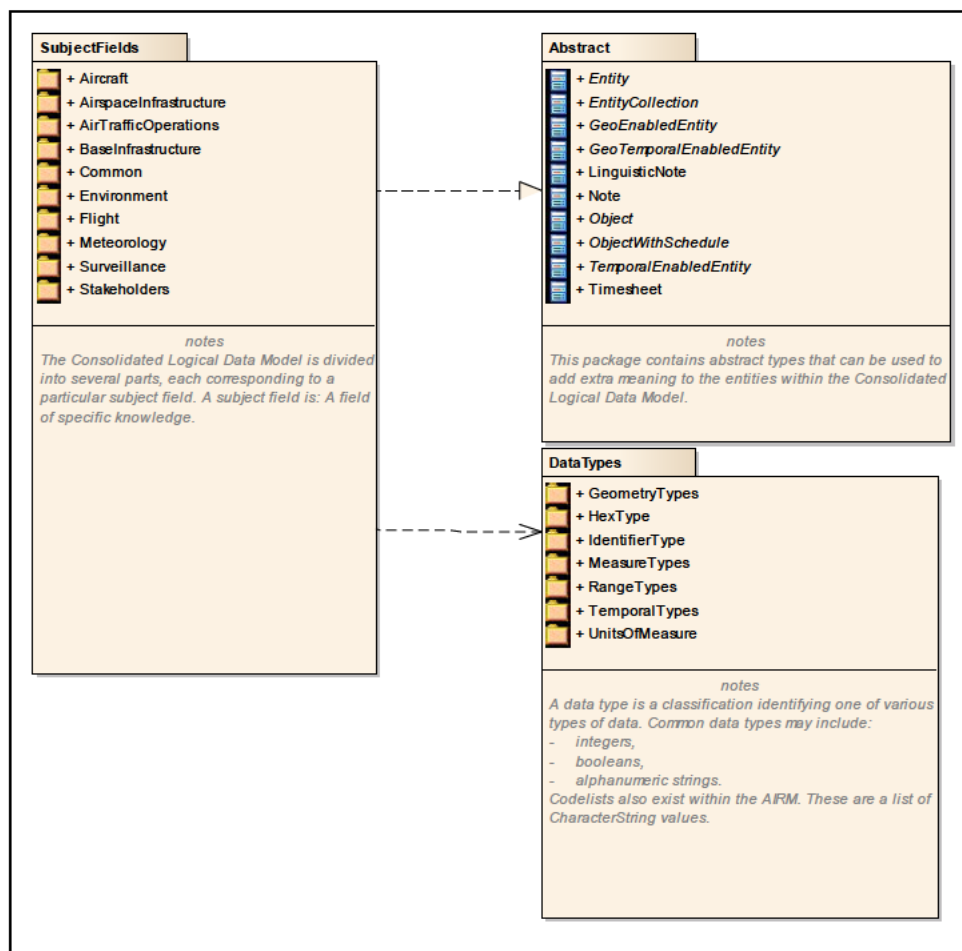
Figure 12: AIRM Consolidated Logical Data Model Structure

7.3 Examples

The following example (*Figure 13*) continues the example from the AIRM Information Model (*Figure 1*) and shows how some of the relationships have been realised in the CLDM.
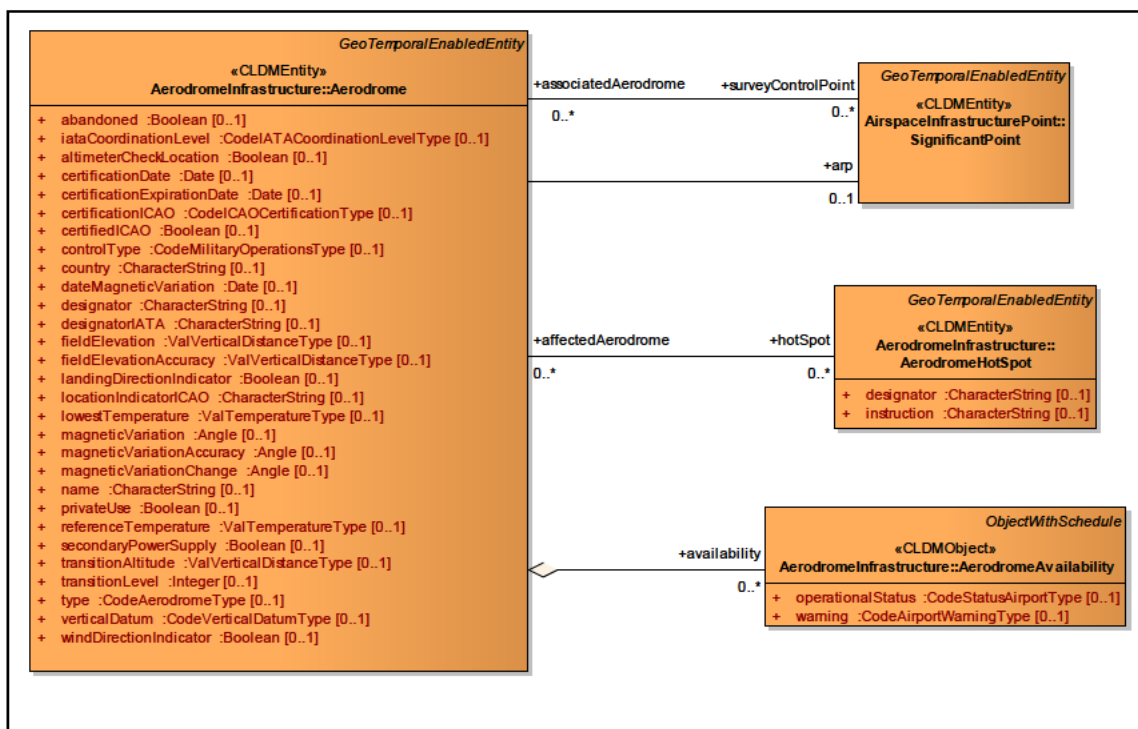
Figure 13: Example AIRM CLDM

Putting the model into words it can be said that the Aerodrome entity "has" a property "arp". This is the realisation of the "Aerodrome has AerodromeReferencePoint" association from the Information Model. In addition, the Consolidated Logical Data Model adds extra details about the availability of the aerodrome.

7.4 Further Information

Reference: AIRM Model,
http://im.eurocontrol.int/wiki/index.php/AIRM_Consolidated_Logical_Data_Model

8 AIRM Constraints Model

8.1 Description

The AIRM Constraints Model provides the AIRM Constraints which have an impact on the AIRM Information Model and/or the AIRM Consolidated Logical Data Model.

8.2 Organisation

The AIRM Constraints Model (like other parts of the AIRM, in particular the Consolidated Logical Data Model) relies on the principle of least constraint. That means it contains only constraints that are business driven and not domain specific. A model derived from the AIRM is expected to at least respect these constraints, but may choose to implement more stringent constraints.

The AIRM Constraints Model is represented using UML and structured English in accordance to another but UML compatible OMG standard with name SBVR and its AIRM/ATM adaption [11] and UML. Its structure reflects the AIRM Information Model and AIRM Consolidated Logical Data Model in order to ensure that the AIRM Constraints are easy to find.

8.3 Example

The following example (*Figure 14*) shows two constraints taken from IATA and ICAO which apply to properties of an Aerodrome.
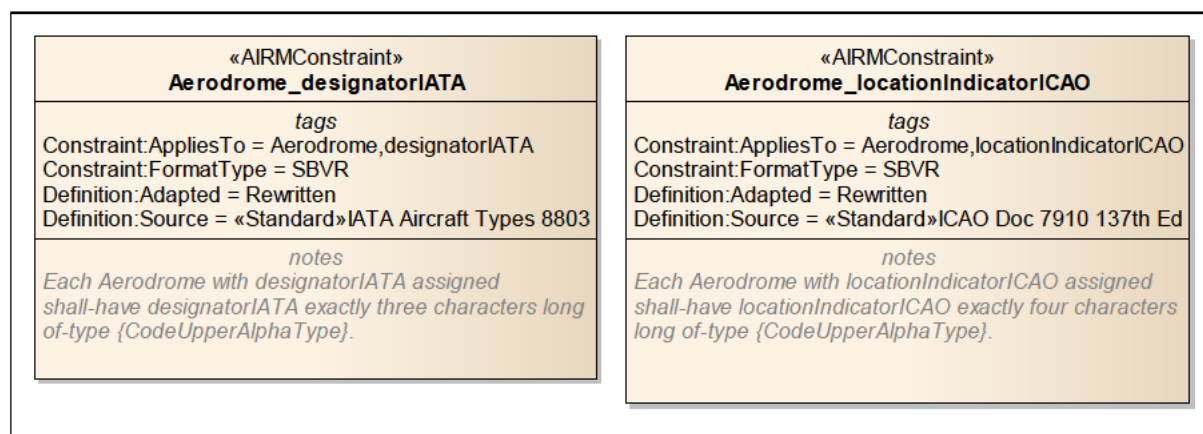
«AIRMConstraint» **Aerodrome_designatorIATA**	«AIRMConstraint» **Aerodrome_locationIndicatorICAO**
tags Constraint:AppliesTo = Aerodrome,designatorIATA Constraint:FormatType = SBVR Definition:Adapted = Rewritten Definition:Source = «Standard»IATA Aircraft Types 8803	*tags* Constraint:AppliesTo = Aerodrome,locationIndicatorICAO Constraint:FormatType = SBVR Definition:Adapted = Rewritten Definition:Source = «Standard»ICAO Doc 7910 137th Ed
notes *Each Aerodrome with designatorIATA assigned shall-have designatorIATA exactly three characters long of-type {CodeUpperAlphaType}.*	*notes* *Each Aerodrome with locationIndicatorICAO assigned shall-have locationIndicatorICAO exactly four characters long of-type {CodeUpperAlphaType}.*

Figure 14: Example AIRM Constraints

8.4 Further Information

Reference: AIRM Model, AIRM Constraints Handbook [11]

9   AIRM Glossary

9.1   Description

This AIRM Glossary provides a simple dictionary of general terms and definitions that may be used to provide consistency across points-of-view and increase semantic interoperability. The glossary consists of a large subset of the terms and definitions from AIRM Information Model and Consolidated Logical Data Model.

9.2   Organisation

The AIRM Glossary is a document containing an alphabetical listing of terms, definitions and association meta-data.

9.3   Example

The following example (*Figure 15*) shows how the Aerodrome entity is represented in the AIRM Glossary.

1.46 Aerodrome

A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

Source: ICAO; ICAO Annex 1; ICAO Annex 15;
Status: Approved
Synonyms: AirportHeliport

Figure 15: Extract of AIRM Glossary

9.4   Further Information

References: the AIRM Glossary

10 AIRM Compliance Framework

10.1 Description

The usage of the AIRM is based on the requirements set out in the AIRM Compliance Framework. The AIRM Compliance Framework is the set of standard means required to establish semantic interoperability in an (international) ATM ecosystem using the AIRM.

10.2 Organisation

The AIRM Compliance Framework is a document outlining the compliance process including the criteria to be assessed and the results which can be reached.

10.3 Example

An example requirement is given in *Figure 16*:

Req.-14.	
Title	Completeness of definition set: Level 2 (L2)
Requirement	In order to claim of AIRM Compliance Level 2, each Entity and Property of the Object under Assessment **shall** have a definition.
Rationale	*Level 2 compliance seeks to demonstrate that the Object under Assessment is aligned with the AIRM "language space", which is defined at UML entity and property level.*
AIRM Rulebook references	AIRM_Rule 89

Figure 16: An example AIRM Compliance Framework requirement

10.4 Further Information

Reference: AIRM Compliance Framework [9]

11 References

[1] NATO Architecture Framework (NAF), v3, http://training-course-material.com/training/Category:NAF

[2] OMG Unified Modelling Language (UML), v2.1, http://www.uml.org/

[3] ICAO Doc 10039 - Manual on System Wide Information Management (SWIM) Concept, http://www.icao.int/airnavigation/IMP/Documents/SWIM%20Concept%20V2%20Draft%20with%20DISCLAIMER.pdf

[4] ICAO Information Management Panel, http://www.icao.int/airnavigation/IMP/Pages/default.aspx

[5] European Interoperability Framework, http://ec.europa.eu/isa/documents/isa_annex_ii_eif_en.pdf

[6] OMG Semantics of Business Vocabulary and Business Rules (SBVR), v1.0, http://www.uml.org/

[7] AIRM Governance Handbook v00.01.06, See Appendix B

[8] AIRM Quality Assurance Handbook v03.02.01, See Appendix B

[9] AIRM Compliance Framework v02.02.04, See Appendix B

[10]AIRM Strategy v01.00.00, See Appendix B

[11] AIRM Constraints Handbook v01.00.01, See Appendix B

Appendix A   Licence

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Appendix B   AIRM Supporting Documents

Throughout this document reference has been made to various supporting documents. These are embedded as objects here to make them easily available.

AIRM Strategy

AIRM_Strategy.doc

AIRM Compliance Framework and Handbook

AIRM_Compliance_Fr   AIRM_Compliance_H
amework.doc   andbook.doc

AIRM Governance Handbook

AIRM_Governance_
Handbook.doc

AIRM Quality Assurance Handbook

AIRM_Quality_Assur
ance_Handbook.docx

AIRM Constraints Handbook

AIRM_Constraints_H
andbook.doc

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