Open Geospatial Consortium

Technology Office

4899 North Old State Road 37
Bloomington, IN 47408

Telephone: +1-812-334-0601
Facsimile: +1-812-961-2053

Request For Quotation

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In the

FEDERAL AVIATION ADMINISTRATION (FAA) SPECIAL ACTIVITY AIRSPACE (SAA) DISSEMINATION PILOT

(FAA SAA DISSEMINATION PILOT)

Appendix B to Annex B – Interface Requirements Document for SAA SWIM Services

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U.S. Department of Transportation
Federal Aviation Administration

Interface Requirements Document

Aeronautical Information Management
Special Activity Airspace Management Web Services

Version 1.0.8

June 23, 2010

Interface Requirements Document
Approval Signature Page
Aeronautical Information Management
Special Activity Airspace Management Web Services

Approval Signatures

Name	Organization	Signature	Date

Revision Record			
Revision Letter	**Description**	**Date**	**Entered By**
0.1	Initial revision		Navin Vembar
0.2	Addressing internal comments	Feb 5, 2009	Kevin Lew
0.3	Addressing SWIM and internal comments	April 24, 2009	Kevin Lew
0.4	Addressed model changes in Appendix C and internal comments.	May 7, 2009	Kevin Lew
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1.0.2	Addressed internal comments and removed the GroupUsage object from Appendix C.	August 19, 2009	Kevin Lew
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1.0.4	Modified the data model to add timeOffset to timesheet and charting to RadioCommunicationChannel.	November 18, 2009	Kevin Lew
1.0.5	Modified the data model to update how RadioCommunicationChannels are associated to an SAA.	January 21, 2010	Kevin Lew
1.0.6	Updated Appendix C to include annotations to denote whether altitudes are inclusive or exclusive.	March 3, 2010	Kevin Lew
1.0.7	Updated Appendix C to include an extension to the Airspace Feature for ATCAAs.	May 11, 2010	Kevin Lew
1.0.8	Updated the user capabilities and removed SAA Groups.	June 23, 2010	Kevin Lew

Table of Contents

1 Scope

This IRD provides the requirements for an interface between the Aeronautical Information Management (AIM) Special Activity Airspace (SAA) Management Web Service and web service clients. It was prepared in accordance with FAA-STD-025f. This web service will be part of the System Wide Information Management (SWIM) family of services, of which AIM is a SWIM Implementing Program (SIP).

From the SWIM Registry IRD (NAS-IR-43070001):

> The goal of the System Wide Information Management (SWIM) program is to achieve systems interoperability and information management for diverse Air Traffic Management (ATM) systems platforms and software implementations. A *Service-Oriented Architecture (SOA)* provides the most advanced approach for achieving these objectives. The SWIM program realizes *SOA* through the implementation of a *Web Service* technological paradigm.

This document is intended to serve as the basis for development of clients of the services provided by AIM.

This document does not specify any policies, rules or procedures as to how the services are to be used.

1.1 Summary

This IRD defines the requirements for the interface between the AIM SAA Management web service and web service clients. The requirements specify the information to be provided and the methods that users of the system shall employ to receive updates about, or to update, SAA information.

Special Activity Airspace (SAA) is a non-official term of convenience to collectively describe Special Use Airspace and Air Traffic Control Assigned Airspace.

A Special Use Airspace (SUA) is a region of airspace designated to be used by the military and thus needs to ensure that no other air traffic uses that airspace during the scheduled times.

An Air Traffic Control Assigned Airspace (ATCAA) is an airspace assigned by Air Traffic Control to provide air traffic segregation between the specified activities being conducted within the assigned airspace and other IFR traffic.

An AIXM Unit is a generic term used for all types of 'units' providing services. An example would be an Air Route Traffic Control Center (ARTCC) providing an Air Traffic Control Service.

The following diagram illustrates the logical architecture of AIM SAA web service:

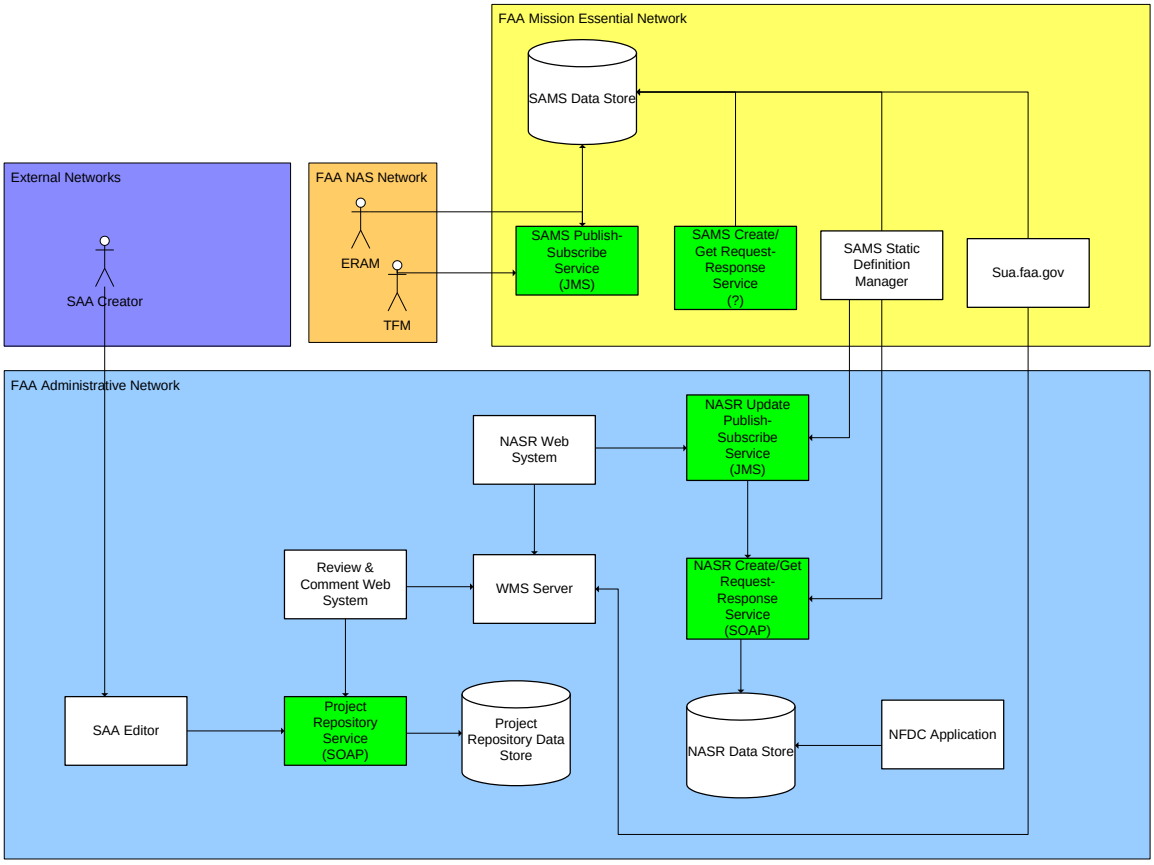

Figure 1 - Logical Architecture of the AIM SAA web service

1.2 Subsystem Responsibility List

Agency	Subsystem or User	Common Name	Responsible Office/Program
FAA ATO	SAA Project Repository		ATO-R/AIM
FAA ATO	SAA Static Repository	NASR	ATO-R/AIM
FAA ATO	SAA Operational Repository	MILOPS	ATO-R/AIM
FAA ATO	En Route Automation Modernization	ERAM	ATO-E

2 Applicable Documents

The following documents form a part of this IRD to the extent specified herein. In the event of a conflict between the referenced documents and the contents of this IRD, this IRD shall be considered the superseding document.

2.1 Government Documents

FAA-STD-025f: Preparation of Interface Documentation
http://ato-p.se-apps.faa.gov/faastandards/

FAA-STD-063: Standard Practice for XML Namespaces
https://ksn.faa.gov/km/atow/com/sysegr/SWIM/SIPs/SWIM%20Segment%201/FAA-STD-063-03-09-09-CCB.doc

FAA-STD-064: Standard Practice for Service Registration
https://ksn.faa.gov/km/atow/com/sysegr/SWIM/SIPs/SWIM%20Segment%201/FAA-STD-064-03-09-09-CCB.pdf

FAA Order JO 7400.2G
http://www.faa.gov/airports_airtraffic/air_traffic/publications/at_orders/media/AIR.pdf

FAA Order JO 7400.8P
https://employees.faa.gov/documentLibrary/media/Order/JO%207400.8P.pdf

NAS-IR-43070001 SWIM Registry IRD
October 17, 2008
https://ksn.faa.gov/km/atow/com/sysegr/SWIM/SIPs/SWIM%20Segment%201/NAS-IR-43070001%20SWIM%20Registry%20IRD%2010312008.pdf

NAS-SR-1000 Functional View
June 2008
http://ato-p.se-apps.faa.gov/faastandards/Docs/NAS-SR-1000_FunctionalView.pdf

NIST SP 800-95 Guide to Secure Web Services
August 2007
http://csrc.nist.gov/publications/nistpubs/800-95/SP800-95.pdf

SWIM Core Architecture Description v 1.0
November 14, 2007
https://ksn.faa.gov/km/atow/com/sysegr/SWIM/SIPs/SWIM%20Segment%201/SWIM%20Arch%20V1.0%2014Nov07.doc

System Wide Information Management (SWIM) Final Program Requirements Segment 1
May 23, 2007

https://ksn.faa.gov/km/atow/com/sysegr/SWIM/SIPs/SWIM%20Segment%201/20070523%20SWIM%20Final%20Program%20Requirements%20rev%207.3d_signed.pdf

SWIM Services Specification Document (SvSD) Segment 1
Revision 1.6
March 2009
https://ksn.faa.gov/km/atow/com/sysegr/SWIM/SIPs/SWIM%20Segment%201/SWIM%20SvSD%20Release%201.6%20%5Bchanges%20accepted%5D%202.doc

SWIM Special Activity Airspace Requirements 1.1
https://ksn.faa.gov/km/Sysops2/airspace/saam/requirements1/SWIM%20Special%20Activity%20Airspace%20Requirements.doc

SWIM WS-I Basic Profile 1.2
https://swimwiki.tc.faa.gov/download/attachments/393237/SWIM_WS-I_Basic_Profile_Version_1.2.doc?version=1

SWIM WS-I Basic Security Profile 1.1
https://swimwiki.tc.faa.gov/download/attachments/393237/SWIM+WS-I+Basic+Security+Profile+Version+1.1.doc?version=1

2.2 Non-Government Documents

Aeronautical Information Exchange Model Specification
http://www.aixm.aero

AIXM Temporality Model 0.5
http://www.aixm.aero/gallery/content/public/release_candidate_3/AIXM%20Temporality%200%205.pdf

JMS Specification 1.1
https://swimwiki.tc.faa.gov/download/attachments/393237/jms-1_1-fr-spec.pdf?version=1

SOAP Version 1.2 Part 1: Messaging Framework
https://swimwiki.tc.faa.gov/download/attachments/393237/SOAPv1_2-Part01-MessagingFramework.pdf?version=1

Unified Modeling Language: Infrastructure Version 2.0
http://www.omg.org/spec/UML/2.0/Infrastructure/PDF/

W3C Namespaces in XML 1.0
August 2006
http://www.w3.org/TR/REC-xml-names/

WS-I Security Challenges, Threats and Countermeasures 1.0
http://www.ws-i.org/Profiles/BasicSecurity/SecurityChallenges-1.0.pdf

3 Interface Requirements

This section provides the requirements for the AIM SAA Management Web Service.

3.1 General Requirements

This section describes the general requirements for the AIM SAA Management Web Service interface and interaction between the service and its clients. This interaction will be described via a use case scenario. The below table of roles serve to define the AIM SAA service user community's roles, and the associated use cases will describe the behavioral aspects of how they interact with the services. These are necessary to describe "who" can do "what" with the services via the functional requirements in Section 3.2. The actors with these roles are defined in the SWIM Special Activity and Airspace Requirements.

Preconditions:
An identity management system has been deployed that will handle user authentication and authorization.

A user has logged into the system and been authorized.

Actor Capabilities:

The following actor capabilities and use cases are pulled from the SWIM Special Activity and Airspace Requirements in order to give the context in which the services are supposed to be used.

Capability	Applies To	Definition
SAA-Read	SAAs	The ability to read data of an SUA or ATCAA from the static repository. The ability to subscribe to SUA or ATCAA update alerts from the static repository.
SAA-Modify	SAAs	The ability to create or modify an SAA in the static repository.
SAA Schedule–Read	SAAs	The ability to read data from an SAA schedule in the operational repository, or subscribe to SAA schedule update alerts.
SAA Schedule-Modify	SAAs	The ability to create or modify an SAA schedule in the operational repository.
SAA Schedule-Delete	SAAs	The ability to delete an SAA schedule from the operational repository.
UUID User	UUIDs	The ability to request new UUIDs from the static repository to use to assign to SUAs or ATCAAs.

Table 1 - Actor Capabilities

Use Cases

Static Repository:

Actor Capability	Action
SAA-Read	Subscribes to SAA update notifications.
SAA-Read	Unsubscribes to SAA update notifications.
SAA-Read	Receives SAA update notification.
SAA-Read	Requests a specific SAA.
SAA-Read	Requests a collection of all the SAA names of a specified SAA type.
SAA-Read	Requests the UUID of an existing SAA.
SAA-Read	Requests the list of the names of all Units.
SAA-Modify	Creates an SAA.
SAA-Modify	Updates an SAA.
SAA-Modify	Creates a Unit.
SAA-Modify	Updates a Unit.
SAA-Modify	Deletes a Unit.
UUID User	Requests new UUIDs.

Table 2 - Static Repository Use Cases

Operational Repository:

Actor Capability	Action
SAA Schedule-Read	Subscribes to SAA usage updates.
SAA Schedule-Read	Unsubscribes to SAA usage updates.
SAA Schedule-Read	Subscribes to SAA status updates.
SAA Schedule-Read	Unsubscribes to SAA status updates.
SAA Schedule-Read	Receives SAA usage update.
SAA Schedule-Read	Receives SAA status update.
SAA Schedule-Read	Requests specific SAA usage information.
SAA Schedule-Read	Requests specific SAA status information.
SAA Schedule-Modify	Updates an SAA usage.
SAA Schedule-Modify	Updates the status of an SAA.

Table 3 - Operational Repository Use Cases

3.1.1 Security Requirements

Section redacted

3.2 Functional Requirements

This subsection summarizes the functional requirements of the AIM SAA Management Web Service. These functional requirements are based on the SWIM Special Activity Airspace Requirements document.

3.2.1 Web Service Functional Requirements

The service functionality can be grouped into the following categories.

- Static Repository
- Operational Repository

IRD-R0001 All services SHALL adhere to SWIM WS-I Basic Profile.

3.2.1.1 Static Repository

IRD-R0002 The service SHALL allow an authorized user to query the repository as described in section 3.2.2.3.1.2.

IRD-R0003 The service SHALL allow authorized users to insert new SAAs into the static repository as described in section 3.2.2.3.1.3.

IRD-R0004 The service SHALL allow authorized users to update existing SAAs in the static repository as described in section 3.2.2.3.1.3.

IRD-R0005 The service SHALL allow authorized users to subscribe to notifications of updates to SAAs.

IRD-R0006 The service SHALL allow authorized users to unsubscribe to notifications of updates to SAAs.

IRD-R0007 The service SHALL provide subscriptions to SAAs based on SAA type.

IRD-R0008 Subscriptions to notifications SHALL be through attaching to JMS topics.

IRD-R0009 Unsubscribing to notifications SHALL be through detaching from JMS topics.

IRD-R0010 The service SHALL notify users when an SAA is updated, based on what the users are subscribed to as described in section 3.2.2.3.1.4.

3.2.1.2 Operational Repository

IRD-R0011 The service SHALL allow authorized users to query the repository as described in section 3.2.2.3.2.2.

IRD-R0012 The service SHALL authenticate the users as described in section 3.2.2.3.1.1.

IRD-R0013 The service SHALL allow authorized users to update existing SAAs in the repository as described in the section 3.2.2.3.2.3.

IRD-R0014 The service SHALL allow authorized users to update the status of SAAs in the repository as described in the section 3.2.2.3.2.3.

IRD-R0015 The service SHALL allow authorized users to subscribe to notifications of updates to SAAs.

IRD-R0016 The service SHALL allow authorized users to unsubscribe to notifications of updates to SAAs.

IRD-R0017 The service SHALL provide subscriptions to SAAs based on SAA type.

IRD-R0018 Subscriptions to notifications SHALL be through attaching to JMS topics.

IRD-R0019 Unsubscribing to notifications SHALL be through and detaching from JMS topics.

IRD-R0020 The service SHALL notify users when an SAA is updated, based on what the users are subscribed to as described in section 3.2.2.3.2.4.

IRD-R0021 The service SHALL allow authorized users to subscribe to notifications of updates to the status of SAAs as described in section 3.2.2.3.2.4.

IRD-R0022 The service SHALL notify subscribed users of the status of an SAA when a change occurs.

3.2.2 Application Processes and Web Service Requirements

The application processes in the web service are defined as follows:

3.2.2.1 Web Service Discovery

IRD-R0023 The service SHALL conform to “FAA-STD-064 Standard Practice for Web Service Registration.”

IRD-R0024 The service SHALL conform to “FAA-STD-063 Standard Practice for XML Namespaces.”

The service registry for registration of SAAM web service – TBD.

Specific protocols for web service discovery are TBD.

3.2.2.2 Web Service Information Transfer Requirements

The following diagram shows the basic sequence of an SAA being updated in the static repository to subscribers getting the SAA after receiving a notification.

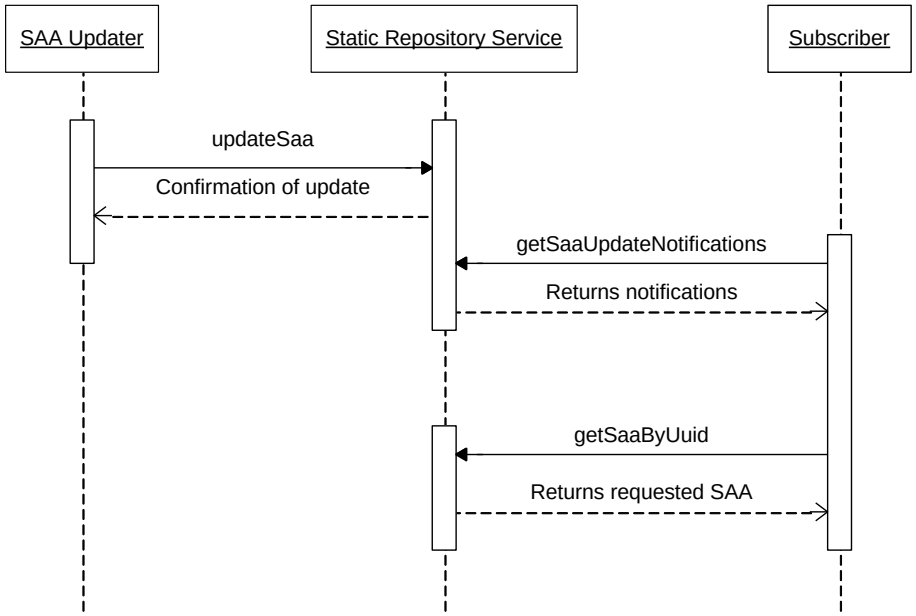

Figure 2 - SAA Sequence

IRD-R0025 The messages SHALL follow protocols as described in the tables in sections 3.2.2.2.1 and 3.2.2.2.2.

The following tables describe the capabilities of each service, the category of system that supports the service (as specified in NAS-SR-1000), and the transfer protocol for the service.

3.2.2.2.1 Static Repository Services

Service Name	***Kind of Capability***	***Category***	***Protocol***
authenticateUser	User Authentication	Routine	TBD
getSaaByUuid	Database Inquiry	Routine	SOAP/HTTP
getSaaNames	Database Inquiry	Routine	SOAP/HTTP
getSaaUuid	Database Inquiry	Routine	SOAP/HTTP
getUnits	Database Inquiry	Routine	SOAP/HTTP
getNewUuid	Database Inquiry	Routine	SOAP/HTTP
insertSaa	Database Update	Routine	SOAP/HTTP
updateSaa	Database Update	Routine	SOAP/HTTP
insertUnit	Database Update	Routine	SOAP/HTTP
notifySaaSubscribers	Subscriber Notification	Routine	JMS
validateSaa	Data Validation	Routine	SOAP/HTTP

3.2.2.2.2 Operational Repository Services

Service Name	***Kind of Capability***	***Category***	***Protocol***
authenticateUser	User Authentication	Essential	TBD
getSaaUsageByUuid	Database Inquiry	Essential	SOAP/HTTP
getSaaUsageBySaaUuid	Database Inquiry	Essential	SOAP/HTTP
getSaaUsageByType	Database Inquiry	Essential	SOAP/HTTP
updateSaaUsage	Database Update	Essential	SOAP/HTTP
updateSaaUsageWithDeconfliction	Database Update	Essential	SOAP/HTTP
notifySaaUsageSubscribers	Subscriber Notification	Essential	JMS
notifySaaStatusSubscribers	Subscriber Notification	Essential	JMS

3.2.2.3 Message Content Requirements

The message content of a web service is described by a WSDL and the associated XML schemas.

The following diagram is a UML representation of the repository SAA data structures and elements with their attributes as defined in the SAA Feature XML schema. This diagram is the AIXM 5 schema extension for SAAs and the complete schema to be used including limitations is given in Appendix C – Accepted AIXM Elements.

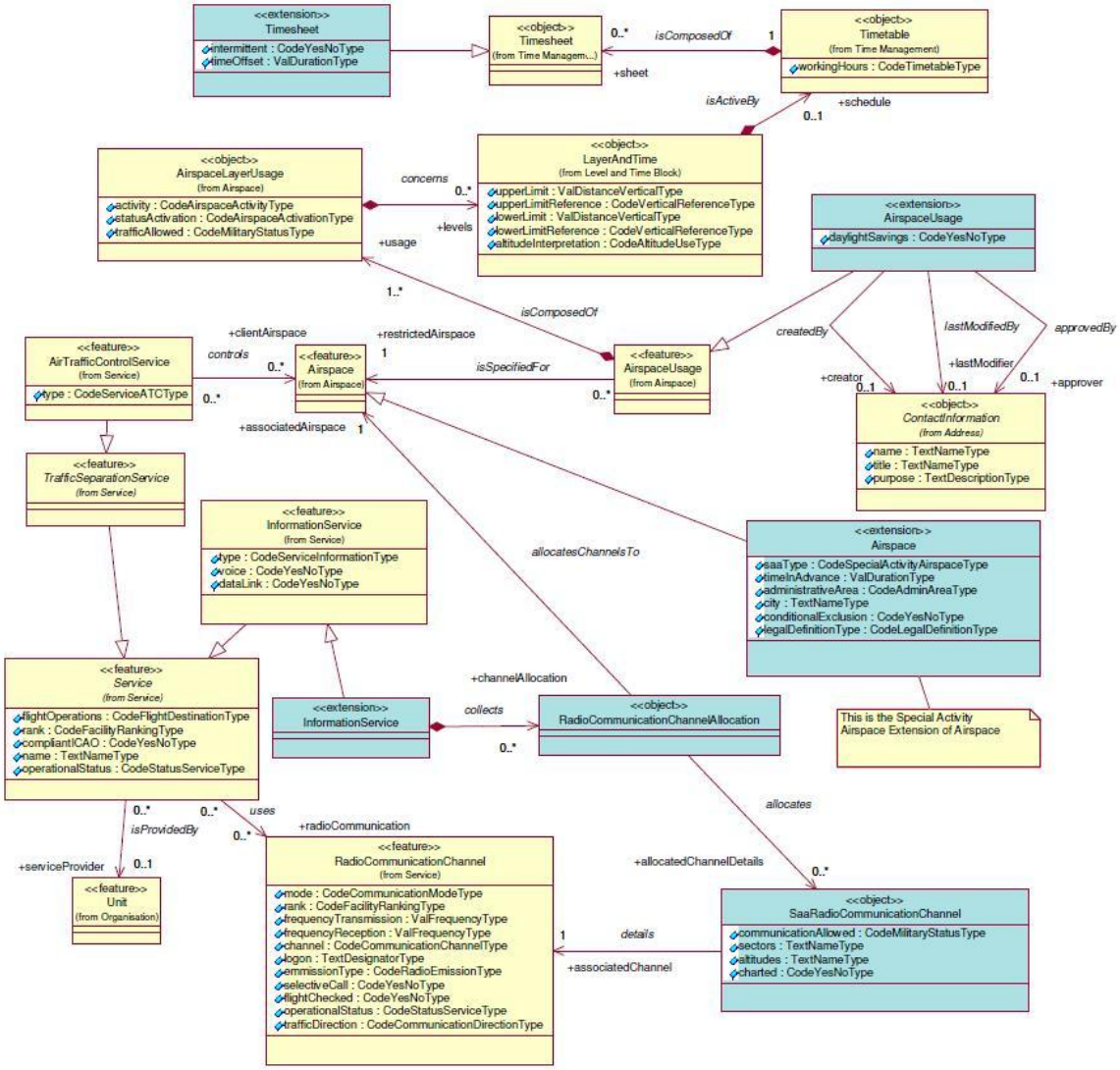

Figure 3 - AIXM 5 Schema Extension for SAAs

The following diagram is a UML representation of the repository SUA data structures and elements with their attributes as defined in the SUA Feature XML schema. This diagram is the AIXM 5 schema extension for SUAs and the complete schema to be used including limitations is given in Appendix C – Accepted AIXM Elements.

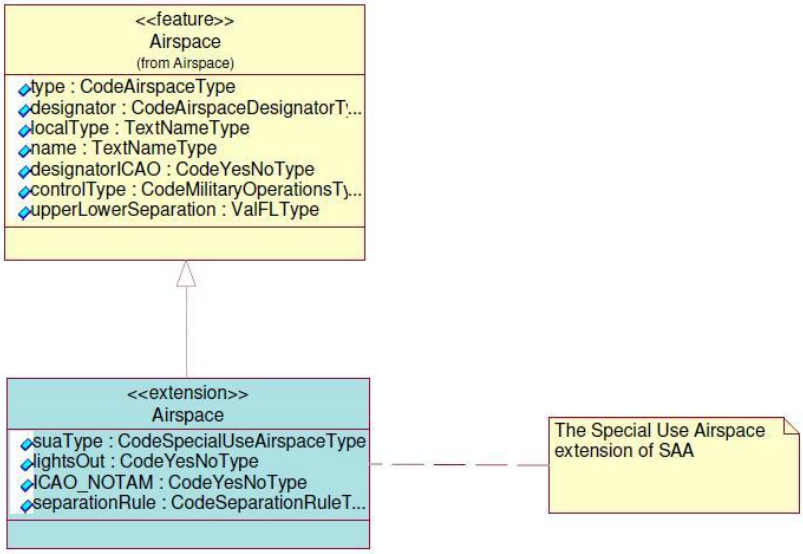

Figure 4 - AIXM 5 Schema Extension for SUAs

The following diagram is a UML representation of the repository ATCAA data structures and elements with their attributes as defined in the ATCAA Feature XML schema. This diagram is the AIXM 5 schema extension for ATCAAs and the complete schema to be used is given in Appendix C.

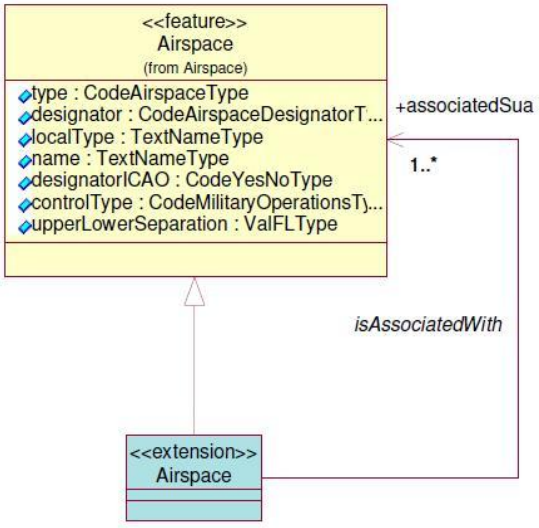

Figure 5 - AIXM 5 Schema Extension for ATCAAs

The following diagram is a UML representation of the repository SAA Message data structures and elements with their attributes as defined in the SAA Message XML schema. This diagram is the AIXM 5 schema extension and the complete schema to be used including limitations is given in Appendix C – Accepted AIXM Elements.

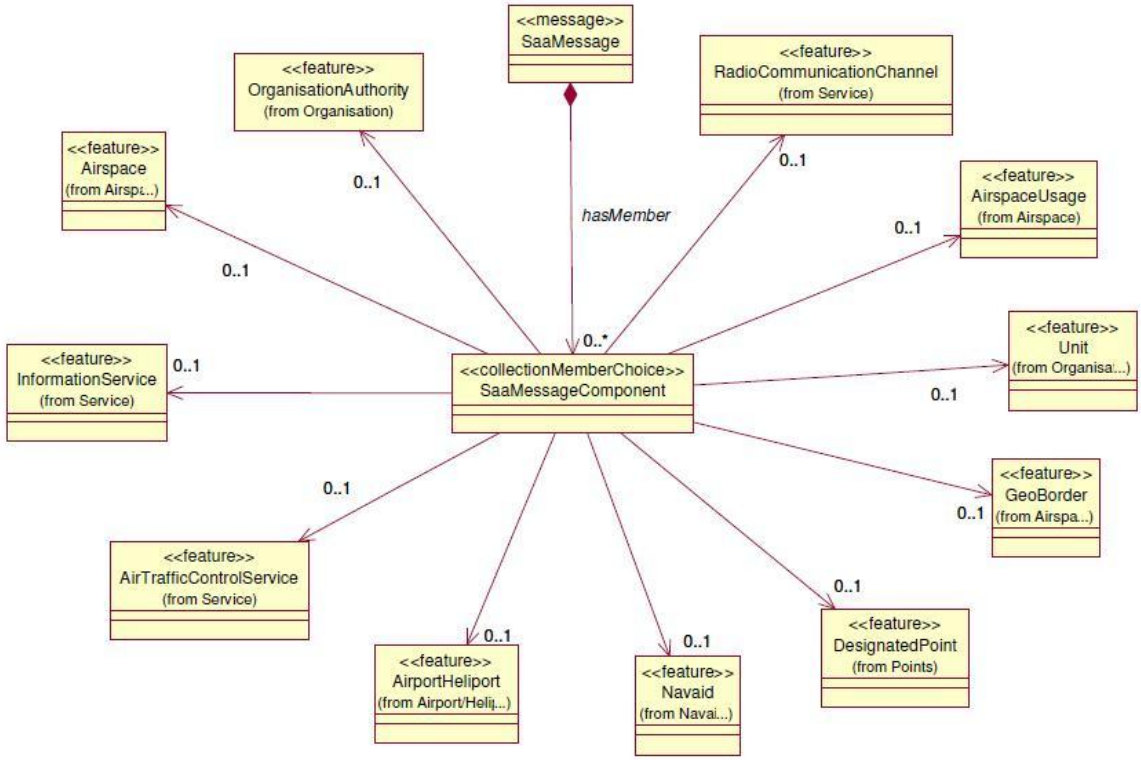

Figure 6 - AIXM 5 Schema Extension for SAA Messages

The following diagram is a UML representation of the repository SAA Schedule Message data structures and elements with their attributes as defined in the SAA Message XML schema. This will be used for messages pertaining to making schedule and status changes in the Operational Repository. This diagram is the AIXM 5 schema extension and the complete schema to be used including limitations is given in Appendix C – Accepted AIXM Elements.

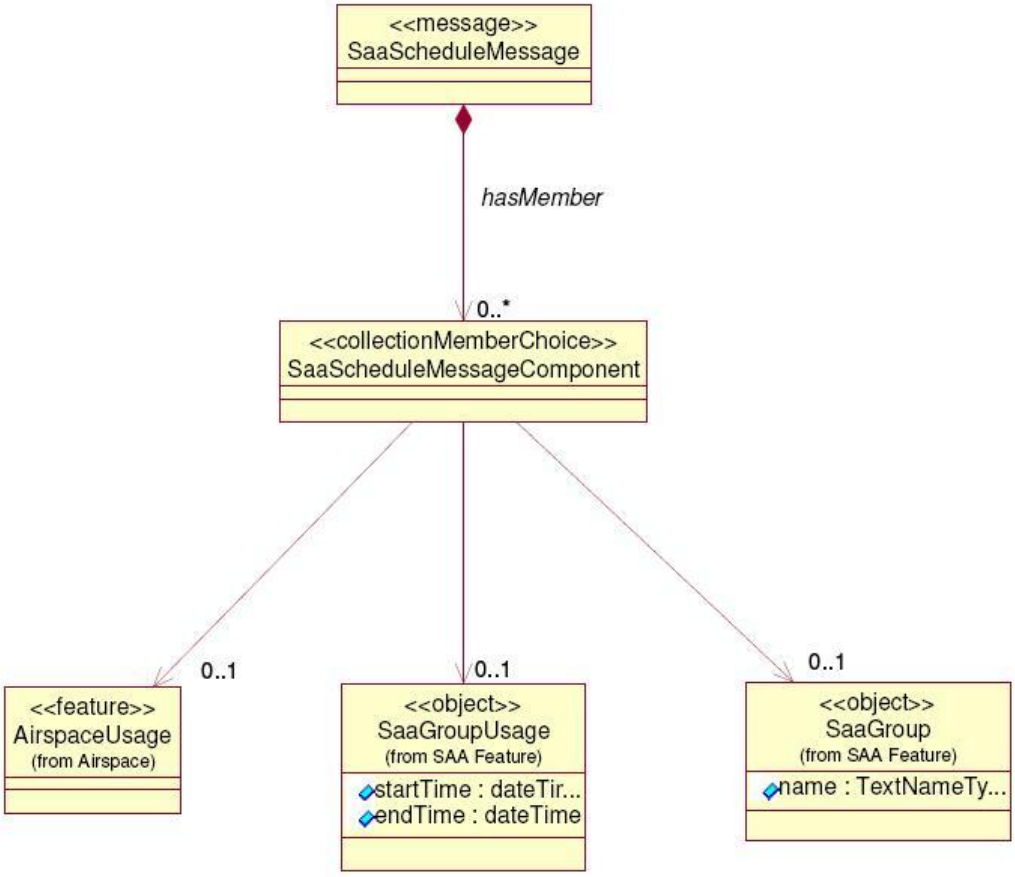

Figure 7 - AIXM 5 Schema Extension for SAA Schedule Messages

The following diagram is a UML representation of the repository Airspace data structures and elements with their attributes as defined in the base AIXM Features XML schema. This diagram is the AIXM 5 schema and the complete schema to be used including limitations is given in Appendix C – Accepted AIXM Elements.

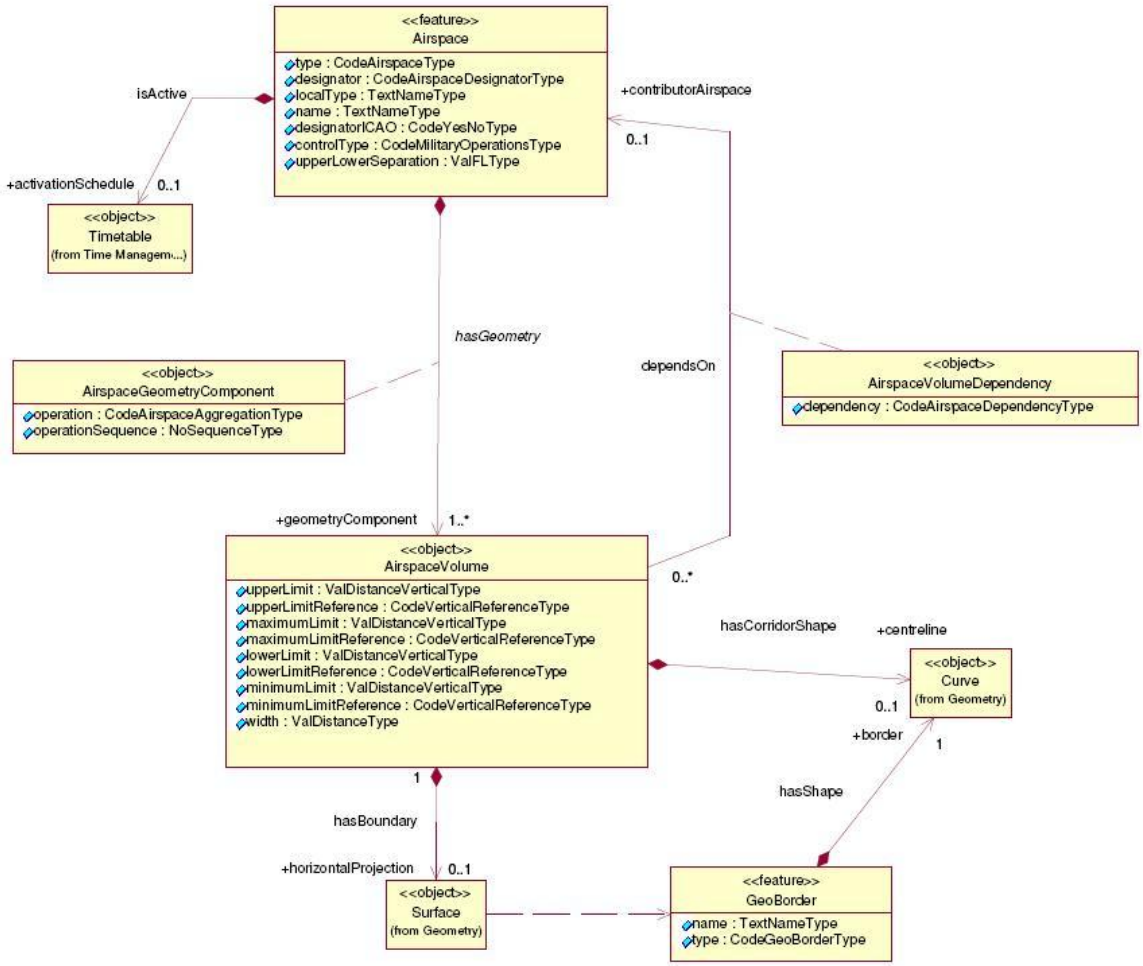

Figure 8 - AIXM 5 Schema for Airspaces

The following diagram is a UML representation of the repository AirspaceUsage data structures and elements with their attributes as defined in the base AIXM Features XML schema. This diagram is the AIXM 5 schema and the complete schema to be used including limitations is given in Appendix C – Accepted AIXM Elements.

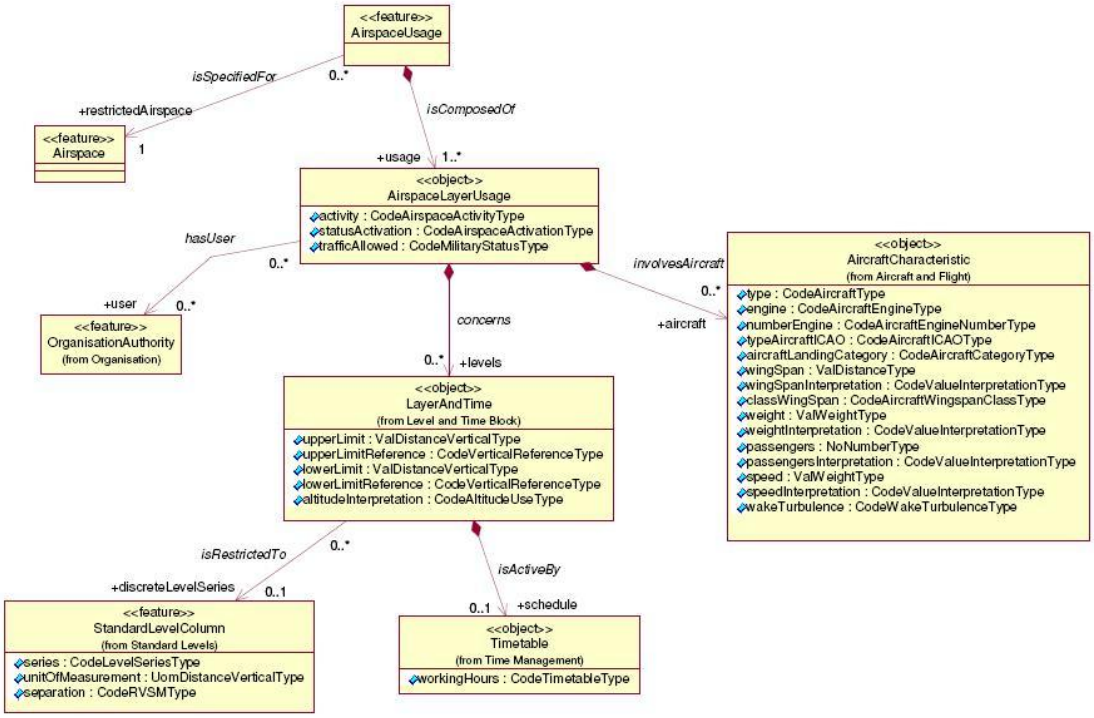

Figure 9 - AIXM 5 Schema for AirspaceUsages

The following diagram is a UML representation of the repository Timetable data structures and elements with their attributes as defined in the base AIXM Features XML schema. This diagram is the AIXM 5 schema and the complete schema to be used including limitations is given in Appendix C – Accepted AIXM Elements.

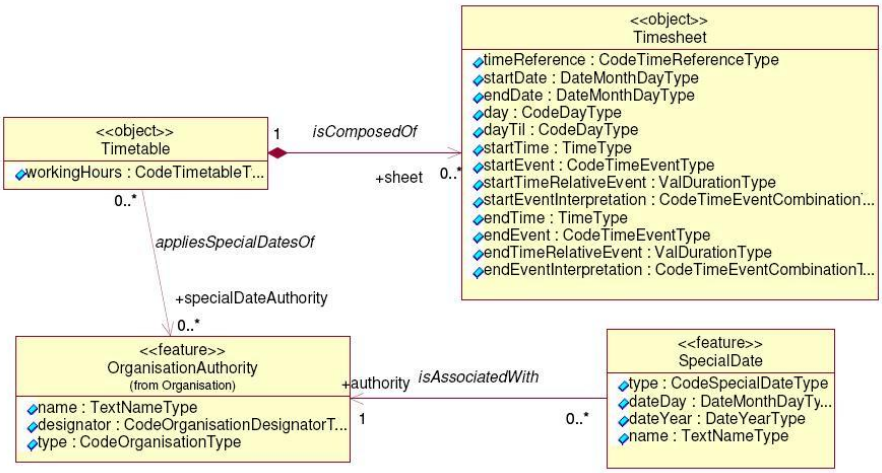

Figure 10 - AIXM 5 Schema for Timetables

The datatypes used for arguments or for returns are specified in Appendix A - Major Data Elements and Attributes in Web Service.

AIXM features and objects that are used as arguments or are returned by the following messages are specified in Appendix C – Accepted AIXM Elements.

IRD-R0026 The message content SHALL adhere to the appropriate type of messages described in the tables in sections 3.2.2.3.1, and 3.2.2.3.2.

3.2.2.3.1 Static Repository Messages

3.2.2.3.1.1 User Authentication Messages

Service Name	*Description*	*Arguments*	*Returns*	*Service Pattern*
authenticateUser	Authenticates a user. This method is dependent on a solution for authentication and authorization to be decided later.	TBD	TBD	Request/Response

Table 4 - Static Repository User Authentication Messages

3.2.2.3.1.2 Retrieval Service Messages

Service Name	*Description*	*Arguments*	*Returns*	*Service Pattern*
getSaaByUuid	Used to get an SAA that has the given UUID and is effective during the given time period.	UUID (i.e., gml:identifier) startTime, endTime	A collection of BASELINE or SNAPSHOT timeslices of the SAA Airspace and AirspaceUsage features. A SOAP fault containing an error message is returned upon failure.	Request/Response
getSaaNames	Used to get a list of all the SAA names and their UUIDs.	saaType	A collection of SAA names and corresponding UUIDs with the passed in saaType. A SOAP fault containing an error message is returned upon failure.	Request/Response

Service Name	*Description*	*Arguments*	*Returns*	*Service Pattern*
getSaaUuid	Returns the UUID of an SAA in the repository that has the given name and saaType.	name, saaType	If the name exists for the given saaType, the UUID of the SAA. If the name does not exist, a boolean value of False. A SOAP fault containing an error message is returned upon failure.	Request/Response
getUnits	Used to get a collection of the names, designators, types, and GML indentifiers for all of the active and pending units in the repository. A unit is an AIXM Unit feature representing a 'unit' providing a service. An example would be an ARTCC providing an Air Traffic Control Service	None	A collection of unit names, designators, types, and GML identifiers. A SOAP fault containing an error message is returned upon failure.	Request/Response
getNewUuid	Used to get a new UUID that is currently not used in the repository.	requestCount	A collection of UUIDs. A SOAP fault containing an error message is returned upon failure.	Request/Response

Table 5 - Static Repository Retrieval Messages

3.2.2.3.1.3 Storage Service Messages

Service Name	*Description*	*Arguments*	*Returns*	*Service Pattern*
insertSaa	Used to insert a new SAA into the repository.	SAA Message structure	Upon success of validation, an acknowledgement of successful SAA inserted, the gml:identifier, and the natural key identifier(s) of the SAA inserted. A SOAP fault containing an error message is returned upon failure.	Request/Response

Service Name	*Description*	*Arguments*	*Returns*	*Service Pattern*
updateSaa	Used to update an SAA in the repository.	SAA Message structure	Upon success of validation, an acknowledgement of successful SAA update, the gml:identifier and the natural key identifier(s) of the SAA updated. A SOAP fault containing an error message is returned upon failure.	Request/Response
InsertUnit	Used to insert a new Unit into the repository. A unit is an AIXM Unit feature representing a 'unit' providing a service.	Unit structure	Upon success of validation, an acknowledgement of successful insert of the Unit, the gml:identifier and the natural key identifier(s) of the Unit inserted. A SOAP fault containing an error message is returned upon failure.	Request/Response

Table 6 - Static Repository Storage Messages

3.2.2.3.1.4 Subscription Service Messages

Service Name	*Description*	*Arguments*	*Returns*	*Service Pattern*
notifySaaSubscribers	Used to notify subscribed users that an SAA has been updated.	None	The UUID of the SUA that has been updated.	Publish/Subscribe

Table 7 - Static Repository Subscription Messages

3.2.2.3.1.5 Validation Service Messages

Service Name	*Description*	*Arguments*	*Returns*	*Service Pattern*
validateSaa	Validation Service - used by the different tools and repositories to validate whether a SAA conforms to AIXM 5, consists of well defined polygons, and its Times of Use is a well-defined time table	SAA Message structure	Returns an object containing a boolean and a String message. Returns boolean as true and empty message if the SAA is valid. Returns Boolean as false and a message indicating the cause if the SAA is not valid	Request/Response

Table 8 - Static Repository Validation Messages

3.2.2.3.2 Operational Repository Messages

3.2.2.3.2.1 User Authentication Messages

Service Name	*Description*	*Arguments*	*Returns*	*Service Pattern*
authenticateUser	Authenticates a user. This method is dependent on a solution for authentication and authorization to be decided later.	TBD	TBD	Request/Response

Table 9 - Operational Repository User Authentication Messages

3.2.2.3.2.2 Retrieval Service Messages

Service Name	*Description*	*Arguments*	*Returns*	*Service Pattern*
getSaaUsageByUuid	Used to get the schedule and status of an SAA AirspaceUsage feature that has the given UUID and is effective during the given time period.	UUID (i.e., gml:identifier), startTime, endTime	A collection of BASELINE or SNAPSHOT timeslices of the SAA AirspaceUsage feature. A SOAP fault containing an error message is returned upon failure.	Request/Response
getSaaUsageBySaaUuid	Used to get the schedule and status of the SAA AirspaceUsage features that are associated with the given UUID of an SAA and is effective during the given time period.	UUID of an SAA (i.e., gml:identifier), startTime, endTime	A collection of BASELINE or SNAPSHOT timeslices of the SAA AirspaceUsage feature. A SOAP fault containing an error message is returned upon failure.	Request/Response
getSaaUsageByType	Used to get the schedules and statuses of a collection of all the SAA AirspaceUsage features of the given type for the given time period.	saaType, startTime, endTime	A collection of BASELINE or SNAPSHOT timeslices of the SAA AirspaceUsage features. A SOAP fault containing an error message is returned upon failure.	Request/Response

Table 10 - Operation Repository Retrieval Messages

3.2.2.3.2.3 Storage Service Messages

Service Name	*Description*	*Arguments*	*Returns*	*Service Pattern*

Service Name	*Description*	*Arguments*	*Returns*	*Service Pattern*
updateSaaUsage	Used to update the AirspaceUsage feature of an SAA. This can include a change to the schedule and/or status.	SAA AirspaceUsage feature	Upon success of validation, an acknowledgement of successful SAA usage update, the gml:identifier and the natural key identifier(s) of the updated SAA AirspaceUsage. A SOAP fault containing an error message is returned upon failure.	Request/Response
updateSaaUsageWithDeconfliction	Used to update the AirspaceUsage feature of an SAA in cases of overlapping schedules being present. This can include a change to the schedule and/or status.	SAA AirspaceUsage feature	Upon success of validation, an acknowledgement of successful SAA usage update, the gml:identifier and the natural key identifier(s) of the updated SAA AirspaceUsage. A SOAP fault containing an error message is returned upon failure.	Request/Response

Table 11 - Operation Repository Storage Messages

3.2.2.3.2.4 Subscription Service Messages

Service Name	*Description*	*Arguments*	*Returns*	*Service Pattern*
notifySaaUsageSubscriber	Used to notify all subscribed users that an SAA's AirspaceUsage has been updated.	None	Upon success, a BASELINE timeslice of the AirspaceUsage. A SOAP fault containing an error message is returned upon failure.	Publish/Subscribe

Service Name	***Description***	***Arguments***	***Returns***	***Service Pattern***
notifySaaStatusSubscriber	Used to notify all subscribed users that an SAA's status has changed.	None	Upon success, a BASELINE timeslice of the AirspaceUsage. A SOAP fault containing an error message is returned upon failure.	Publish/Subscribe

Table 12 - Operation Repository Subscription Messages

3.2.2.4 Relationship among Messages

IRD-R0027 All messages SHALL behave synchronously except the following:

- notifySaaSubscribers
- notifySaaUsageSubscribers
- notifySaaStatusSubscribers

IRD-R0028 All messages except the following SHALL implement In-Out pattern:

- notifySaaSubscribers
- notifySaaUsageSubscribers
- notifySaaStatusSubscribers

IRD-R0029 The messages following SHALL implement Out-Only pattern:

- notifySaaSubscribers
- notifySaaUsageSubscribers
- notifySaaStatusSubscribers

3.2.2.5 Quality of Service Requirements

IRD-R0030 The operational repository SHALL meet mission essential requirements for uptime. These uptime requirements are TBD.

IRD-R0031 Services that use SOAP SHALL implement the WS-Reliable Messaging protocol for message distribution to help reduce errors in message distribution.

IRD-R0032 The messages SHALL have response times as described in the tables in sections 3.2.2.5.1, and 3.2.2.5.2.

3.2.2.5.1 Static Repository Message Response Times

Service Name	***Response Time***
authenticateUser	Respond in 5 seconds or less.
getSaaByUuid	Respond per volume per timeslice with a 95th percentile response time of 5 seconds.

Service Name	***Response Time***
getSaaNames	Respond with a 95th percentile response time of 5 seconds.
getSaaUuid	Respond with a 95th percentile response time of 5 seconds.
getUnits	Respond with a 95th percentile response time of 5 seconds.
getNewUuid	Respond with a 95th percentile response time of 5 seconds.
insertSaa	Respond per volume per timeslice with a 95th percentile response time of 10 seconds.
updateSaa	Respond per volume per timeslice with a 95th percentile response time of 10 seconds.
insertUnit	Respond with a 95th percentile response time of 10 seconds.
notifySaaSubscribers	Responds with a 95th percentile response time of 5 minutes of an update, insert, or invalidation.
validateSaa	Responds per volume per timeslice with a 95th percentile response time of 10 seconds.

Table 13 - Static Repository Message Response Times

3.2.2.5.2 Operational Repository Message Response Times

Service Name	***Response Time***
authenticateUser	Respond in 5 seconds or less.
getSaaUsageByUuid	Respond in 2 seconds or less.
getSaaUsageBySaaUuid	Respond in 2 seconds or less.
getSaaUsageByType	Respond in 2 seconds or less.
updateSaaUsage	Respond in 2 seconds or less.
updateSaaUsageWithDeconfliction	Respond in 2 seconds or less.

Service Name	*Response Time*
notifySaaUsageSubscribers	Responds within 5 seconds or less of an update, insert, or invalidation of an SAA.
notifySaaStatusSubscribers	Responds within 5 seconds or less of an update to the status of an SAA.

Table 14 - Operational Repository Message Response Times

3.2.2.6 Error Handling Requirements

Each service will have its own error or exception conditions specified based on its requirements. These conditions will not be detailed here because it is out of scope of this document.

IRD-R0033 Services that use JMS shall use methods described in section 7 of the JMS Specification 1.1 to handle exceptions.

IRD-R0034 Services that use SOAP shall use SOAP Faults when handling exceptions.

3.2.2.7 Interface Summary Table

This IRD imposes no explicit Interface Summary Table requirements.

3.2.3 Protocol Implementation

3.2.3.1 Application Layer Services

IRD-R0035 The SOAP and JMS messaging protocols shall be used for services as detailed in the tables in sections 3.2.2.3.1, and 3.2.2.3.2.

3.2.3.2 Transport Layer and Lower Layers

IRD-R0036 The system shall use TCP for all service transport.

IRD-R0037 The system shall use IP V4 for all internet transport.

4 Quality Assurance Provisions

4.1 Responsibility For Verification

The government is responsible for the development and verification of requirements for each project. The government may delegate verification activities to other organizations, independent contractors, and/or the major prime contractor.

4.2 Special Verification Requirements

There are no special verification requirements at this time.

4.3 Verification Requirements Traceability Matrix

Verification shall be in accordance with Table [4.3.1], Verification Requirements Traceability Matrix (VRTM).

The contents of the VRTM provides verification of each technical requirement contained in this document with the appropriate verification methods. The appropriate verification methods are as follows:

- Demonstration - This is a method in which qualitative determination of properties is made for a configuration item, including software and/or the use of technical data and documentation. The items being verified are observed, but not quantitatively measured, in a dynamic state.

- Analysis - This is a method in which hardware or software designs are compared with known scientific and technical principles, procedures, and practices to estimate the capability of the proposed design to meet the mission and system requirements.

- Test - This is a method in which performance is measured during or after the controlled application of functional and/or environmental stimuli. Quantitative measurements are analyzed to determine the degree of compliance. The process uses standardized laboratory equipment, procedures, and/or services.

4.3.1 Verification Requirements Traceability Matrix Table

D=Demonstration A=Analysis T=Test

Requirements References	Verification Phase Level			
	Service Level	Integration Level	Site Level	Remarks
3.1.1 Security Requirements				
IRD-R0001	D	D	D	
IRD-R0002	A	A	A	
IRD-R0003	A	A	A	
IRD-R0004	D	D	D	
3.2 Functional Requirements				
3.2.1 Web Service Functional Requirements				
IRD-R0005	A	A	A	
3.2.1.1 Static Repository				
IRD-R0006	D	D	D	
IRD-R0007	D	D	D	
IRD-R0008	D	D	D	
IRD-R0009	D	D	D	
IRD-R0010	D	D	D	
IRD-R0011	D	D	D	
IRD-R0012	D	D	D	
IRD-R0013	D	D	D	
IRD-R0014	D	D	D	
3.2.1.2 Operational Repository				
IRD-R0015	D	D	D	
IRD-R0016	D	D	D	
IRD-R0017	D	D	D	
IRD-R0018	D	D	D	
IRD-R0019	D	D	D	
IRD-R0020	D	D	D	
IRD-R0021	D	D	D	
IRD-R0022	D	D	D	
IRD-R0023	D	D	D	
IRD-R0024	D	D	D	
IRD-R0025	D	D	D	
IRD-R0026	D	D	D	
3.2.2 Application Processes and Web Service Requirements				
3.2.2.1 Web Service Discovery				
IRD-R0027	A	A	A	
IRD-R0028	A	A	A	

3.2.2.2 Web Service Information Transfer Requirements				
IRD-R0029	A	A	A	
3.2.2.2.1 Static Repository Services				
3.2.2.2.2 Operational Repository Services				
3.2.2.3 Message Content Requirements				
IRD-R0030	D	D	D	
3.2.2.3.1 Static Repository Messages				
3.2.2.3.1.1 User Authentication Messages				
3.2.2.3.1.2 Retrieval Service Messages				
3.2.2.3.1.3 Storage Service Messages				
3.2.2.3.1.4 Subscription Service Messages				
3.2.2.3.1.5 Validation Service Messages				
3.2.2.3.2 Operational Repository Messages				
3.2.3.2.1 User Authentication Messages				
3.2.2.3.2.2 Retrieval Service Messages				
3.2.2.3.2.3 Storage Service Messages				
3.2.2.3.2.4 Subscription Service Messages				
3.2.2.4 Relationship Among Messages				
IRD-R0031	D	D	D	
IRD-R0032	D	D	D	
IRD-R0033	D	D	D	
3.2.2.5 Quality of Service Requirements				
IRD-R0034	A	A	A	
IRD-R0035	A	A	A	
IRD-R0036	T	T	T	
3.2.2.5.1 Static Repository Message Response Times				
3.2.2.5.2 Operational Repository Message Response Times				
3.2.2.6 Error Handling Requirements				

IRD-R0037	A	A	A	
IRD-R0038	A	A	A	
3.2.2.7 Interface Summary Table				
3.2.3 Protocol Implementation				
3.2.3.1 Application Layer Services				
IRD-R0039	A	A	A	
3.2.3.2 Transport Layer and Lower Layers				
IRD-R0040	A	A	A	
IRD-R0041	A	A	A	
4.1 Responsibility for Verification				

Table 15 - Verification Requirements Traceability Matrix Table

5 Preparation for Delivery

This IRD imposes no explicit Preparation for Delivery requirements.

6 Notes

6.1 Definitions

The following definitions are assumed in this document.

Asynchronous Service	A service in which users initiate a request to a service and resume their processing without waiting for a response.
BASELINE Timeslice	A kind of Time Slice that describes the feature state (the set of all feature's properties) as result of a permanent change.
Facility	Any facility which would be a using or controlling facility in the legal definition of a SUA, definition of an ATCAA, along with ARTCCs and TRACONs
In-Out Pattern	A message exchange pattern that consists of two messages. The first is a message to the service from a user. The second is a message from the service to the user in response to the first message.
Operational Repository	A common location for storing SAA operational data.
Out-Only Pattern	A message exchange pattern that consists of one message being sent from the service to a user.
PERMDELTA Timeslice	A kind of Time Slice that describes the difference in a feature state as result of a permanent change.
Project	A collection of files, directories or other projects (i.e., subprojects) representing an SAA.
Project Owner	The user who created a given project.
Project Repository	A common location for storing SAA design projects.
SNAPSHOT Timeslice	A kind of Time Slice that describes the state of a feature at a time instant.
Static Repository	A common location for storing SAA static data.
Synchronous Service	A service in which users initiate a request on a service and then stops their processing until they receive a response.
Unit	An AIXM Unit feature. A generic term meaning variously all types of 'units' providing all types of services.
User Role	A collection of capabilities which a user may enact on a project.

Web Service	Self-describing, self-contained, modular units of software application logic that provide defined business functionality. Web services are consumable software services that typically include some combination of business logic and data. Web services can be aggregated to establish a larger workflow or business transaction. Inherently, the architectural components of web services support messaging, service descriptions, registries, and loosely coupled interoperability.

6.2 Abbreviations and Acronyms

AIM	Aeronautical Information Management
AIXM	Aeronautical Information Exchange Model
ARTCC	Air Route Traffic Control Center
ATCAA	Air Traffic Control Assigned Airspace
ATM	Air Traffic Management
ATO	Air Traffic Organization
ERAM	En Route Automation Modernization
FAA	Federal Aviation Administration
GML	Geography Markup Language
IRD	Interface Requirements Document
ISS	Information System Security
JMS	Java Message Service
MILOPS	Military Operations Systems
NAS	National Airspace System
NASR	National Airspace System Repository
SAA	Special Activity Airspace

SOA	Service-Oriented Architecture
SOAP	Simple Object Access Protocol
SUA	Special Use Airspace
SIP	SWIM-Implementing Program
SvSD	SWIM Services Specification Document
SWIM	System Wide Information Management
UUID	Universally Unique Identifier
UML	Unified Modeling Language
XML	Extensible Markup Language
WS-I	Web Services Interoperability Organization

Appendix A - Major Data Elements and Attributes in Web Service

Element/Attribute name	*Description*	*Data Type*	*Max Length*
endTime	A date value to indicate the ending of a time interval	date	N/A
name	Designation of element object or element by a linguistic expression.	string	255
requestCount	A integer value used a parameter to indicate the number of results for the message to return with a maximum value of 100.	int	N/A Max value of 100
roleID	A string that uniquely identifies a role.	string	255
saaType	A string value to identify the subtype of an SAA (SUA, ATCAA, etc).	string	50
startTime	A date value to indicate the beginning of a time interval	date	N/A
userID	A string that uniquely identifies a user.	string	255

Appendix B – SAA XML Schemas

Core AIXM 5 schemas:
https://swimwiki.tc.faa.gov/download/attachments/5439658/AIXM_Features.xsd
https://swimwiki.tc.faa.gov/download/attachments/5439658/AIXM_AbstractGML_ObjectTypes.xsd
https://swimwiki.tc.faa.gov/download/attachments/5439658/AIXM_DataTypes.xsd

SAA Structure
https://swimwiki.tc.faa.gov/download/attachments/5439658/SAA-Feature.xsd

SAA Datatypes
https://swimwiki.tc.faa.gov/download/attachments/5439658/SAA-DataTypes.xsd

SAA Message Structure
https://swimwiki.tc.faa.gov/download/attachments/5439658/SAA-Message.xsd

SUA Structure
https://swimwiki.tc.faa.gov/download/attachments/5439658/SAA-Feature.xsd

Appendix C – Accepted AIXM Elements

Italicized items are extensions from the base AIXM.

The xlink:href attribute must be set to a gml:id of another feature.

AIXM features must contain Timeslices.

All Timesheets for a single AirspaceUsage much have the same value for timeReference.

The gml:identifier for the Airspace and AirspaceUsage features must be a UUID provided by getNewUuid method from the Static Repository web service.

GML objects are described in Appendix F.

Object or Feature	***Element***	***Description***	***DataType***	***Domain Values***	***Attribute***
AirportHeliport (Feature)		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/helicopters.			gml:id
	name	The name of the Airport/Heliport.	TextNameType		
	designator	A coded designator for an Aerodrome/Heliport.	CodeAirportHeliportDesignatorType		
	ReferencePoint	Identifies the Airport Reference Point.	ElevatedPoint (Object)		

Object or Feature	***Element***	***Description***	***DataType***	***Domain Values***	***Attribute***
Airspace (Feature)		A defined three dimensional region of space relevant to air traffic.			gml:id gml:identifier
	name	The name of the airspace	TextNameType		
	geometryComponent	A portion of airspace that contributes to the defintion of an Airspace geometry.	AirspaceVolume (Object)		
	annotation	A text note about the Airspace not captured in the rest of the model. A note with the propertyName of 'legalDefinitionType' defines the legal definition. A note with the propertyName of 'conditionalExclusion' describes the conditional exclusion for the Airspace.	Note (Object)		
ATCAA extension of Airspace					gml:id
	associatedSua	The SUA that the ATCAA is associated with.	Reference to an Airspace Feature		
SAA extension of Airspace					gml:id
	saaType	The SAA type.	CodeSpecial ActivityAirspaceType	SUA ATCAA SAA_COMPONENT	
	administrativeArea	The state the SAA is located.	CodeAdminAreaType	ALABAMA ALASKA AMERICAN SAMOA ARIZONA ARKANSAS	

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
				BAHAMA ISLANDS BRITISH WEST INDIES CALIFORNIA CANAL ZONE COLORADO CONNECTICUT DELAWARE DIST. OF COLUMBIA FLORIDA GEORGIA GUAM HAWAII IDAHO ILLINOIS INDIANA INTERNATIONAL IOWA KANSAS KENTUCKY LOUISIANA MAINE MARYLAND MASSACHUSETTS MICHIGAN MIDWAY ATOLL MINNESOTA MISSISSIPPI MISSOURI MONTANA N MARIANA ISLANDS NEBRASKA NEVADA NEW HAMPSHIRE NEW JERSEY NEW MEXICO NEW YORK NORTH CAROLINA NORTH DAKOTA OFFSHORE ATLANTIC	

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
				OFFSHORE CARIB OFFSHORE GULF OFFSHORE PACIFIC OHIO OKLAHOMA OREGON PENNSYLVANIA PUERTO RICO RHODE ISLAND SOUTH CAROLINA SOUTH DAKOTA TENNESSEE TEXAS UTAH VERMONT VIRGIN ISLANDS VIRGINIA WAKE ISLAND WASHINGTON WEST VIRGINIA WISCONSIN WYOMING	
	city	The city the SAA is located.	TextNameType		
	timeInAdvance	The amount of time in advance of the effective time of the SAA necessary to issue a change by NOTAM.	ValDurationType		uom
	conditionalExclusion	If there is a conditional exclusion associated with this SAA (where an exclusion from an airspace is dependent on something else). An annotation on the Airspace to this property will describe the exclusion.	CodeYesNoType	YES NO	

Object or Feature	***Element***	***Description***	***DataType***	***Domain Values***	***Attribute***
	legalDefintionType	Whether the legal definition is generated from the data by a system, or entered by a person. The legal definition is defined by a note to the Airspace associated with this property.	CodeLegalDefinitionType	GENERATED HUMAN	
SUA extension of Airspace					gml:id
	suaType	The SUA Type.	CodeSpecial UseAirspaceType	MOA NSA CFA PA RA WA AA	
	ICAO_NOTAM	Whether an ICAO NOTAM needs to be issued for schedule activity.	CodeYesNoType	YES NO	
	lightsOut	Whether the airspace is permitted to host Lights Out/Night Vision Goggles activity per FAA/DoD Exemption order.	CodeYesNoType	YES NO	
	separationRule	Type of separation rule for objects in airspace.	CodeSeparationRuleType	AIRCRAFT OTHER UNSPECIFIED	
AirspaceGeometryComponent (Object)		The role of the component in the airspace geometry. If the geometry of an airspace is composed of single volume, then the attributes of this association class may be left empty.			

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
	operation	A code indicating how the component participates in the aggregation, such as addition, subtraction or intersection.	CodeAirspaceAggregationType	BASE UNION INTERS SUBTR	
	operationSequence	A number indicating the order of the component in the aggregation.	NoSequenceType		
	geometryComponent	An portion of airspace that contributes to the defintion of an Airspace geometry.	AirspaceVolume (object)		
AirspaceLayerUsage (Object)		Time and Level associated with a specific usage.			
	statusActivation	The activation status of the airspace block.	CodeAirspaceActivationType	AVBL_FOR_ACTIVATION REQUESTED ALLOCATED ACTIVE IN_USE INACTIVE OTHER	
	trafficAllowed	The specific users in terms of civil or military allowed to use the designated airspace when active.	CodeMilitaryStatusType	MIL CIVIL ALL	
	Activity	The primary situation or reason on the ground or in the air, which may have an impact on air traffic.	CodeAirspaceActivityType	AD_TFC HELI_TFC TRAINING AEROBATICS AIRSHOW SPORT ULM GLIDING PARAGLIDER HANGGLIDING PARACHUTE	

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
				AIR_DROP BALLOON RADIOSONDE SPACE_FLIGHT UAV AERIAL_WORK CROP_DUSTING FIRE_FIGHTING MILOPS REFUEL JET_CLIMBING EXERCISE TOWING NAVAL_EXER MISSILES AIR_GUN ARTILLERY SHOOTING BLASTING WATER_BLASTING ANTI_HAIL BIRD BIRD_MIGRATION FIREWORK HI_RADIO HI_LIGHT LASER NATURE FAUNA NO_NOISE ACCIDENT POPULATION VIP VIP_PRES VIP_VICE OIL GAZ REFINERY CHEMICAL	

Object or Feature	***Element***	***Description***	***DataType***	***Domain Values***	***Attribute***
				NUCLEAR TECHNICAL ATS PROCEDURE	
	levels	The level and time associated with the airspace usage part.	LayerAndTime (Object)		
AirspaceUsage (Feature)		Conditions of usages for an airspace.			gml:id gml:identifier
	usage	One particular usage concerning a vertical layer of the Airspace.	AirspaceLayerUsage (Object)		
	restrictedAirspace		Feature reference to an Airspace using xlink:href		
	annotation	A text note used to describe an aspect of the AirspaceUsage not captured in the rest of the model.	Note (Object)		
SAA extension of AirspaceUsage					gml:id
	daylightSavings	Whether the AirspaceUsage uses Daylight Savings Time.	CodeYesNoType		
	approvedBy	The contact information for the person who last approved the schedule.	ContactInformation (Object)		
	createdBy	The contact information for the person who created the schedule.	ContactInformation (Object)		

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
	lastModifiedBy	The contact information for the person who last modified the schedule.	ContactInformation (Object)		
AirspaceVolume (Object)					
	lowerLimit	The vertical position of the airspace floor. If the AirspaceGeometryComponent has an operation = 'BASE', then 'FLOOR' is not a valid value for lowerLimit.	ValDistanceVerticalType	GND FLOOR	uom
	lowerLimitReference	The reference surface used for the value of the lower limit. For example, Mean Sea Level, Ground, standard pressure, etc..	CodeVerticalReferenceType	SFC MSL W84 STD OTHER	
	upperLimit	The vertical position of the airspace ceiling. If the AirspaceGeometryComponent has an operation = 'BASE', then 'CEILING' is not a valid value for upperLimit.	ValDistanceVerticalType	UNL CEILING	uom
	upperLimitReference	The reference surface used for the value of the upper limit. For example, Mean Sea Level, Ground, standard pressure, etc..	CodeVerticalReferenceType	SFC MSL W84 STD OTHER	

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
	horizontalProjection	The surface defining the horizontal shape of the AirspaceVolume.	Surface (Object)		
	contributorAirspace	An Airspace, whose geometry has an impact on the geometry of the AirspaceVolume.	AirspaceVolumeDependency (Object)		
	annotation	A note used to describe if the altitude values are inclusive or exclusive. The propertyName should be set to either “upperLimit” or “lowerLimit”. The value of the note element of the inner LinguisticNote should be either “INCLUSIVE” or “EXCLUSIVE”.	Note (Object)		
AirspaceVolumeDependency (Object)		An association class that defines the dependency between the geometry of an AirspaceVolume and the geometry of another (parent) Airspace.			
	dependency	A code indicating how the contributor Airspace impacts the geometry of the AirspaceVolume.	CodeAirspaceDependencyType	FULL_GEOMETRY HORZ_PROJECTION	
	theAirspace	A reference to an AirspaceFeature	Feature reference to an Airspace using xlink:href		

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
AirTrafficControlService (Feature)		A kind of service that provides control and separation services to aircraft in the air.			gml:id
	rank	The order of priority of the service, such as "primary" or "alternate".	CodeFacilityRankingType	PRIMARY SECONDARY ALTERNATE EMERG GUARD OTHER	
	name	A free text name by which the service is identified.	TextNameType		
	groundCommunication	The contact information of the service.	ContactInformation (Object)		
	type	The type of air traffic control service provided. 'ACS' indicates that the service is for the controlling agency of the SAA. 'OTHER' indicates that the service is for the using agency of the SAA.	CodeServiceATCType	ACS UAC OACS APP TWR ADVS EFAS CTAF OTHER	
	clientAirspace	The airspace for which the air traffic separation service is provided.	Feature reference to an Airspace using xlink:href		
	serviceProvider	The Unit that provides the Service.	Feature reference to a Unit using xlink:href		
ContactInformation (Object)		Information required to enable contact with the responsible person and/or organization.			

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
	name	The official name of the contact.	TextNameType		
	title	The official title of the contact.	TextNameType		
	voice	Telephone numbers at which the organisation or individual may be contacted.	TextPhoneType		
	facsimilie	The telephone number of a facsimile machine for the responsible organisation or individual.	TextPhoneType		
	eMail	The address of the electronic mailbox of the responsible organisation or individual.	TextAddressType		
	deliveryPoint	The street address line for the location. More than one address line may be used.	TextAddressType		
	city	The city of the location or organisation.	TextNameType		
	administrativeArea	The state or province of the location or organisation.	TextNameType	ALABAMA ALASKA AMERICAN SAMOA ARIZONA ARKANSAS BAHAMA ISLANDS BRITISH WEST INDIES CALIFORNIA CANAL ZONE COLORADO CONNECTICUT DELAWARE DIST. OF COLUMBIA FLORIDA GEORGIA	

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
				GUAM HAWAII IDAHO ILLINOIS INDIANA INTERNATIONAL IOWA KANSAS KENTUCKY LOUISIANA MAINE MARYLAND MASSACHUSETTS MICHIGAN MIDWAY ATOLL MINNESOTA MISSISSIPPI MISSOURI MONTANA N MARIANA ISLANDS NEBRASKA NEVADA NEW HAMPSHIRE NEW JERSEY NEW MEXICO NEW YORK NORTH CAROLINA NORTH DAKOTA OFFSHORE ATLANTIC OFFSHORE CARIB OFFSHORE GULF OFFSHORE PACIFIC OHIO OKLAHOMA OREGON PENNSYLVANIA PUERTO RICO RHODE ISLAND SOUTH CAROLINA	

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
				SOUTH DAKOTA TENNESSEE TEXAS UTAH VERMONT VIRGIN ISLANDS VIRGINIA WAKE ISLAND WASHINGTON WEST VIRGINIA WISCONSIN WYOMING	
	postalCode	The ZIP or other postal code for the location or organisation.	TextNameType		
	country	The country of the physical address for the location or orgainsation. Full name, not ISO 3166 abbreviations.	TextNameType		
Curve (Object)		An AIXM curve derived from GM_Curve and extended to include Horizontal Accuracy Properties.			gml:id
	gml:Curve		gml:Curve (GML object)		
DesignatedPoint (Feature)		A geographical location not marked by the site of a radio navigation aid, used in defining an ATS route, the flight path of an aircraft or for other navigation or ATS purposes.			gml:id
	name	The full textual name of a designated point, if any.	TextNameType		
	designator	The coded designator of the point.	CodeDesignatedPointDesignatorType		

Object or Feature	***Element***	***Description***	***DataType***	***Domain Values***	***Attribute***
	type	The specific type of designated point whether published by the State, published by the ICAO or created by another agency for convenience of identification etc.	CodeDesignatedPointType	ICAO COORD CNF DESIGNED MTR OTHER	
	location	The geographical location of the designated point.	Point (Object)		
ElevatedPoint (Object)		An AIXM Point derived from GM_Point that includes properties for describing a point with elevation and vertical extent. Used in obstacles, navaids, etc.			
	gml:Point		gml:Point (GML structure)		
GeoBorder (Feature)		A physical or political border.			gml:id
	name	Name of the geoborder.	TextNameType		
	type	A code indicating the type of geographical border. The most common situation is the political boundary between two countries.	CodeGeoBorderType	STATE WATER COAST RIVER BANK *HIGHWAY* *RAIL* OTHER	
	border	The shape (polyline) of the GeoBorder.	Curve (Object)		

Object or Feature	***Element***	***Description***	***DataType***	***Domain Values***	***Attribute***
	annotation	A text note used to describe an aspect of the LayerAndTime not captured in the rest of the model.	Note (Object)		
InformationService (Feature)		A kind of service that consists in the provision of aeronautical, meteorological, traffic and related information to aircraft crew and other actors involved in flight operations, in flight or on the ground.			gml:id
	rank	The order of priority of the service, such as "primary" or "alternate".	CodeFacilityRankingType	PRIMARY SECONDARY ALTERNATE EMERG GUARD OTHER	
	name	A free text name by which the service is identified.	TextNameType		
	groundCommunication	The contact information of the service.	ContactInformation (Object)		
	radioCommunication	The Radio Communication Channel the Service uses.	Feature reference to a RadioCommunicationChannel using xlink:href		
	type	The type of information service provided.	CodeServiceInformationType	INFO	
	serviceProvider	The Unit that provides the Service.	Feature reference to a Unit using xlink:href		
SAA extension to InformationService					

Object or Feature	***Element***	***Description***	***DataType***	***Domain Values***	***Attribute***
	channelAllocation	An object associated specific communication channels with a specific airspace.	RadioCommunicationChannelAllocation (Object)		
LayerAndTime (Object)					
	upperLimit	Upper limit of the block. The data type also allows a special non-numerical value "CEILING", meaning "the top of the airspace. This can useful in the case of Airspace that have a non-constant upper limit.	ValDistanceVerticalType		uom
	upperLimitReference	A code indicating the reference for a vertical distance. Two series of values exist: 1) real distance: from GND, from the MSL, from the WGS-84 ellipsoid 2) pressure distance: QFE, QNH, STD.	CodeVerticalReferenceType		
	lowerLimit	Lower limit of the block. The data type also allows a special non-numerical value "FLOOR" meaning "the bottom of the airspace". This can useful in the case of Airspace that have a non-constant lower limit.	ValDistanceVerticalType		uom

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
	lowerLimitReference	A code indicating the reference for a vertical distance. Two series of values exist: 1) real distance: from GND, from the MSL, from the WGS-84 ellipsoid 2) pressure distance: QFE, QNH, STD.	CodeVerticalReference Type		
	altitudeInterpretation	Indicates how the upper and/or lower altitude values should be interpreted.	CodeAltitudeUseType	ABOVE_LOWER BELOW_UPPER AT_LOWER BETWEEN RECOMMENDED EXPECT_LOWER AS_ASSIGNED OTHER	
	schedule	The times when the vertical layer is affected.	TimeTable (Object)		

Object or Feature	***Element***	***Description***	***DataType***	***Domain Values***	***Attribute***
	annotation	A text note used to describe an aspect of the LayerAndTime not captured in the rest of the model. When describing if the altitudes of the layer are inclusive or exclusive the following should be used: • The propertyName should be set to either “upperLimit” or “lowerLimit”. • The value of the note element of the inner LinguisticNote should be either “INCLUSIVE” or “EXCLUSIVE”.	Note (Object)		
LinguisticNote (Object)		The Note written linguistically.			
	note	The text of the Note.	TextNoteType		
Navaid (Feature)		One or more Navaid Equipment providing navigation services. The Navaid Equipment share business rules like paired frequencies.			gml:id
	name	The long name given to the composite navaid.	TextNameType		
	designator	The coded identifier given to the navaid system.	CodeNavaidDesignator Type		

Object or Feature	***Element***	***Description***	***DataType***	***Domain Values***	***Attribute***
	type	Type of the navaid service.	CodeNavaidServiceType	VOR DME NDB TACAN MKR ILS ILS_DME VORTAC VOR_DME NDB_DME TLS LOC LOC_DME OTHER NDB_MKR	
	location	Graphical location of the navaid (system).	ElevatedPoint (Object)		
Note (Object)		A text note used to describe an aspect of a feature or object not captured in the rest of the model.			
	propertyName	The name of the note. If a general note on the object or feature, this element is empty. 'legalDefinitionType' means the note is the legal definition of the SAA. 'conditionalExclusion' describes the condition in which an exclusion is active for an Airspace Feature.	TextDescriptionType	conditionalExclusion legalDefinitionType	

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
	translatedNote	The Note written linguistically. This will contain the legal definition or generated definition of the SAA.	LinquisticNote (Object)		
OrganisationAuthority (Feature)		A feature used to model various Organisations and Authorities. For example: ATS Organisations, Aircraft Operating Agencies, States, Groups of States, etc.			gml:id
	name	The full official name of the State, Organisation, Authority, aircraft operating agency, handling agency etc.	TextNameType		
	designator	A coded identifier of the organisation, authority, agency or unit. Description: CA= Canada, FAA= Federal Aviation Administration, UK = United Kingdom, ICAO = International Civil Aviation Organization	CodeOrganisationDesignatorType		

Object or Feature	***Element***	***Description***	***DataType***	***Domain Values***	***Attribute***
	type	A code indicating the nature of an authority in terms of its status or business role in ATM. For example: State, group of States, organisation within a State, aircraft operating agency, etc.	CodeOrganisationType	STATE STATE_GROUP ORG INTL_ORG ACFT_OPR HANDLING_AGENCY NTL_AUTH ATS COMMERCIAL OTHER	
	contact	Contact details for the organisation (phone, postal address, e-mail, etc.)	ContactInformation (Object)		
Point (Object)		AIXM Point containing horizontal accuracy data. In AIXM horizontal accuracy is considered a property of the geometry.			gml:id
	gml:pos		gml:pos (GML element)		
RadioCommunicationChannel (Feature)		One or two (communication) frequencies used to provide a service. For one way broadcast (such as ATIS) the frequencyTransmission attribute only will be used.			gml:id

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
	mode	The type of communication channel. 'OTHER' with an annotation will be used to denote UHF.	CodeCommunicationModeType	HF VHF VDL1 VDL2 VDL4 AMSS ADS_B ADS_B_VDL HFDL OTHER	
	rank	A code indicating the role of the communication channel, interms of primary, alternate, emergency, etc.	CodeFacilityRankingType	PRIMARY SECONDARY ALTERNATE EMERG GUARD OTHER	
	frequencyTransmission	The value of the transmission frequency.	ValFrequencyType		uom
	frequencyReception	The value of the reception frequency.	ValFrequencyType		uom
	channel	The identifier of the radio channel on which the communication takes place.	CodeCommunicationChannelType		
	annotation	A text note used to clarify the RadioCommunicationChannel mode if 'OTHER'.	Note (Object)		
RadioCommuncationChannelAllocation (Object)		An object associated specific communication channels with a specific airspace.			

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
	associatedAirspace	The airspace the associated channels apply to.	Feature reference to an Airspace using xlink:href		
	allocatedChannelDetails	The radio communication channels and SAA specific information that are allocated to the associated airspace	SaaRadioCommunicationChannel (Object)		
SaaRadioCommunicationChannel (Object)		A collection of attributes of a RadioCommunicationChannel that are specific to a specific SAA.			
	communicationAllowed	Identifying if a channel is for military or commercial use.	CodeMilitaryStatusType	MIL CIVIL	
	sectors	A list of sectors that the channel is limited to.	TextNameType		
	altitudes	The altitudes the channel is limited to.	TextNameType		
	charted	A flag indicating if there is charting for the channel.	CodeYesNoType		
	associatedChannel	The RadioCommunicationChannel that these attributes applies to.	Feature reference to a RadioCommunicationChannel using xlink:href.		
Surface (Object)		An AIXM surface derived from GM_Surface and extended to include Horizontal Accuracy Properties			
	gml:polygonPatches		gml:polygonPatches (GML object)		

Object or Feature	***Element***	***Description***	***DataType***	***Domain Values***	***Attribute***
Timesheet (Object)		A component of a timetable, which must be specified with only one set of attributes, indicating the working hours of an other element.			
	timeReference	A code indicating the time reference system (for example, 'UTC'). If timeReference is not present, the time is in local time.	CodeTimeReferenceType	UTC UTCW	
	startDate	The start date of the validity of a timesheet.	DateMonthDayType		
	endDate	The end date of the validity of a timesheet.	DateMonthDayType		

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
	day	A code indicating the day the timesheet is referring to.	CodeDayType	MON MON_XHOL TUE TUE_XHOL WED WED_XHOL THU THU_XHOL FRI FRI_XHOL SAT SAT_XHOL SUN SUN_XHOL WORK_DAY BEF_WORK_DAY AFT_WORK_DAY HOL BEF_HOL AFT_HOL ANY OTHER	

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
	dayTil	A code indicating the days affected by a timesheet.	CodeDayType	MON MON_XHOL TUE TUE_XHOL WED WED_XHOL THU THU_XHOL FRI FRI_XHOL SAT SAT_XHOL SUN SUN_XHOL WORK_DAY BEF_WORK_DAY AFT_WORK_DAY HOL BEF_HOL AFT_HOL ANY OTHER	
	startTime	The time of the day when the period described in the timesheet starts.	TimeType		
	startEvent	A coded reference to an event (like sunset or sunrise), the occurrence of which indicates when the period described in the Timesheet starts.	CodeTimeEventType	SR SS OTHER	

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
	startTimeRelativeEvent	The number of minutes before or after the event referred to in the startEvent attribute when the period described in the Timesheet starts.	ValDurationType		uom
	startEventInterpretation	When both the startTime and startEvent values are not NULL, this attribute explains how the combination of the two attributes should be interpreted, i.e. which of the two moments in time is the beginning of the period described by the timesheet.	CodeTimeEventCombinationType	EARLIEST LATEST OTHER	
	endTime	The time of the day when the period described in the timesheet ends.	TimeType		
	endEvent	A coded reference to an event (like sunset or sunrise), the occurrence of which indicates when the period described in the Timesheet ends.	CodeTimeEventType	SR SS OTHER	
	endTimeRelativeEvent	The number of minutes before or after the event referred to in the endEvent attribute when the period described in the Timesheet ends	ValDurationType		uom

Object or Feature	***Element***	***Description***	***DataType***	***Domain Values***	***Attribute***
	endEventInterpretation	When both the endTime and endEvent values are not NULL, this attribute explains how the combination of the two attributes should be interpreted, i.e. which of the two moments in time is the beginning of the period described by the timesheet.	CodeTimeEventCombinationType	EARLIEST LATEST OTHER	
SAA extension of Timesheet					gml:id
	intermittent	Whether or not the usage of the airspace in this timesheet is considered to be intermittent (not expected to be used for all of the scheduled time).	CodeYesNoType	YES NO	
	timeOffset	The time offset from GMT being used in the timesheet. All timesheets for the same SAA should use the same timeOffset.	ValDurationType		uom=”HR”
TimeTable (Object)		An entity used to describe operational hours, working hours, activation hours, hours of watch, etc. .			

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
	workingHours	Code indicating the type of working hours. There are two meanings when workingHours is set to 'NOTAM.' 1) If there are no Timesheets in the Timetable then this means "other times by NOTAM." 2) If there are Timesheets in the Timetable, this means that the specified times are "by NOTAM."	CodeTimetableType	H24 HJ HN HX HO NOTAM TIMSH OTHER	
	sheet	The TimeSheet element of a TimeTable.	Timesheet (Object)		
TrafficSeparationService (Feature)		A kind of service that provides control and separation services, to aircraft in the air and on the ground.			
Unit (Feature)		A generic term meaning variously all types of 'units' providing all types of services. This includes particularly Air Traffic Management (ATM) Units but also units which are not express verbs included in ATM such as SAR, MET, COM etc.			gml:id

Object or Feature	*Element*	*Description*	*DataType*	*Domain Values*	*Attribute*
	name	The full textual name of a unit. This name must be established according to the rules specified by ICAO, viz.: in the official language of the country, transposed into the Latin Alphabet where necessary.	TextNameType		
	type	A type by which the Unit is recognized, usually related to the standard type of services provided by it (e.g. area control center, advisory center, aeronautical information services office).	CodeUnitType	ARTCC MIL MILOPS TRACON TWR OTHER	
	designator	A coded designator associated with the Unit. For example, the ICAO Location Indicator of an ACC, as listed in DOC 7910.	CodeOrganisationDesignatorType		
	military	Indicates whether the Unit is civil, military or joint.	CodeMilitaryOperationsType	CIVIL MIL JOINT OTHER	
	ownerOrganisation	The Organisation/Authority to which the Unit belongs.	Feature reference to an OrganisationAuthority using xlink:href		
	annotation	A text note used to describe an aspect of the Unit not captured in the rest of the model (such as a parent Unit).	Note (Object)		

Appendix D – Accepted Methods of Defining an SAA in GML

AIXM Surface

```
<aixm:Surface gml:id="Surface01">
  <gml:polygonPatches>
    <gml:PolygonPatch>
      <gml:exterior>
      <gml:Ring>
          <gml:curveMember>
            <gml:Curve gml:id="Curve01">
              <gml:segments>
                <gml:LineStringSegment>
                  <gml:pos>-155.5855555555556 61.3994444444444</gml:pos>
                  <gml:pos>-156.4188888888889 61.3827777777778</gml:pos>
                  <gml:pos>-158.2358333333333 61.62</gml:pos>
                  <gml:pos>-158.1025 61.8825</gml:pos>
                  <gml:pos>-156.0022222222222 62.5827777777778</gml:pos>
                  <gml:pos>-155.8022222222222 62.5244444444444</gml:pos>
                </gml:LineStringSegment>
              </gml:segments>
            </gml:Curve>
          </gml:curveMember>
          <gml:curveMember xlink:href="#Curve02"/>
          <gml:curveMember xlink:href="#Curve03"/>
        </gml:Ring>
      </gml:exterior>
    </gml:PolygonPatch>
  </gml:polygonPatches>
</aixm:Surface>
```

Figure F-1

The geometries of an SAA are defined as GML polygons. The AIXM Surface feature contains the GML polygon in the highest level. Within Surface feature is the following structure:

```
<gml:polygonPatches>
        <gml:PolygonPatch>
                <gml:exterior>
```

A gml:exterior element can contain either the gml:LinearRing element or the gml:Ring element.

gml:LinearRing

A gml:LinearRing element contains multiple gml:pos elements that then define the individual points that define a polygon. These points are defined by latitude and longitude in decimal format separated by a space:

```
<gml:pos>-90.5425 38.7750</gml:pos>
```

gml:Ring

A gml:Ring element contains one or more gml:curveMember elements.

A gml:curveMember can contain either a gml:LineString element or a gml:Curve element. Alternatively a gml:curveMember can have a xlink:href attribute that references another GML geometry object in the same message through its gml:id :

```
<gml:curveMember xlink:href="#Curve02"/>
```

gml:LineString

A gml:LineString element contains multiple gml:pos elements that then define the individual points of a line. These points are defined by latitude and longitude in decimal format separated by a space:

```
<gml:pos>-90.5425 38.7750</gml:pos>
```

gml:Curve

A gml:Curve element contains a gml:segments element.

A gml:segments element can have one or more instances of gml:LineStringSegment or gml:ArcByCenterPoint elements. Alternatively it can contain a gml:CircleByCenterPoint element.

gml:LineStringSegment

A gml:LineStringSegment contains multiple gml:pos elements that then define the individual points of a line. These points are defined by latitude and longitude in decimal format separated by a space:

```
<gml:pos>-90.5425 38.7750</gml:pos>
```

gml:ArcByCenterPoint

A gml:ArcByCenterPoint element contains a gml:pos element to represent the point where the arc is centered around, a gml:radius element to represent the distance the arc is from the center point, and a gml:startAngle and gml:endAngle elements to represent where an arc begins and ends with the unit of measure always being degrees:

```
<gml:ArcByCenterPoint numArc="1">
        <gml:pos>-91 39</gml:pos>
        <gml:radius uom="NM">5</gml:radius>
```

```
        <gml:startAngle uom="degree">0.0</gml:startAngle>
        <gml:endAngle uom="degree">45.0</gml:endAngle>
    </gml:ArcByCenterPoint>
```

gml:CircleByCenterPoint

A gml:CircleByCenterPoint element contains a gml:pos element to represent the point where the circle is centered around and a gml:radius element to represent the radius of the circle:

```
    <gml:CircleByCenterPoint numArc="1">
        <gml:pos>-91 39</gml:pos>
        <gml:radius uom="NM">5</gml:radius>
    </gml:CircleByCenterPoint>
```

Using AIXM features as center points

A gml:ArcByCenterPoint or gml:CircleByCenterPoint element can define the position of the center point through a reference to an AIXM Navaid, DesignatedPoint, TouchDownLiftOff, RunwayCentrelinePoint, or AirportHeliport feature. This reference is through the xlink:href attribute of a gml:pointProperty element and must be the value of a gml:id of another GML geometry object:

```
    <gml:CircleByCenterPoint numArc="1">
        <gml:pointProperty xlink:href="#point03"/>
        <gml:radius uom="NM">5</gml:radius>
    </gml:CircleByCenterPoint>
```

AIXM Curve

```
<aixm:Curve gml:id="VID006676645">
  <gml:segments>
    <gml:LineStringSegment>
      <gml:pos>-90.4554 39.1112</gml:pos>
      <gml:pos>-90.45 39.13</gml:pos>
      <gml:pos>-90.46 39.135</gml:pos>
      <gml:pos>-90.44 39.15</gml:pos>
      <gml:pos>-90.475 39.2</gml:pos>
      <gml:pos>-90.51 39.215</gml:pos>
      <gml:pos>-90.485 39.205</gml:pos>
      <gml:pos>-90.53 39.24</gml:pos>
      <gml:pos>-90.54 39.255</gml:pos>
      <gml:pos>-90.61 39.256</gml:pos>
    </gml:LineStringSegment>
  </gml:segments>
</aixm:Curve>
```

Figure F-2

The geometry of an AIXM GeoBorder is defined by an AIXM Curve or an AIXM ElevatedCurve.

An AIXM Curve contains an gml:segments element.

A gml:segments element contains one or more gml:LineStringSegment elements.

A gml:LineStringSegment contains multiple gml:pos elements that then define the individual points of a line. These points are defined by latitude and longitude in decimal format separated by a space:

<gml:pos>-90.5425 38.7750</gml:pos>

AIXM Point or ElevatedPoint

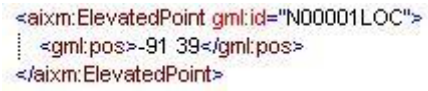

Figure F-3

The location of an AIXM Point or ElevatedPoint is represented by a gml:pos element. This is a point defined by latitude and longitude in decimal format separated by a space:

<gml:pos>-90.5425 38.7750</gml:pos>

AIXM timeSlice

Figure F-4

The abstract timeSlice element of AIXM uses gml to define the valid time of the timeSlice. The begin and end times of the gml:TimePeriod are represented by the gml:beginPosition and gml:endPosition elements. These times are represented by a date or if there is no explicit end time for the timeSlice, then “unknown” is set to the indeterminatePosition attribute.

Accepted GML Elements

The xlink:href attribute must be set to a gml:id of another feature.

Element	***Accepted Child Element***	***Accepted Attributes***
ArcByCenterPoint		numArc
	endAngle	uom = “degree”
	pos	
	pointProperty	xlink:href
	radius	uom
	startAngle	uom = “degree”
CircleByCenterPoint		numArc
	pos	
	pointProperty	xlink:href
	radius	uom
Curve		gml:id
	segments	
curveMember		
	Curve	gml:id
	LineString	gml:id
exterior		
	LinearRing	
	Ring	
LinearRing		
	pointProperty	xlink:href
	pos	
LineString		gml:id
	pointProperty	xlink:href
	pos	
LineStringSegment		
	pointProperty	xlink:href
	pos	
PolygonPatch		
	exterior	
polygonPatches		
	PolygonPatch	
Ring		
	curveMember	xlink:href
segments		
	ArcByCenterPoint	numArc
	CircleByCenterPoint	numArc
	LineStringSegment	
TimePeriod		gml:id
	beginPosition	
	endPosition	indeterminatePosition
validTime		
	TimePeriod	gml:id