

AFTN Terminal System Segment Specification

Flight ATM Systems Ltd.



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Anders Brolien	Flight ATM Ltd. System Architecture Design	1	SC
Peter Venton	Flight ATM Systems Ltd. Application Design	1	SC

Referenced Documents

Reference	Identification	Name
[1]	ICAO DOC 4444	Procedures for Air Navigation Services, Air Traffic Management, Fourteenth Edition — 2001
[2]	Volume II, Communication Procedures including those with PANS status, Sixth Edition October 2001;	Annex 10 to the Convention on International Civil Aviation International Civil Aviation Organization, International Standards and Recommended Practices and Procedures for Air Navigation Services
[3]	GEN-CDP	Flight ATM System Ltd, AFTN Terminal Configuration Data Preparation
[4]	DPS.ET1.ST09-STD-01-01	EUROCONTROL STANDARD DOCUMENT for ATS Data Exchange Presentation (ADEXP) Edition 2.1 Edition Date December 2001
[5]	GEN-USR	AFTN Terminal User Manual

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1 Document Overview

1.1 Identification

Program: <Program Name>
Document Name: AFTN Terminal System Segment Specification
Document Number: GEN-SSS
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1.2 Purpose

This document contains the requirements for the AFTN Terminal application.

1.3 Scope

This document contains requirements that together describe the AFTN Terminal functionality.

1.4 Conventions

The requirements presented within this document are numbered. The requirement numbering schema will take the following form:

<Requirement Number> - <Short Description of Requirement>

<Atomic requirement>

<End of requirement number indicator>

The various items shown above are described in the following list:

- **Requirement Number** – A unique number assigned by the RM tool in which this document is stored.
- **Short Description of Requirement** – A brief textual summary describing the requirement.
- **Atomic requirement** – The textual description that describes the atomic requirement.
- **End of requirement number indicator** – Terminates the atomic requirement description. Using a terminator makes provision for more than one paragraph to be included as part of the description in addition to providing support for automatic extraction of requirements if required using VBA scripts etc. (not discussed further in this document).

An example is shown below:

GEN-SSS-001 – Network status

It shall be possible to transmit an FPL message in ICAO format.

#

The term 'shall' is used to indicate a mandatory function within a requirement. Each requirement contains a single 'shall', i.e. it is atomic. Any supporting text required to clarify a requirement is placed before the requirement and does not use the term 'shall'. Supporting text is regarded as a comment and is not to be construed as a requirement.

2 System Overview

The Flight ATM Systems Ltd. AFTN Terminal Application is designed to receive from and transmit to the AFTN a number of different message types including:

- ATS Messages in both ICAO and ADEXP formats;
- METARs for meteorological data;
- NOTAMs;
- Other plain text messages as required;

The application is implemented using state of the art technological solutions:

- Messages are stored in a COTS XML database;
- The application is implemented in Java™ which provides scalability for future enhancements as well as a reduction in initial production and subsequent maintenance costs due to the high levels of support for the language.

The application paradigm is based on commercial email applications; this paradigm is immediately recognisable from the main application window. The application provides the following functionality:

- Support for processing all ICAO ATS messages defined in [1], (receive and transmit);
- Support for processing ADEXP messages, message processing conforms to the rules defined by EUROCONTROL in [4] (receive and transmit). The ADEXP message titles supported are defined in configuration data at a programming level. Currently changes to the ADEXP configuration data must be made through Flight ATM Systems. Ltd.
- Support for reception and transmission of METAR and NOTAM messages;
- Support for reception and transmission of other free text message carried by the AFTN;
- Archiving of all received and transmitted messages to meet legal retention obligations;

2.1.1 Message Processing

The application aims to reduce operator workload by automating the ATS message filing process as far as possible.

Received ATS (ICAO and ADEXP) messages are parsed for syntax and semantics and saved to the database; erroneous messages are also saved to the database but flagged to users as containing errors; errors do not have to be corrected.

When composing ATS (ICAO and ADEXP) messages for transmission any errors detected during message composition must first be corrected before transmission onto the AFTN. It is not possible to transmit an erroneous message.

The payload of METAR and NOTAM messages is not parsed on reception or transmission, the message header is.

To assist in efficient message composition, message creation is supported with a number of form editors. Context sensitive help is continuously available to users providing an explanation of a field's syntax.

Free text editors are also available in which messages can be entered; these editors must be used for METAR and NOTAM messages or other non-ATS messages. No form editor support is currently available for ADEXP message and these must also be entered by hand if required.

2.1.1.1 Message Parsing

Received and created ATS messages are fully parsed for conformance to ICAO or ADEXP standards as defined in [1] and [4] respectively. The route field (ICAO field 15) is checked for correct syntax and semantics; there is no check with any AIP data to ensure a point lies on a route etc. As much semantic checking is carried out as possible without the availability of AIP data.

Field 18 and 19 are also checked but many fields are not parsed due to the free text nature of many fields. However, fields such as field 18 EET are checked for correct syntax and semantics. The overall concept is to provide syntax and semantic checking wherever ICAO specifies very specific rules (EET and DOF are examples where such rules are clearly defined).

ADEXP messages are parsed for the following:

- That the correct primary fields are present for a given message title;
- That auxiliary terms are syntactically and semantically correct;
- That a primary field contains the correct auxiliary term;
- All parsing rules are implemented as defined in the ADEXP standard given in [4].

Only messages with a priority indicator 'FF' are parsed for ATS message compliance, (this includes ADEXP and ICAO formats); other priority indicators are used for specific message types which, as already stated are not parsed.

The messages parsed are:

- ICAO ATS messages - ACH, ACP, AFP, APL, ARR, CDN, CHG, CNL, CPL, DEP, DLA, EST, FPL, FNM, MFS, RQP, RQS and SPL;
- ADEXP ETFMS messages DES, ERR, FLS, REA, SAM, SLC, SMM and SRM;
- ADEXP ATS messages ACK, MAN, REJ, IACH, IAFP, IAPL, IARR, ICHG, ICNL, IDEP, IDLA, IFPL, IRQP, and IRQS;

2.1.2 System Architecture

This document does not attempt to provide a detailed view of the system architecture; for a more detailed description refer to the document X (TBP). This document does not attempt to propose the ultimate architectural solution, however the implementation does assume a client server architecture where the server (dual redundant configuration) is connected to the AFTN with a number of clients connected to the server. It is foreseen that the clients use a GUI. The GUI is not described in this document and is assumed to be described by the User Manual given in [5].

A simplified view of the architecture is shown in the following figure.

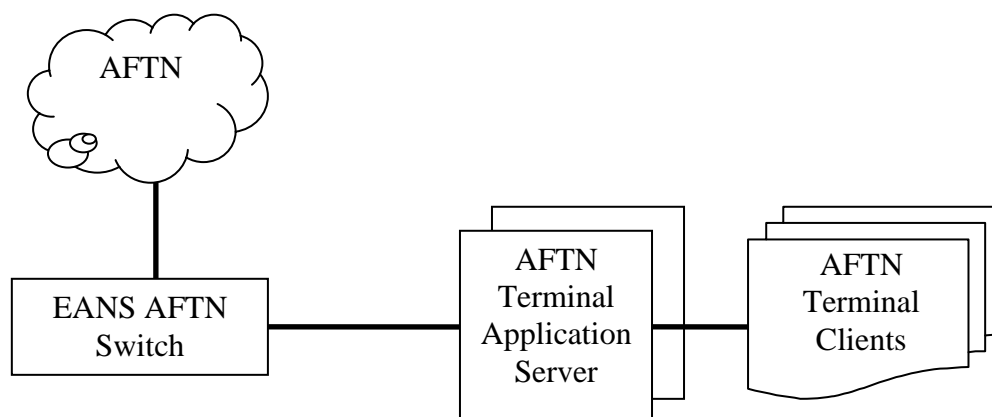


Figure 1 - Architectural Overview

This document describes the functional aspects covering:

- General functions to improve the application user friendliness
- Message reception
- Message transmission
- Message composition

3 Functional Requirements

This section contains the functional requirements for the AFTN Terminal application.

3.1 General

The AFTN Terminal application connects to the AFTN via an AFTN switch which is a proprietary installation at EANS. The connection status is displayed to the end user.

GEN-SSS-001 – Network status

The AFTN Terminal application shall indicate the status of the network connection with the AFTN switch to the end user.

#

3.1.1 Printing

GEN-SSS-002 – Printing

The AFTN Terminal application shall provide support to print any message stored in its database.

#

3.1.2 Help Facility

GEN-SSS-003 – Help

The AFTN Terminal application shall provide context sensitive online help.

#

3.1.3 Error Handling

The user interface is expected to be a GUI; such interfaces facilitate high levels of assistance from the application in indicating erroneous fields in a message. AFTN messages can be quite long and it is critical that a field containing an error is not simply reported to the end user but also that the part of an erroneous field is highlighted so that a user can quickly identify the location of the problem.

In addition the error message should be as clear as possible as to the error.

GEN-SSS-004 – Error messages

The AFTN Terminal application shall display error messages that clearly describe an error and where applicable, provide the expected syntax and/or semantics.

#

GEN-SSS-005 – Error highlighting

The AFTN Terminal application shall highlight an erroneous field when an error is selected.

Note: The assumption here is that the user interface is based on a GUI.

#

GEN-SSS-006 – Error attention

The AFTN Terminal application shall ensure that received messages containing errors are brought to the attention of the end user by providing a display attribute which differentiates erroneous messages from those without errors.

#

3.1.4 Housekeeping

The database containing all messages received and transmitted can be periodically 'house kept'. This ensures that the resource utilisation of the database is kept at a minimum whilst maintaining legally required message retention periods and message recovery obligations.

In order to provide system administrators with the flexibility to schedule housekeeping as well as be able to specify a retention period the function is implemented as a standalone application that connects with a server DB. The function can be run with a time parameter specifying the retention period; any messages older than a specified date and time are deleted.

GEN-SSS-007 – Stale data removal

The AFTN Terminal application housekeeping function shall remove messages from the database older than a date and time specified as a parameter to the housekeeping function.

#

GEN-SSS-008 – Message recording

The AFTN Terminal application shall ensure that all received and transmitted messages are recorded to long term storage where they are retained to meet to the 28 day storage requirement.

#

3.1.5 Message Deletion

GEN-SSS-009 – Message deletion

The AFTN Terminal application shall support manual deletion of a message.

#

3.2 Message Reception

The AFTN terminal is able to receive message from the AFTN. The messages supported include ATS, NOTAM, METAR and other free text messages typically found on the AFTN.

Received messages are grouped based on the priority indicator with ATS messages submitted for comprehensive parsing. ATS message processing is supported in both ICAO and ADEXP formats. The syntax and semantics for ATS messages are checked against the relevant standards given in [1] and [4].

A message can be broadly considered to consist of two parts:

- Message envelope – contains addressing information, priority indicator and filing time;
- Message payload – the message body that contains the operationally relevant data;

3.2.1 Message Envelope Processing

AFTN messages, irrespective whether the message payload is in ICAO or ADEXP format, contains addressing information that precedes the message payload. The definition of the message envelope is given in [2]; the AFTN terminal parses the envelope for all message types and generates an error if any of the envelope data does not comply with that described in [2].

The envelope data includes the following items:

- Priority Indicator
- Destination addressees
- Originator
- Filing time

GEN-SSS-010 – Message envelope parsing

The AFTN Terminal application shall parse the message envelope for all AFTN messages received to ensure compliance with the syntax and semantics given in [2].

#

GEN-SSS-011 – Message envelope fields parsed

The AFTN Terminal application shall parse the following items in the message envelope:

- Priority Indicator
- Destination addressees
- Originator
- Filing time

#

GEN-SSS-012 – Message envelope address data

The AFTN Terminal application shall accept both ICAO and SITA addresses in the addressee and originator fields.

#

GEN-SSS-013 – Message envelope error handling

The AFTN Terminal application shall display an error when a field in the message envelope does not conform to the syntax and semantics presented in [2].

#

GEN-SSS-014 – Message reception alarm

The AFTN Terminal application shall sound an alarm when a message with priority indicator 'SS' is received.

#

3.2.1.1 Priority Indicator Processing

The message priority indicator is used to ascertain the type of message being processed. ATS messages are typically received with priority indicator 'FF'; these messages are the subject of additional parsing for the message payload. Messages are grouped based on the priority indicator for organisational purposes.

GEN-SSS-015 – Priority indicator groups

The AFTN Terminal application shall discriminate between ICAO priority indicators and group messages based upon the priority indicator.

#

GEN-SSS-016 – Supported priority indicators

The AFTN Terminal application shall recognise the following ICAO priority indicators:

- FF - Standard Air Traffic Service (ATS) Message
- SS - Distress message
- DD - Urgent message
- GG - One of the following:
 - Meteorological message
 - Flight Regularity Message
 - Aeronautical Information Services message
- KK - Aeronautical Administrative message.

#

GEN-SSS-017 – Unrecognised priority indicator error

The AFTN Terminal application shall display an error if a message is received with an unrecognised priority indicator.

#

3.2.2 Message Payload Processing

Messages with priority indicator 'FF' are submitted for comprehensive parsing of the message body.

GEN-SSS-018 – FF messages parsed

The AFTN Terminal application shall parse the message payload for AFTN messages received with message priority 'FF'.

#

GEN-SSS-019 – Parsing formats

The AFTN Terminal application ATS message parser shall support parsing in both ICAO and ADEXP formats.

#

GEN-SSS-020 – Supported ICAO ATS messages

The AFTN Terminal application shall support processing for the following ICAO ATS messages:

- ACH - ATC Change message
- ACP - Acceptance message
- AFP - ATC Flight Plan Proposal message
- APL - ATC Flight Plan message
- ARR - Arrival message
- CDN - Coordination message
- CHG - Change message
- CNL - Cancel message
- CPL - Current Flight Plan message
- DEP - Departure message
- DLA - Delay message
- EST - Estimate message
- FPL - Flight Plan message
- FNM - Oceanic message
- MFS - Oceanic message
- RQP - Request Flight Plan message
- RQS - Request Supplementary Flight Plan Data message
- SPL - Supplementary Flight Plan message

#

GEN-SSS-021 – Supported ADEXP ATS messages

The AFTN Terminal application shall support processing for the following ADEXP ATS messages:

- ACK – Message acknowledgement
- MAN – Message processed manually by the IFPS
- REJ – Message rejection

- IACH – ATC Change message
- IAFP – ATC Flight Plan Proposal message
- IAPL – ATC Flight Plan message
- IARR – Arrival message
- ICHG – Change message
- ICNL – Cancel message
- IDEP – Departure message
- IDLA – Delay message
- IFPL – Flight Plan message
- IRQP – Request Flight Plan message
- IRQS – Request Supplementary Flight Plan Data message

#

GEN-SSS-022 – Supported ETFMS messages

The AFTN Terminal application shall support processing for the following ADEXP ETFMS messages:

- DES – De-suspension Message
- ERR – Error Message
- FLS – Flight Suspension Message
- REA – Ready message
- SAM – Slot Allocation Message
- SLC – Slot Requirement Cancellation Message
- SMM – Slot Missed Message
- SRM – Slot Revision Message

#

GEN-SSS-023 – Unrecognised message title error

The AFTN Terminal application shall reject message with an unsupported message title, (i.e. the title is not listed as supported in this document).

#

GEN-SSS-024 – Error handling for ICAO fields

The AFTN Terminal application shall report an error for any fields in a supported ICAO ATS message that do not conform to the syntax and semantics given in [1].

#

GEN-SSS-025 – Error handling for ADEXP fields

The AFTN Terminal application shall report an error for any fields in a supported ADEXP message that do not conform to the syntax and semantics given in [4].

#

3.3 Message Transmission

The AFTN Terminal supports transmission of AFTN messages onto the AFTN. When a message is composed for transmission it is treated in an identical manner as for received messages:

- Messages with priority indicator 'FF' have the message envelope and payload parsed;
- Message with priority indicators other than 'FF' only have the message envelope parsed;

In either case a message must be error free before it can be transmitted.

For details on message reception processing refer to section 3.2 titled 'Message Reception'. For details on the support offered for creating a message for transmission refer to section 3.4 titled 'Message Composition'.

GEN-SSS-026 – AFTN message transmission

The AFTN Terminal application shall support transmission of any AFTN message onto the AFTN.

#

GEN-SSS-027 – Transmission of error free messages

The AFTN Terminal application shall only permit transmission of error free messages.

#

3.4 Message Composition

The AFTN Terminal application supports the creation of new messages; two methods to create messages are supported:

- Free text editor
- Form Editors

The free text editor can be used to create any AFTN message. The form editors are required to reduce message creation time and the number of errors upon message entry. As the form editors require knowledge of a message's structure they are limited to the most common ICAO ATS messages.

To further facilitate rapid message creation a message copy function is provided with which existing messages can be copied, (effectively used as a template) to create a new message. A 'reply to' function is also available which can be used to create a message with a different title from an existing message, i.e. an ARR can be created using an FPL as the source. The new message (i.e. the ARR) need only have the ATA modified.

GEN-SSS-028 – Text editor

The AFTN Terminal application shall provide a text editor with which any AFTN message can be created.

#

GEN-SSS-029 – Form editor

The AFTN Terminal application shall provide form editors for the following ICAO ATS messages:

- ACP, ARR, CDN, CHG, CNL, CPL, DEP, DLA, EST, FPL, RQP, RQS and SPL;

#

GEN-SSS-030 – Message copy

The AFTN Terminal application shall provide a message copy function in order to create new messages.

#

GEN-SSS-031 – Reply to message

The AFTN Terminal application shall provide a 'reply to' function in order to create new messages.

#

GEN-SSS-032 – Composition field initialisation

The AFTN Terminal application shall initialise the 'Originator' and 'Addressee' fields when a new message is:

- Manually created using a blank form editor;

- Manually created using a blank text editor;
- Created using the 'copy' function;
- Created using the 'reply to' function;

#

3.5 Message Categorization and Grouping

As already described in GEN-SSS-015 the AFTN Terminal application groups received messages based on the priority indicator. In addition to this automatic grouping the system also supports the manual categorization of messages (received or manually entered) into groups. If this function is visualised in a GUI then it takes the form of 'folders' into which one or more messages can be placed.

The folders are maintained in the database and can be manually created, modified and deleted.

GEN-SSS-037 – Manual message categorization

The AFTN Terminal application shall support the manual categorization of one or more messages into groups and maintain the group structure in its database.

#

3.6 Statistics

The AFTN Terminal application provides statistics about data received and transmitted.

GEN-SSS-038 – Statistics

The AFTN Terminal application shall provide as a minimum the following statistics data:

- Number of messages received;
- Number of messages transmitted;
- The uptime of each client;
- The uptime of each server;

#

4 Non-Functional Requirements

This section describes non-functional requirements for the AFTN Terminal Application.

4.1 Support for Degraded Mode Operation

The AFTN Terminal application provides a 'hot standby' to take over the servers functions should a catastrophic failure occur with the main server. The descriptions in this section refer to the server instances as follows:

- EXEC – This is the server currently operating as the primary server. All data received and transmitted is made available to the standby server for replication purposes.
- STBY – This is the server shadowing the EXEC server; should the EXEC fail this server takes over and acts as the primary server.

GEN-SSS-033 – Hot standby functionality

The AFTN Terminal application shall provide hot standby functionality for the applications server.

#

GEN-SSS-040 – Server recovery

The AFTN Terminal application shall provide the ability to restart a server using an existing database.

#

4.2 System Configuration

This section describes requirements for configuring the application. This section assumes that the end user interface is a GUI.

GEN-SSS-034 – Window configuration

The AFTN Terminal application shall provide a mechanism to configure the following attributes for all windows implemented by the application:

- Width
- Height
- Position with respect to the Window managers desktop
- Whether or not a window can be resized

#

GEN-SSS-035 – Look and feel

The AFTN Terminal application shall provide a means to configure the 'look and feel' to ensure it conforms to the underlying window manager 'look and feel'.

#

GEN-SSS-036 – Network configuration

The AFTN Terminal application shall provide a mechanism with which to define the network interface that includes:

- IP address
- Port number

#

GEN-SSS-039 – Message capacity

The AFTN Terminal application shall be able to store, process and continue normal operations with MAX_MESSAGES messages.

#

5 System Parameters

This section contains system parameters and other constants used in the requirements contained within this document.

Parameter Name	Description	Default Value	Min	Max
MAX_MESSAGES	Maximum number of messages that the system can store and process while continuing normal operations	To be specified by customer	N/A	N/A

6 Appendix A – Acronyms

Acronym	Description
A	
ACH	ATC Change Message (ICAO format, CFMU special)
ACK	EUROCONTROL Operational Reply Message indicating a message was successfully accepted by EUROCONTROL and automatically processed
ACP	Acceptance message (OLDI)
ADEXP	ATS Data Exchange Presentation
AFP	ATC Flight Plan proposal Message (ICAO)
AFTN	Aeronautical Fixed Telecommunications Network
AIP	Aeronautical Information Publication
APL	ATC Flight Plan Message (ICAO)
ARR	ICAO ATS Arrival Message
ATA	Actual Time of Arrival
ATC	Air Traffic Control
ATM	Air Traffic Management
ATS	Air Traffic Service
C	
CDN	Coordination Message (OLDI)
CDP	Configuration Data Preparation
CHG	ICAO ATS Change Message
CNL	ICAO ATS Cancel Message
COTS	Common Off The Shelf
CPL	Configuration Data Preparation
D	
DEP	ICAO ATS Departure Message
DES	De-Suspension Message (ETFMS)
DLA	ICAO ATS Delay Message
DOF	Date of Flight
E	
EET	Estimated Elapsed Time
ERR	ETFMS Operational Reply Message
EST	Estimate Message (ICAO)
ETFMS	Enhanced Tactical Flow Management System
EUROCONT	European Organisation for the Safety of Air Navigation
ROL	
F	
FLS	Flight Suspension Message (ETFMS)
FNM	Oceanic message
FPL	Flight Plan Message (ICAO)
G	
GUI	Graphical User Interface
I	
IACH	EUROCONTROL ATC Change Message
IAFP	EUROCONTROL ATC Flight Plan Proposal Message
IAPL	EUROCONTROL ATC Flight Plan Message
IARR	EUROCONTROL ATS Arrival Message
ICAO	International Civil Aviation Organisation
ICHG	EUROCONTROL ATS Change Message
ICNL	EUROCONTROL ATS Cancel Message
IDEP	EUROCONTROL ATS Departure Message
IDLA	EUROCONTROL ATS Delay Message
IFPL	EUROCONTROL ATS Flight Plan Message
IFPS	Integrated Initial Flight Plan Processing System
IP	Internet Protocol

Acronym	Description
IRQP	EUROCONTROL Request Flight Plan Message
IRQS	EUROCONTROL Request Supplementary Information
K	
M	
MAN	EUROCONTROL Operational Reply Message indicating a message received by EUROCONTROL required manual processing
METAR	Meteorological Aviation Routine Report
MFS	Oceanic message
N	
NOTAM	Notice To Airmen
P	
PANS	Procedures for Air Navigation Services
R	
REA	Ready Message (ETFMS)
REJ	EUROCONTROL Operational Reply Message indicating a message was rejected by EUROCONTROL and returned to sender
RM	Requirement Management
RQP	Request Flight Plan message
RQS	Request Supplementary Information (ICAO)
S	
SAM	Slot Allocation Message (ETFMS)
SC	Soft Copy
SITA	Société Internationale de Télécommunications Aéronautiques
SLC	Slot Requirement Cancellation Message (ETFMS)
SMM	Sector Monitor Message (RMCDE)
SPL	Supplementary Flight Plan message (ICAO)
SRM	Slot Revision Message (ETFMS)
SSS	System Segment Specification
T	
TBD	To be decided
TBP	To be provided
V	
VBA	Visual Basic Script
X	
XML	Extensible Mark up Language