International Civil Aviation Organization

Fifth Meeting of MID Region AIM Database Task Force
Fourth Meeting of MIDANPIRG AIM Sub-Group

MIDAD TF/5 and AIM SG/4
(Cairo, Egypt, 13-15 February 2018)

Agenda Item 5: AIM Planning and Implementation in the MID Region

GUIDANCE ON POSTING OF AERONAUTICAL INFORMATION ON THE WEB

(Presented by the Secretariat)

SUMMARY

This paper presents actions taken for the development of a guidance on posting of aeronautical information on the web.

Action by the meeting is at paragraph 3.

REFERENCES

- AIM SG/3 Report

1. INTRODUCTION

1.1 In order to improve the timeliness of aeronautical information and in accordance with the ICAO Guidelines on the use of Public Internet for Aeronautical Applications (Doc 9855), the MIDANPIRG/11 meeting, through Conclusion 11/39, encouraged States to use the internet for the advance publication of the Aeronautical Information Products.

2. DISCUSSION

2.1 AIS websites are one of main sources of States' aeronautical information for users. The meeting may wish to note that 10 out of the 15 MID States have currently AIS websites. However, only 6 States are making their up-to-date AIPs available on the web.

2.2 The AIM SG/3 meeting recalled that some Guidelines on the use of Public Internet for Aeronautical Applications are included in the ICAO Doc 9855. However, the meeting recognized the need for additional guidance with regard to the posting of aeronautical information products on the web.

2.3 As a follow-up action, ICAO MID Office initiated communication with Jeppesen and EUROCONTROL regarding their experience related to the development of the "*EUROCONTROL Guidelines for AIP distribution on the internet*" (**Appendix A**). After careful review of the mentioned document and considering that similar topics and issues were included in that document, it was found that the document could be useful for the MID Region.

3. ACTION BY THE MEETING

3.1 The meeting is invited to review and encourage States to use the guidance related to posting of aeronautical information on the internet, included in the "*EUROCONTROL Guidelines for AIP distribution on the internet*".

EUROCONTROL

EUROCONTROL Guidelines for Aeronautical Information Publication (AIP) distribution on the Internet

Edition: 1.0
Edition date: October 2017
Reference nr: EUROCONTROL-GUID-165
ISBN: 978-2-87497-089-4

EUROPEAN ORGANISATION
FOR THE SAFETY OF AIR NAVIGATION

EUROCONTROL

EUROCONTROL Guidelines for Aeronautical Information Publication (AIP) distribution on the Internet

DOCUMENT IDENTIFIER : EUROCONTROL-GUID-165

Edition Number	**:**	**1.0**
Edition Date	**:**	**October 2017**
Status	**:**	**Released Issue**
Intended for	**:**	**General Public**
Category	**:**	**EUROCONTROL Guidelines**

DOCUMENT CHARACTERISTICS

TITLE		
EUROCONTROL Guidelines for Aeronautical Information Publication (AIP) distribution on the Internet		
	Publications Reference:	GUID-165
	ISBN Number:	978-2-87497-089-4
Document Identifier	**Edition Number:**	1.0
EUROCONTROL-GUID-165	**Edition Date:**	October 2017

Abstract

These guidelines have been designed by the EUROCONTROL AIM/SWIM Team to support the requirements of Data Services Providers (DAT) and assist the Aeronautical Information Services Providers (AISP) in developing and adapting their systems for the distribution of the State AIP on the Internet as an official and authoritative source of information.

Keywords

AIP | Internet | DAT | AIRAC

Contact Person(s)	Tel	Unit
A. PETROVSKY	+ 32 2 729 3269	ATM/STR/SWM

STATUS, AUDIENCE AND ACCESSIBILITY					
Status		**Intended for**		**Accessible via**	
Working Draft	☐	General Public	☑	Intranet	☐
Draft	☐	EUROCONTROL	☐	Extranet	☑
Proposed Issue	☐	Restricted	☐	Internet (www.eurocontrol.int)	☑
Released Issue	☑				

DOCUMENT APPROVAL

The following table identifies all management authorities who have successively approved the present issue of this document.

AUTHORITY	NAME AND SIGNATURE	DATE
ATM/STR/SWM Unit Editor	Mr Alexandre Petrovsky	16.10.2017
Head of ATM/STR/SWM Unit	Mr Dennis Hart	18.10.2017
Head of DPS/STAN Unit	Mr Peter Green	20/10/2017
Director DPS	Mr Adriaan Heerbaart	20/10 - 17
Director General	Mr Frank Brenner	6/11/2017

DOCUMENT CHANGE RECORD

The following table records the complete history of the successive editions of the present document.

EDITION NUMBER	EDITION DATE	REASON FOR CHANGE	PAGES AFFECTED
1.0	October 2017	Released issue agreed by the AIM/SWIM Team, editorial corrections, addition of EAD PAMS Pro	All Sections 1&2 Section 3.1

Publications
EUROCONTROL Headquarters
96 Rue de la Fusée
B-1130 BRUSSELS

Tel: +32 (0)2 729 4715
Fax: +32 (0)2 729 5149
E-mail: publications@eurocontrol.int

CONTENTS

EXECUTIVE SUMMARY

These guidelines have been designed by the EUROCONTROL AIM/SWIM Team to support the requirements of Data Services Providers (DAT) and assist the Aeronautical Information Services Provider (AISP) in developing and adapting their systems for the distribution of the State AIP on the Internet as an official and authoritative source of information.

1. Introduction

1.1 Purpose/Objective of the document

The purpose of this document is the provision of guidance and best practices to help Aeronautical Information Service Providers (AISPs) in distributing the State AIP on the Internet as an official/authoritative source of information, while satisfying the needs of the DAT providers.

1.2 EUROCONTROL Guidelines

EUROCONTROL guidelines, as defined in the EUROCONTROL Regulatory and Advisory Framework (ERAF), are advisory and contain:

"Any information or provisions for physical characteristic, configuration, material, performance, personnel or procedure, the use of which is recognised as contributing to the establishment and operation of safe and efficient systems and services related to ATM in the EUROCONTROL Member States."

Therefore, the application of the EUROCONTROL Guidelines is not mandatory.

In addition, the EUROCONTROL Regulatory and Advisory Framework specifies that:

"EUROCONTROL Guidelines may be used, inter alia, to support implementation and operation of ATM systems and services, and to:

- *complement EUROCONTROL Rules and Specifications;*
- *complement ICAO Recommended Practices and Procedures;*
- *complement EC legislation;*
- *indicate harmonisation targets for ATM Procedures;*
- *encourage the application of best practice;*
- *provide detailed procedural information."*

These EUROCONTROL Guidelines have been developed under the EUROCONTROL Regulatory and Advisory Framework (ERAF) and are maintained by EUROCONTROL in accordance with this Framework.

1.3 Structure of the document

This document comprises the following chapters:

a) Chapter 2 describes the problems and requirements.

b) Chapter 3 provides guidance for AIP distribution on the Internet.

c) Chapter 4 includes examples of identified best practices.

d) Chapter 5 describes the long-term perspectives.

1.4 Applicability

This document is intended to be read and used by all Air Navigation Service Providers (ANSPs) in the EUROCONTROL Member States (41) and Comprehensive Agreement States (2).

EUROCONTROL makes no warranty, either implied or expressed, for the information contained in this document, neither does it assume any legal liability or responsibility for the accuracy, completeness or usefulness of this information.

1.5 Conventions

The following conventions are used in section 3.3 for denoting requirements, recommendations and optional elements:

- '**must**' indicates a statement, the compliance with which is mandatory to achieve the implementation of these EUROCONTROL Guidelines.
- '**should**' indicates a recommendation or best practice, which may or may not be applied.
- '**may**' indicates an optional element.

1.6 Definitions

'Data services (DAT) provider' means an organisation that processes aeronautical data for use on aircraft and/or provides an aeronautical database for use on aircraft applications/equipment.

1.7 Abbreviations

Term	Definition
AIC	Aeronautical Information Circular
AIM	Aeronautical Information Management
AIRAC	Aeronautical Information Regulation And Control
AIS	Aeronautical Information Service
AISS	Aeronautical Information Systems Security
AISP	Aeronautical Information Services Provider
AIP	Aeronautical Information Publication
AMDT	Amendment to AIP
ANSP	Aeronautical Navigation Services Provider
ATM	Air Traffic Management
CD	Compact Disc
CRC	Cyclic Redundancy Check
CSV	Comma Separated Values
DAT	See definition in 1.6
DO	RTCA Document
DVD	Digital Versatile Disc
EC	European Commission
ECAC	European Civil Aviation Conference
ED	EUROCAE Document
ERAF	EUROCONTROL Regulatory and Advisory Framework
EUROCAE	European Organisation for Civil Aviation Equipment
FTP	File Transfer Protocol
HMI	Human-Machine Interface
HTML	Hypertext Markup Language
HTTP	Hypertext Transport Protocol
HTTPS	Secure HTTP
IAIP	Integrated Aeronautical Information Package
ICAO	International Civil Aviation Organization
IP	Internet Protocol
ISBN	International Standard Book Number
ISO	International Standards Organization
JSON	JavaScript Object Notation
MET	Meteorological services for air navigation
MD5	Message Digest 5 Algorithm
NOTAM	Notice to Airmen
PDF	Portable Document Format
PKI	Public Key Infrastructure

RTCA	Radio Technical Commission for Aeronautics
SESAR	Single European Sky ATM Research
SHA	Secure Hash Algorithm
SSL	Secure Socket Layer
SUP	AIP Supplement
SWIM	System-Wide Information Management
SWIM-TI	SWIM Technical Infrastructure
TCP	Transmission Control Protocol
TLS	Transport Layer Security
WCMS	Web content management system
XML	Extensible markup Language
ZIP	Compressed File

1.8 Reference Material

	Document type	Document title
EUROCONTROL AIM/SWIM Team-8	Action Paper (AP03)	AIS website disclaimers action
EUROCONTROL AIM/SWIM Team-9	Information Paper (IP01)	AIMSWIM Team-8 ACT 01 and 02
EUROCONTROL AIM/SWIM Team-9	Action Paper (AP05)	AIS website disclaimer
EUROCONTROL AIM/SWIM Team-10	Slides	Disclaimers Possible Solutions
EUROCONTROL AIM/SWIM Team-11	Slides	Use of disclaimers on AIS websites
EUROCONTROL AIM/SWIM Team-12	Action Paper (AP04)	Guidance AIP distribution Internet

1.9 Acknowledgements

These guidelines are the result of the joint efforts of the AIM/SWIM Team's Action Group and the experts who have made contributions to the Action Group. Without their commitment and support, this work would not have come to fruition.

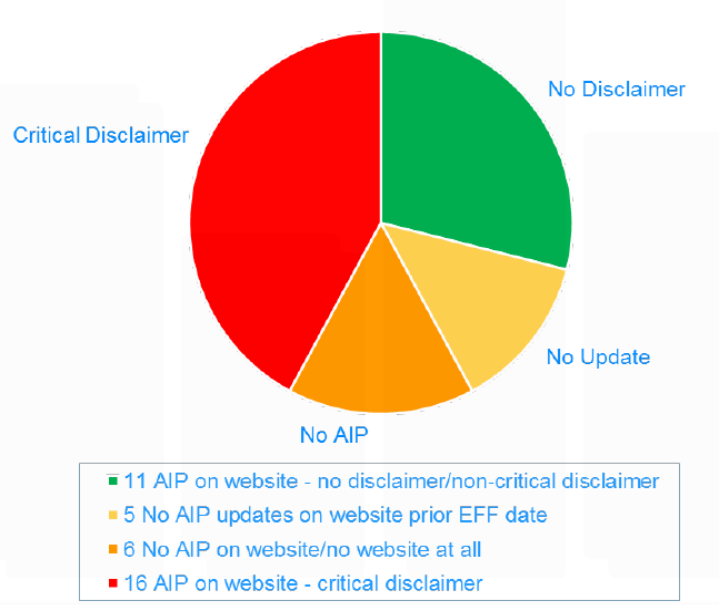
Members of the AIM/SWIM Team's Action Group

	Name	Company
Mr	Jonas Berli	Lufthansa Systems
Ms	Szilvia Exterde	Lufthansa Systems
Mr	Javier Fenoll Rejas (Lead)	Enaire
Ms	Christine Groos	Jeppesen
Mr	Christoph Kleiner	Lufthansa Systems
Mr	Volker Meyer	Jeppesen
Mr	Oula-Lo Paltto	ANS Finland
Mr	Alexandre Petrovsky (Secretary)	EUROCONTROL
Mr	Michael Sauter	Lufthansa Systems
Ms	Marit Sormus	NAVBLUE
Mr	Frank Wigold	Lufthansa Systems

2. Problems and requirements

By the end of 2015, most AISPs were using disclaimers on their AIS websites, thus preventing the use of electronic publications available online for operational use by the DAT providers.

The graph below provides the breakdown of all AISP websites in the ECAC region (end 2015) from the DAT provider perspective of the operational usefulness of the information provided.



This affects the work of DAT providers as they:

a) find the period available between the database cut-off date (20 days before the AIRAC effective date) and the latest delivery date for postal amendments (28 days before the effective date) insufficient to allow the processing, verification and validation of all State aeronautical information amendments, since the data volume has increased every year by 20%,

b) would prefer to use the online electronic State aeronautical information and amendment service, which is in most cases available earlier than the paper version (42 days in advance of the effective date), but cannot make use of it in the absence of authorisation from the States concerned (disclaimers restricting the use of online aeronautical information),

c) experience difficulties using the available electronic online State aeronautical information amendment service owing to the absence of proper notification processes for updates/changes similar to those used for hard copies.

2.1 Reasons for current website disclaimers

After contacting several AISPs (April-June 2016), the following reasons for publishing their AIPs on the website as non-official/non-authoritative (adding a disclaimer) were identified:

a) Protection from legal liability – may vary from State to State.

b) Technical reasons (e.g. security, caching browsers and intermediate servers, knowledge).

c) Financial reasons (difficult to calculate the AISP share of the total ANSP Internet usage cost).

d) Unawareness of disclaimer existence, and conservative attitude towards digital AIP distribution on the Internet.

e) Absence of sufficient guidance material (request for industry-recognised best practices).

f) Absence of clarity on possible required functionalities (library, website or applications).

g) Absence of process that guarantees that all published AIP products are identical. AISPs have their history with paper-based processes, and moving to the digital environment often requires running these processes in parallel, leading to inconsistencies.

h) Lack of ability to check that a certain file downloaded locally by the customers was online at a certain time, and that it was actually published by the AISP.

i) Lack of appropriate data quality control processes that state that AISPs are responsible for clearly expressing their requirements to their solution providers and verifying the solutions with audits.

j) AIS provider is not accredited by the State as an Internet aviation service provider (ref ICAO Doc 9855).

2.2 Requirements from DAT providers

The following items list the DAT providers' needs for efficient use of the AISP information provided online:

- The DAT providers should be authorised to use the online electronic version of the AIP (incl. AMDT, SUP, AIC and NOTAM summaries), i.e. there should be no disclaimers for operational use by the DAT providers.
- The AISPs should provide their electronic version of the AIRAC amendments online at least 42 days (56 days for major changes) in advance of the effective date.
- The AISPs should notify the DAT providers of any updates and/or corrections to the already released State aeronautical information published on the Internet (AIP, AIRAC amendments, regular amendments, Supplements, AICs, etc.).
- In order to ensure data consistency between data published using different publication methods/formats, changes before the next AIRAC cycle to data already published in AIRAC documents should only be published by NOTAMs, and the physical updating of the affected publications should only be carried out simultaneously in all methods/formats in the subsequent AIRAC documents' amendment cycles.
- The AIPs in pdf should be provided as unlocked files with copy and print functions enabled, embedded fonts and with graphics and text not being incorporated as a picture or as a scan but e.g. as layers or vectors.

Note: While considering AIP distribution on the Internet a good and desirable practice, these guidelines do not impose additional obligations on AIS providers, as DAT providers will effectively perform their function as long as the AIP (e.g. in electronic format on DVD/CD or in paper format) reaches them at least 42 days (56 days for major changes) in advance of the effective date.

2.3 Relevant requirements from ICAO Annex 15

It is important to stress that ICAO Standards and Recommended Practices must be followed also for AIP distribution on the Internet; there follows below the list of the standard and recommended practices extracted from Annex 15 (AMDT 38), considered more relevant in the context of this document:

2.1.4 Each Contracting State shall ensure that the aeronautical data and aeronautical information provided are complete, timely and of required quality in accordance with 3.3.

3.3.3.2 The integrity of aeronautical data shall be maintained throughout the data process from survey/origin to distribution to the next intended user (the entity that receives the aeronautical information from the aeronautical information service provider). […]

3.5.2 Electronic aeronautical data sets shall be protected by the inclusion in the data sets of a 32-bit cyclic redundancy check (CRC) implemented by the application dealing with the data sets. This shall apply to the protection of the integrity classification of data sets as specified in 3.3.3.

3.6.2 Where aeronautical data and aeronautical information are provided in multiple formats, processes shall be implemented to ensure data and information consistency between formats.

3.7.5 Each quality management system shall include the necessary policies, processes and procedures, including those for the use of metadata, to ensure and verify that aeronautical data are traceable throughout the aeronautical information data chain so as to allow any data anomalies or errors detected in use to be identified by root cause, corrected and communicated to affected users.

6.1.1 Information concerning the circumstances listed in Appendix 4, Part 1, shall be distributed under the regulated system (AIRAC), i.e. basing establishment, withdrawal or significant changes upon a series of common effective dates at intervals of 28 days, including 14 January 2010. The information notified therein shall not be changed further for at least another 28 days after the effective date, unless the circumstance notified is of a temporary nature and would not persist for the full period.

2.4 Summary of evidence requirements

In view of the current ICAO requirements and the needs of the DAT providers, the AISP distributing official/authoritative AIPs on the Internet should adapt its processes in order to provide evidence of the following:

- Authenticity: evidence that the document/data is being published exclusively by the competent authority officially recognised by the State for aeronautical data provision.
- Integrity: evidence that the document/data is complete and was not modified after creation.
- Validity: evidence of the period for which the content is valid, evidence of the time when the document was published and when it is effective.
- Traceability: evidence that certain content was available at a certain point in time and can be tracked back to the originator.
- Timeliness: AIRAC amendment is available at least 42 (56 for major changes) days before the effective date.
- AIRAC rules: No changes will be made to the original document after it has been published. Changes to data between AIRAC dates can only be made by NOTAMs.
- Consistency between products: Evidence that data for all distribution methods and formats are derived from the same aeronautical source (e.g. all published formats of an AIRAC AMDT such as a DVD or a PDF file on the website, as well as the paper copy, contain exactly the same information).
- Assurance: The AISP assures that the AIP published on the Internet can be used as an authoritative source for their national AIP publication. (Different from current disclaimers stating that the content on the Internet can only be used for information or that the AIP on the Internet is not warrantied for integrity, accuracy and completeness and is not considered reliable).

3. Guidance for AIP distribution on the Internet

3.1 Planning considerations

When planning or assessing AIP distribution on the Internet in order to ensure that it is provided as an official/authoritative source of aeronautical information, the AISP should:

- Analyse the AIP production process to ensure that all possible different formats are coherent.
- Have available the proper technical infrastructure to distribute the AIP on the Internet.
- Define/analyse the process by which the AIP content is uploaded to the Internet, to ensure that it maintains its integrity.
- Define/analyse the publishing process to ensure that the content is available on the Internet at the proper point in time.
- Conduct a safety analysis if the current systems or processes need to be adapted for AIP distribution on the Internet.
- Ensure proper training of operational personnel.

The following guidelines provide a series of options for further implementing these processes as well as ways of mitigating the risks associated with certain identified threats. However, they are not meant to all be mandatory. Each AISP will select the options best suited to its needs or define its own. For example, some AISP may consider using other existing platforms for distribution of their AIP on the Internet such as the EASA-certified EAD PAMS Pro which includes already in its processes all the requirements described in Section 2.4.

Section 4 of this document provides practical examples of application to specific AISPs as best practice material.

3.2 Technical guidance

This guidance does not provide a detailed technical description of the various technologies to be used; however, the following reference material may be useful:

- ED-201: Aeronautical Information Systems Security (AISS) framework guidance (December 2015)
- SESAR SWIM yellow profile, D42-004 - SWIM-TI Yellow Profile Technical Specification 3.0 (December 2014)
- Eurocae ED-76A/ RTCA DO-200B standards for processing aeronautical data (June 2015)
- ICAO Doc 9855 Guidelines on the Use of the Public Internet for Aeronautical Applications (2005)

3.3 Guidance and best practices

According to quality management system best practices, it is recommended that distribution processes, available systems and relevant decisions are recorded in policies or procedures which are then re-assessed and reviewed regularly and in particular when new threats to Internet distribution are identified.

The following paragraphs contain guidance material for AIP distribution on the Internet. They do not – under any circumstances – substitute/replace any of the ICAO Annex 15 provisions.

Availability

Availability could be threatened by the planned or unplanned system outage caused by maintenance, hardware malfunctions, security attacks, etc.

A careful evaluation of expected demand has to be performed in order to ensure that the appropriate hardware and sufficient bandwidth is available, taking into account more than probable peak requests on AIRAC publication dates (e.g. based on the number of AIP subscriptions).

Making the complete AIP available as a downloadable package can also help with content unavailability incidents; once downloaded by users, it may be used offline. However, DAT providers prefer (for the sake of efficient processing of data) Internet availability of AIRAC publications, including the Amendment service.

The infrastructure (hardware and software) must as a minimum be protected against:

- Service Attacks
- Service Utilisation above maximum levels

High-availability infrastructure must be considered (duplicated sites or cloud services).

A maintenance plan for the infrastructure must be available, together with a backup (contingency) policy, fault recovery plan (off-site storage for archive disaster recovery purposes) and supervision process.

The supervision process must be established in order to warn of unexpected unavailability, using the following metrics:

- Service Time
- Number of Requests
- Time of Last Request
- Number of Failed Requests
- Number of Successful Requests
- Maximum Response Time
- Average Response Time

The maintenance, patch and upgrade policies must take into account the AIRAC publication and effective date in order to maintain highest availability on those dates.

Authenticity and confidentiality

Authenticity could be threatened by a non-legitimate change of published content.

HTTPS over TCP, where confidentiality, integrity, authenticity and authorisation are provided in the transport protocol layer (or stronger mechanisms) should be used for AIP distribution on the Internet.

Regular updates of software to apply security patches must be performed at least every 3 months. It is recommended to establish a process to apply security patches as soon as they are released.

Deployment of proxy servers and firewalls must be planned in order to prevent direct access to the data store.

Role Based Access Control must be implemented. Only authorised connections are permitted.

The authentication policy, when using a username/password pattern, must provide rules on password minimum requirements: length, use of symbols and alphanumeric characters.

A supervision process must be put in place and have mechanisms to detect, report and handle the following incidents:

- Denial of Service
- Intrusion
- Malicious or unauthorised software installation
- Reconnaissance (e.g. port scanning)
- Physical damage
- Information compromises
- Software failure (with security implications)

Once an incident has occurred, a report must be drawn up in order to avoid a future recurrence, including

- Causes
- Impact
- Actions performed (step by step description)
- Consequences
- Mitigations
- Status

Vulnerability assessments must be performed at least once a year.

A mechanism to alert AIP users of detected unauthorised published files must be defined. Once an unauthorised content has been detected on the Internet, customers must be alerted, with actions listed to perform content validation.

This alerting service could be provided via email to all subscribers as an instrument of pre-information, to be followed by authorised publication as soon as possible.

A mechanism to perform a regular assessment of the authenticity of published AIP content must be defined and performed at least once a year, e.g. by CRC checks on the published files.

The Public Key Infrastructure (PKI) may also be used to ensure file authenticity, e.g. X.509 PKI.

Integrity

Integrity could be threatened by degradation during network transmission.

HTTPS over TCP, where confidentiality, integrity, authenticity and authorisation are provided in the transport protocol layer (or stronger mechanisms) should be used for AIP distribution on the Internet.

Additional integrity mechanisms should be considered: CRC values for published AIP files may be made available to users. At least 32-bit CRCs must be used. SHA-2 or SHA-3 algorithms are recommended.

The Public Key Infrastructure (PKI) may also be used to ensure file authenticity, e.g. X.509 PKI.

AIS as an Internet aviation service provider

Typically the final delivery of Internet content to customers depends on a number of providers, i.e. Internet service providers, which are outside the control of the AISP. This is in fact a similar situation as for traditional AIP postal distribution with regard to the postal delivery company, so the same principles apply and are discussed in this document.

If so requested by a State, the guidance in this document could be used by a service provider for accreditation as evidence of following best practices on confidentiality, integrity, authenticity and availability as regards the delivery of AIPs via the Internet (ICAO Doc 9855 para 2.3.2).

Proper change management and coherence between products

Even when Internet publication can be immediate and instantaneous, there are a number of operational requirements on aeronautical information distribution which demand adherence to AIP, AIRAC and NOTAM publication processes.

AIP content on the Internet must not be changed outside the AIRAC rules. Only NOTAMs must be used to warn of changes in data.

Integrity between AIP product formats/distribution channels has to be guaranteed. AISP procedures have to guarantee that all sources of official AIP data remain synchronised and unchanged during the validity period of the publication.

If the AISP provides the AIP in more than one format, e.g. paper, PDF and HTML, all AIP product versions (i.e. different formats) should have the same production process, with the only changes in the output format being at the latest possible stage of the production process (e.g. only one product source document or database, multiple output formats; e.g. one document that is edited, reviewed and verified, then exported to HTML and PDF for two distribution versions). Following this process, the content of all product versions will be identical and would therefore be applicable as official/authoritative.

Where no single production process is applicable to all AIP product versions, careful implementation of quality control processes and cross checks must be established in order to guarantee the required level of integrity between all product versions.

Validity

If more than one AIP amendment is made simultaneously available by an AISP on the Internet, the validity period of each amendment must be clear to users. This could be achieved by using time stamps and/or incremental revision numbers (e.g. if a currently valid AIP or an AIP or AMDT that will be valid in the future or has been valid in the past is made available at the same time).

Acknowledgeable alerts should be provided to users when accessing non-valid AIP versions.

Traceability

Traceability on this document is to be understood for the processes these guidelines apply to. Full traceability can only be achieved on the full data chain, which is beyond the scope of this document.

The quality management system in place at the AISP must maintain records that enable traceability checks on the AIP content published on the Internet, e.g. CRC control sheets, content management system logs, etc. This enables the AISP to demonstrate that certain content was on the Internet at a certain moment.

An offline back-up copy of the AIP content on the Internet must be archived for legal recording purposes.

Timeliness

AISP procedures must guarantee that AIPs are available on the Internet at least 42 days before the effective date (56 days for major changes).

Publication in PDF

If published in PDF format, AIP pages must be prepared, stored and published in a way that enables copy/paste and printing of content. The graphics and text are not incorporated in the PDF file as a picture or scan but e.g. as layers or vectors and all used fonts are embedded.

In any case, as PDF is a format optimised for human readability, moving towards AIP data distribution as data sets (e.g. XML, CSV, JSON, etc.) will enable much more efficient data processing mechanisms in the future.

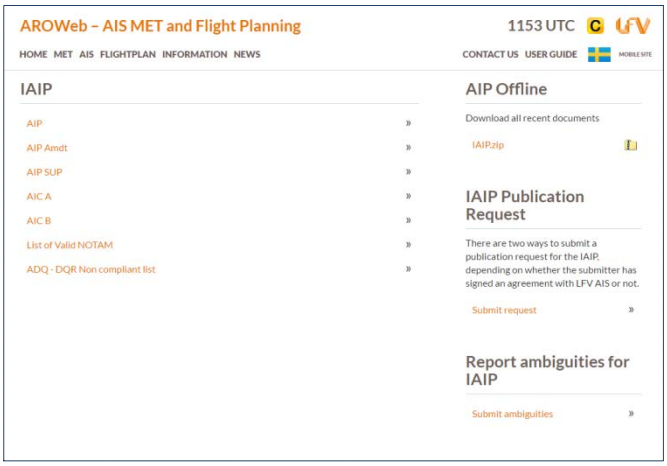
Assurance

The AISP assures that the AIP published on the Internet may be used as an authoritative source for their national AIP publication. (Different from current disclaimers stating that the content on the Internet may only be used for information or that the AIP on the Internet is not warrantied for integrity, accuracy and completeness and is not considered reliable).

4. Best Practices

This section provides several examples of the provision of official aeronautical information on the Internet by the European AISPs (no disclaimers preventing their operational use) and the best practices considered relevant by the DAT providers.

LFV – AIP Sweden



AIP Sweden is provided on the web (AIP website) and as a ZIP download. Amendments, Supplements, AICs and monthly NOTAM summaries are available for download. AIRAC Amendments are provided 42 days prior to their effective date as PDF files. There is no critical disclaimer preventing DAT providers from using the AIP data.

HTTPS is used. The IAIP download function includes CRC via the use of ZIPs and time stamps for date of validity.

Dedicated websites (https://aro.lfv.se or https://lfv.se/iaip) and servers for AIS, MET and Flight Planning are used, separated from the main LFV website (http://lfv.se).

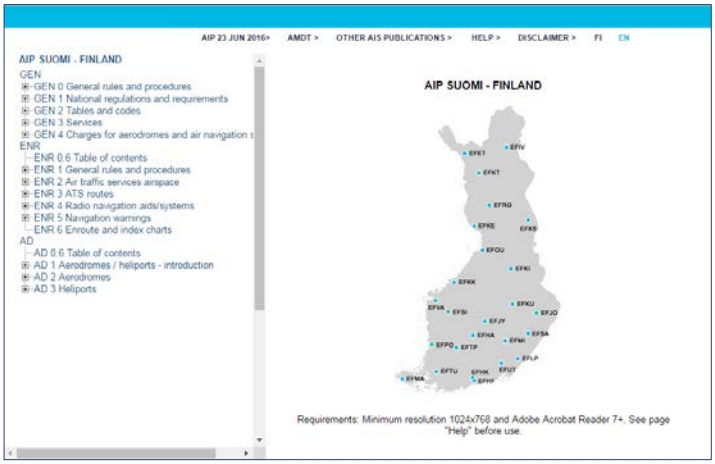
A Safety Assessment is carried out prior to new website releases.

LFV has introduced functionality in order to be able to publish new information at 00:00 UTC without having to have staff in the office in the middle of the night.

An increasing number of personnel have been trained to carry out website publishing, together with updated routines.

An error reporting function for AIPs has been introduced on the website.

ANS Finland – AIP Finland



The term AIP refers both to the AIP of Finland and its AMDTs, as they are located in the same directory.

FTP is used to synchronise the AIP to the Internet (e.g. the English version can be found at https://www.ais.fi/aip/en/). The FTP password is reasonably strong. The synchronisation is performed automatically at regular intervals.

The AIP is located on the same server as the AIS website (https://www.ais.fi/). Both the AIS website and the AIP are protected by an SSL certificate (SHA-256 RSA).

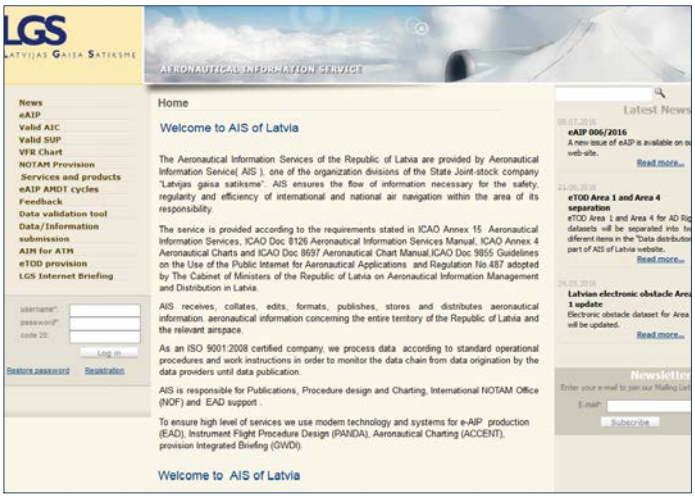
The AIP consists of, among other things, HTML and PDF files. All the PDF files are certified by the AIS so that it is possible to see that the files are indeed published by it and so that the files cannot be changed without breaking the certificate.

The AIP is also available as an ISO image (e.g. for English-speaking people at https://www.ais.fi/en/products-and-services/aip-iso-image). It comprises exactly the same material as is on the Internet, i.e. the valid AIP and its last three AMDTs. The publication process of the ISO image is different to that of the AIP. After burning the ISO Image, it is uploaded manually to the Web Content Management System (WCMS) used to run the AIS website.

The AIP itself, however, is not located in this WCMS; this is the case only for the ISO image whose integrity can be verified with the help of its SHA-1 checksum.

As Finland no longer has a paper AIP, the AIP on the AIS website is the only official version of the AIP of Finland. The AIP is available to all users free of charge. There is no need to register with any system to use it. The same applies to the ISO image.

Finland also has two feedback forms on the AIS website. One of them can be used to send feedback about the AIS products and the website. Via this form users can send information about possible errors in the AIP.



LGS - AIP Latvia

In the past there was a disclaimer on the AIS website. The disclaimer was at that time needed to prevent the use of non-integrity/non-ensured aeronautical information.

The following actions have been put in place to enable the disclaimer to be removed - the appropriate secure technical solutions, procedures and personnel training were implemented to ensure the integrity of the Latvian aeronautical information content provided via the AIS website.

The following technologies are used on the website to enforce security:

The website is available via the HTTPS (secure) protocol and is signed by a security certificate, thus ensuring:

- That the website's users can check whether they are connected to the genuine AIS of the Latvia web-server and that the connection is private.
- That all data exchange between website and end user goes through the virtual tunnel that uses cryptography and ensures the integrity of the exchanged information.

- The website also has an extra level in its authentication system. To login to the website's protected area, a user will need to provide a username, password and one special key-code from a key-code table sent to that user during registration.

- LGS has established an MD5 hash check procedure for the publically available eAIP package, and the web-server runs a hash sum check on a regular basis and sends a report to administrators. This procedure ensures the integrity of the eAIP files while they are stored on a server.

- Also, the website has an enforced integrity handling system. As the standard web technology cannot provide an option for checking the integrity of downloaded files on the end user's computer, LGS has a JAVA applet running under the website's file upload and download forms. That applet is able to create the file's CRC checksum on the end user's computer prior to uploading the file from the user's computer to our web-server, and after the upload is finished the applet checks the CRC values of the user's file and the new file uploaded to the server. The same mechanism works on the download procedure (from web-server to end user's computer). It also stores download attempt history (IP, user, what file was downloaded, was the download successful).

ENAIRE – AIP Spain

An example of transitional mitigation actions taken for the official distribution of AIPs on the Internet while the main AIP website still maintains a disclaimer.

The Spanish AIP is provided by ENAIRE by means of DVD postal distribution, the AIP website and ISO download.

The AIP website maintains a disclaimer and is not for operational use; the main reasons are:

- HTTP only, no SSL certificate available.
- Production process not unified with the DVD and ISO AIP (navigation menus).

A project is being implemented to make it possible to provide the official AIP website by 2017.

In the meantime, a mechanism to download and verify the official AIP ISO DVD image has been made available:

- MD5 checksum is provided to verify the downloaded file.
- ISO AIP download functions are only available to registered DVD subscribers.

Common elements

While it may vary strongly from AISP to AISP and each Company structure, based on the above listed examples of best practices, a series of common elements have been identified as generally necessary for the provision of an official AIP on the Internet:

- Domain
- Internet bandwidth costs.

- Web server (shared, dedicated, cloud, etc.) (initial deployment + maintenance)
- Publication system, e.g. a web content management system (WCMS) (initial deployment + maintenance)
- SSL/TLS certificate
- Webmaster
- AISP staff training in the publication system
- Security audit
- PDF certificate, if applicable.
- National product registry (ISBN, etc.)

5. Long-term perspective

This document is based on the understanding of the AIP as a traditional document/product, typically published as a series of PDF or HTML files.

While the Internet distribution of AIP and other AIS products is still not as common as might be expected based on current information distribution practices and technology availability, it is anticipated that based on user demand and ease of use, the aeronautical information products will soon be commonly available on the Internet, and that the Internet will in most cases be the only source for them.

It is recognised that even today, and much more in the future, the aeronautical data that is currently available in the AIP will be made available digitally as data set files or through web services (e.g. AIP dataset, airspace dataset, obstacle dataset, etc.).

Despite all these anticipated changes in the future, most of the content of this document on availability, authenticity, integrity, change management, coherence between products, validity, timeliness and traceability should still apply.

Some additional considerations regarding the provision of data sets and web services:

- When providing data sets or web services, detailed documentation on the formats and standards used should be made available to users by means of a Data Product Specification.
- Changes to formats and standards used should be notified to users in sufficient time to allow proper adaptation.
- When providing data sets or web services, an HMI enabling final users to visualise the content should be provided, thus ensuring one mechanism whereby end users are sure of being able to look at data in the way intended by the AISP.

When data is provided by means of data sets or web services and also as an AIP document, the sources should be consistent, e.g. data sets and document tables generated from the same database.

www.eurocontrol.int