



**Single European Sky –
Provision of Aeronautical Information
for the European Upper Flight
Information Region (EUIR)**

Phase One Report

**Review and Analysis
of the Current Situation**



© 2004 European Commission. All rights reserved. No part of this publication may be reproduced, transmitted, stored in a retrieval system, or translated into any language in any form by any means, without the prior written permission of The European Commission.

This document has been produced for The European Commission by:
STASYS Limited, Lenten House, 16 Lenten Street, Alton, Hampshire, GU34 1HG.

Tables of Contents

1	Introduction	5
1.1	General.....	5
1.2	Purpose of Document.....	5
1.3	Scope	5
2	Background	7
2.1	The Single European Sky.....	7
2.2	Background to Study	7
2.3	Objective of Study	8
2.4	Approach	8
3	Aeronautical Information Stakeholders	9
3.1	General.....	9
3.2	Regulators	9
3.3	Data Collectors.....	9
3.4	Data Originators	9
3.5	Data Processors.....	10
3.6	Data Publishers.....	10
3.7	Data Users	10
4	Review of Current Documentation.....	11
4.1	International.....	11
4.2	National	17
5	Military.....	18
5.1	Background	18
5.2	Working Methods	18
5.3	Provision of Information for Publication.....	18
6	State Collaborations.....	19
6.1	General.....	19
6.2	Maastricht Upper Area Control Centre	19
6.3	Central European Air Traffic Service.....	19
6.4	Finland / Sweden.....	20
6.5	Belgocontrol (Belgium).....	20
7	Data Collection, Processing and Dissemination.....	21
7.1	General.....	21
7.2	Data Origination	21
7.3	Data Collection	21
7.4	Data Processing.....	22
7.5	Data Publication	22
7.6	Data Distribution.....	22
8	Technology	24
8.1	General.....	24
8.2	European AIS Database.....	24
8.3	State AIS Systems	24
8.4	AICM/AIXM.....	25
8.5	xNOTAM.....	26
8.6	eAIP.....	26
9	Interoperability	28
9.1	Procedural	28
9.2	System Connection	28
9.3	Entities.....	29
9.4	Data Dictionary.....	29
9.5	Quantity of Geospatial Information.....	30
10	Results of Questionnaire.....	31

10.1	The Questionnaire.....	31
10.2	Question 1	31
10.3	Question 2	32
10.4	Question 3	32
10.5	Question 4	33
10.6	Question 5	34
10.7	Question 10	34
10.8	Question 11	34
10.9	Question 13 ₍₁₎	35
10.10	Question 13 ₍₂₎	36
11	Issues	37
11.1	General.....	37
11.2	Delegation of Service	37
11.3	Copyright.....	38
11.4	Liability	39
11.5	Costs / Charging.....	40
11.6	Integrity.....	40
11.7	Language	41
11.8	Provision – Paper and Electronic?	42
11.9	Duplication of Data	43
11.10	Structure of Document	44
11.11	Timeliness	45
11.12	Independence of Service.....	46
11.13	Future New Data Elements	46
11.14	Quality Management	47
11.15	Certification	47
12	Phase 2.....	49
13	Reference Documents.....	50
13.1	General.....	50
14	Abbreviations	51
	Table 1: Additional Data Elements.....	29
	Table 2: ICAO Specified Integrity Levels	40
	Table 3: Documents Referenced	50
	Table 4: Abbreviations Used.....	52
	Figure 1: Single European Sky Coverage.....	6
	Figure 2: Response to Question 1	31
	Figure 3: Response to Question 2	32
	Figure 4: Response to Question 3	33
	Figure 5: Response to Question 5	34
	Figure 6: Response to Question 11	34
	Figure 7: Response to Question 13 ₍₁₎	35
	Figure 8: Response to Question 13 ₍₂₎	36
	Figure 9: 28-day AIRAC Cycle.....	45

This page is intentionally left blank.

1 INTRODUCTION

1.1 General

In the context of the legislative proposals on the Single European Sky (SES), the European Commission (EC) has proposed the establishment of a single European Upper Flight Information Region (EUIR) to overcome the fragmentation of airspace. A consequence of this is the development of a single aeronautical information publication relating to the EUIR.

A study, which is being undertaken by STASYS, supported by Letové prevádzkové služby Slovenskej republiky, štátny podnik (LPS), has been commissioned that defines and analyses alternative options for the provision of aeronautical information publication for the EUIR. This includes the evaluation of institutional, legal, technical and operational implications.

The results of the study will be used to identify the preferable solution for the implementation of a single Aeronautical Information Publication (AIP) relating to the EUIR and, if required, be the basis for implementation legislation and planning.

1.2 Purpose of Document

This document provides the findings of Phase 1 of the study. Phase 1 identified and reviewed the current situation regarding the provision of Aeronautical Information both within, and beyond, the SES region.

1.3 Scope

This document has been developed to address the need for the provision of Aeronautical Information for the EUIR.

Throughout its development consideration has been given to the future wishes of the EC to extend this solution to also address the lower airspace and possibly the terminal control area.

The SES is currently foreseen to include the European Union (EU) Member States, those States acceding to EU membership in May 2004 and associated States, those who although not EU members, wish to be included within the SES.

Nevertheless, the content of this report is not specifically limited to these States. It is envisaged that, in the future, other States may wish to join the Single European Sky, either through gaining membership of the EU or by inclusion as further associated States.

This provides a list of current SES States (hereafter referred to as the SES States) as follows:

Members of the European Union:

Austria	Germany	The Netherlands
Belgium	Greece	Portugal
Denmark	Ireland	Spain
Finland	Italy	Sweden
France	Luxembourg	United Kingdom

States who will join the European Union in May 2004:

Cyprus	Latvia	Slovak Republic
Czech Republic	Lithuania	Slovenia
Estonia	Malta	
Hungary	Poland	

Associated States, in particular:

Norway	Switzerland
--------	-------------

This provides a total SES coverage as shown in Figure 1.

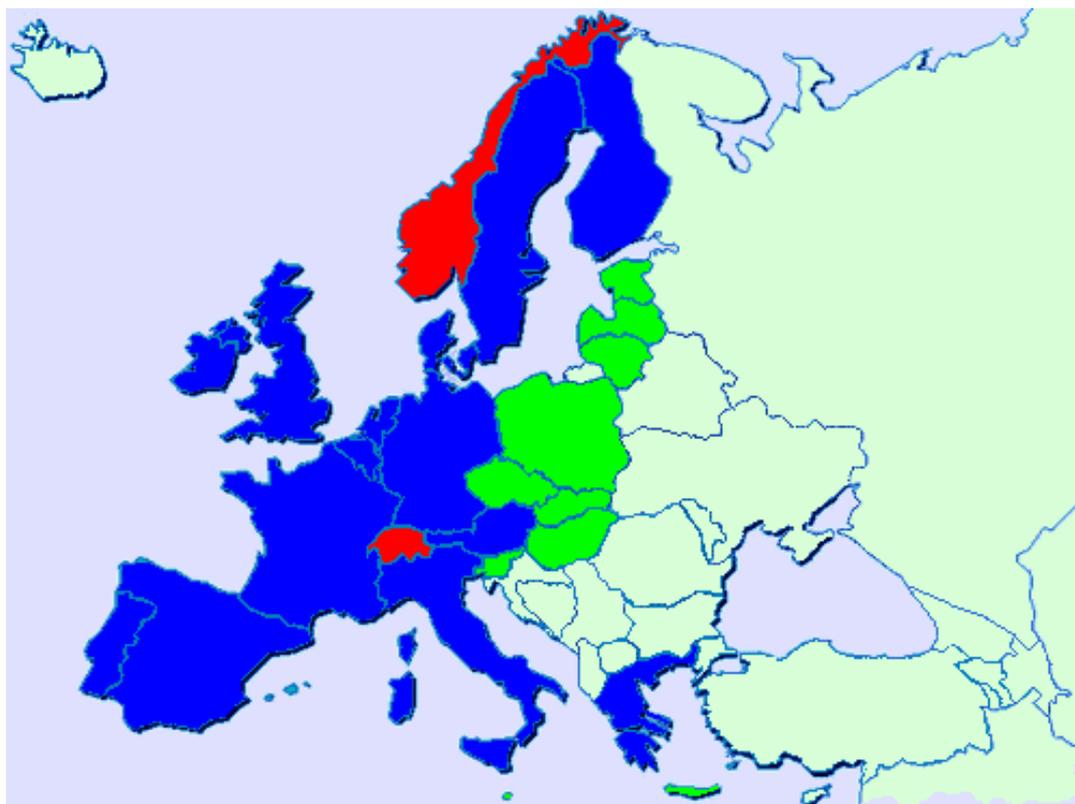


Figure 1: Single European Sky Coverage

2 BACKGROUND

2.1 The Single European Sky

The Single European Sky will be a harmonised and integrated network, providing for safe, orderly and efficient air transport. As such it will facilitate the movement of people and goods across the Community and between the Member States and third countries. Since air traffic is anticipated to grow considerably over the longer term it must also contribute to a reduction in the environmentally damaging effects of air transport.

Member States have recognised that an important part in achieving these overall aims is that air navigation services should make optimum use of the limited resource which is airspace. The development of the SES presents an opportunity to improve the efficiency of the overall aviation infrastructure and to contribute to the reduction in the level of delays experienced by passengers and freight customers in recent years. Although in many cases delays may be attributable to airport or airline factors, a significant proportion of delays have been generated through a lack of capacity in airspace or through inefficient application of that capacity. The implementation of RVSM has addressed this issue in the short-term but, as the number of flights increases, capacity will once again become an issue.

A more efficient system will assist in reducing the workload of pilots and controllers, and therefore contribute to the safety of air travel by its very existence. Indeed the SES proposals are designed to combine to support safety.

The vital safety element inherent in the provision of air navigation services, together with its social and economic importance, means that a simple facilitation of harmonised standards in Europe is insufficient to address the issues. Instead, a legislative and regulatory framework is required to detail requirements that are more aligned to meet the goals of the SES.

2.2 Background to Study

In order for a flight to take place, all information necessary must be made available to all parties or actors involved, these include amongst others, the Pilots, Airline Operators and Air Navigation Service Providers.

Primarily there are two types of information, firstly about the environment in which the flight takes place and secondly about the flight itself. These two information types are normally referred to as Aeronautical Information and Flight Planning Information respectively.

Aeronautical Information is published by way of the Integrated Aeronautical Information Package (IAIP), in accordance with ICAO Annex 15 (Reference 4), which is published typically on a per State basis¹. This leads to two significant issues:

1. For a flight across Europe the airspace of several States may be crossed and therefore similarly reference to several IAIPs is required;

¹ It should be noted that some States delegate the publication of their Aeronautical Information to another State.

2. As the airspace is typically structured on national boundaries, and therefore territorial borders, this leads to the inefficient use of airspace and a more complex Air Traffic Service routing. Even a short flight may cross several States, requiring reference to several IAIPs.

As part of the SES, the EC will introduce a single European Upper-Flight Information Region, the EUIR. Through the introduction of such an airspace structure, the issues raised above will be addressed through a more unified approach to airspace planning and the publication of a single IAIP² for the EUIR.

2.3 Objective of Study

It is intended that this study will identify a number of possible solutions for the provision of Aeronautical Information for the EUIR and make a recommendation as to the preferred approach to be taken.

Furthermore, the study shall build on this recommendation to provide high-level guidance as to how it may be implemented. Assistance will be provided for the drafting of the necessary legislation.

2.4 Approach

The study has been divided into three phases each of which builds upon its predecessor. These phases are:

2.4.1 Phase One

Research of the current situation in terms of the current legislation, regulation and documentation related to and which may affect the implementation of the EUIR and the publication of its AIP.

2.4.2 Phase Two

The identification and description of possible means by which the EUIR AIP may be developed, maintained and published, a recommendation of the most suitable way forward being made.

2.4.3 Phase Three

The selected method for implementation of the EUIR AIP is elaborated and draft legislation prepared.

² Excluding Pre-Flight Information Bulletins

3 AERONAUTICAL INFORMATION STAKEHOLDERS

3.1 General

As a prerequisite it was necessary to identify the key stakeholders involved in the provision of Aeronautical Information in order to review the material currently available.

In order to address the currently available material, it was necessary to establish the Stakeholders involved in the provision of Aeronautical Information.

Within this document care has been taken to avoid, as far as possible, the term Aeronautical Information Services (AIS). The reason for this is to avoid the confusion which may be caused through use of this term as the scope of tasks undertaken by the AIS of States varies quite significantly. Furthermore, the study is related to the publication of aeronautical information including amendment service, which constitutes only one function of a typical AIS.

In order to refer to the tasks undertaken to make aeronautical information suitable for publication, the main data processing functions have been split into the three following activities:

- Data Collecting;
- Data Processing;
- Data Publishing.

Thereafter, six different classifications of Stakeholder were identified and are described below.

3.2 Regulators

Many States have separated the functions of Service Regulation and Provision, a Regulator being responsible for specifying and overseeing that an adequate level of service provision is provided in accordance with EC and EUROCONTROL requirements.

3.3 Data Collectors

Typically a State has many Data Originators who provide the aeronautical information under their responsibility. All this information must be brought together for processing. The Data Collector is defined as the stakeholder responsible for collecting and collating aeronautical information.

3.4 Data Originators

Data is typically originated in one of two ways – either through the survey / specification of equipment such as Aerodromes and NavAids or through design such as airspace or instrument procedures.

The providers of this information, some of which are themselves dependent upon the supply of information, are considered to be the Data Originators.

3.5 Data Processors

Usually aeronautical information supplied by Data Originators is not to be immediately published. It should usually be subjected to processing through which it is validated and verified to ensure that it, amongst other requirements:

- Is of a sufficient quality;
- Has been provided by the appropriate authority;
- Is consistent with the other data to which it relates;
- May be co-ordinated with neighbouring States data.

The user who undertakes these steps is referred to, within this document, as the Data Processor. Once the data has been processed it is considered, within this study, to be approved for publication.

3.6 Data Publishers

Once data has been fully processed and is known to meet the needs of the user, it is provided to them for use. This has been done traditionally in paper format but increasingly electronic means are being used.

The function of taking approved, processed, aeronautical information and providing it in a form of use to the end-users is undertaken by the Data Publishers.

3.7 Data Users

The publication of Aeronautical Information is currently made mainly through use of the IAIP. Use of package of information is made by a diverse list of users. Those established are listed below:

- AIS providers;
- Chart producers;
- Navigation database providers;
- Flight planners;
- Airline operators;
- Air Navigation Service Providers (ANSP);
- General Aviation (GA);
- Military;
- Airport Operators (AO);
- Government;
- Other interested parties.

4 REVIEW OF CURRENT DOCUMENTATION

4.1 International

4.1.1 *European Commission*

The EC is the driving force and executive body of the EU and is the key organisation behind the implementation of the SES.

4.1.1.1 *SES Legislation*

The material which has one of the most significant impacts on the implementation of the EUIR is the legislation introducing it. Four different legislative documents have been established:

- Framework Regulation;
- Air Navigation Services Regulation;
- Airspace Regulation;
- Interoperability Regulation.

The study is being conducted to ensure that the proposals made meet the needs of this legislation, specify a service which may be delivered by the States and used by their clients.

4.1.2 *ICAO*

4.1.2.1 *General*

The International Civil Aviation Organization (ICAO), which exists as a specialised agency of the United Nations, was created with the signing in Chicago, on 7th December 1944, of the Convention on International Civil Aviation. ICAO is the permanent body charged with the administration of the principles laid out in the Convention.

4.1.2.2 *The Chicago Convention*

The 96 articles of the Chicago Convention establish the privileges and restrictions of all Contracting States and provide for the adoption of International Standards and Recommended Practices (SARPS) regulating international air transport.

The Convention accepts the principle that every State has complete and exclusive sovereignty over the airspace above its territory and provides that no scheduled international air service may operate over or into the territory of a Contracting State without its previous consent.

The aims and objectives of ICAO, as contained in Article 44 of the Chicago Convention, are to develop the principles and techniques of international air navigation and to foster the planning and development of international air transport so as to:

- Insure the safe and orderly growth of international civil aviation throughout the world;

- Encourage the arts of aircraft design and operation for peaceful purposes;
- Encourage the development of airways, airports and air navigation facilities for international civil aviation;
- Meet the needs of the peoples of the world for safe, regular, efficient and economical air transport;
- Prevent economic waste caused by unreasonable competition;
- Insure that the rights of Contracting States are fully respected and that every Contracting State has a fair opportunity to operate international airlines;
- Avoid discrimination between Contracting States;
- Promote safety of flight in international air navigation;
- Promote generally the development of all aspects of international civil aeronautics.

The Chicago Convention is supported by a wide array of documentation issued by ICAO. The sections below identify and review the main documents which are either affected by, or will affect, the implementation of the EUIR and its corresponding AIP.

4.1.2.3 *Annex 1 – Personnel Licensing*

ICAO Annex 1 (Reference 1) provides details of the licensing requirements of staff as mandated by ICAO. Furthermore, details are provided of the method in which a license shall be granted and the manner in which it shall be presented.

Today, under the ICAO SARPS, personnel providing an AIS need not be licensed providing they are not also acting in another role which does require such a qualification.

The annex does not prohibit the introduction of licensing for AIS, the only restriction placed would be on the colour of an issued license which should not be any of those specified by the Annex which are used for particular types of license, e.g. yellow for an Air Traffic Control Officer (ATCO).

4.1.2.4 *Annex 4 – Aeronautical Charts*

Essential elements of aeronautical information are the charts which aid the user in planning and executing a flight.

ICAO Annex 4 (Reference 2) specifies how the charts included within the AIP should be presented. The charts presented within the EUIR AIP should be presented in accordance with this Annex, deviation from which should not be necessary although additional representation may be required to reflect the EUIR and, in future, Functional Airspace Block (FAB) boundaries.

4.1.2.5 *Annex 10 – Aeronautical Telecommunications*

ICAO Annex 10, Volume III (Reference 3), includes a description of the manner in which the Aeronautical Fixed Telecommunication Network (AFTN) is used.

The EUIR service must ensure that any products which are distributed using this medium, such as NOTAM, are issued in compliance with this standard.

Furthermore, it is reasonable to assume that the receipt of information via the AFTN will also be required and hence the handling of such messages must also be available.

The provider of the EUIR AIP must therefore be AFTN equipped and have a suitable address to indicate its wide scope of operations.

4.1.2.6 Annex 15 – Aeronautical Information Services

ICAO Annex 15 (Reference 4) sets out the requirements that must be met by States in the provision of their Aeronautical Information Service. Amongst others, details are provided of the:

- Functions that must be provided;
- Products that must be offered;
- Timeliness that must be achieved;
- Quality that must be insured.

4.1.2.7 Doc 7910 – Location Indicators

Although this document will not directly affect or be affected by the introduction of the EUIR, it may be necessary for the EC to request the issue of a location codes relating to the European region.

4.1.2.8 Doc 8126 – Aeronautical Information Services Manual

ICAO Doc 8126 (Reference 6), the AIS Manual explains the basic functions of an AIS and the basic organisation required to undertake these functions. It is intended that the manual:

- Assists the consistent and harmonised implementation of the SARPS contained with ICAO Annex 15;
- Ensures the maximum efficiency of the AIS organisation and operation;
- Provides assistance in the training of AIS personnel;
- Details the required dissemination of aeronautical information.

The manual is not mandatory, such material being confined to the Annexes, it provides general guidance.

The content of the manual is applicable to any AIS and therefore should be applied by the provider of the EUIR AIP. The application of the AIS Manual is considered essential.

4.1.2.9 Doc 8400 – Abbreviations and Codes

ICAO Doc 8400 (Reference 7) provides a list of the abbreviations and codes approved for use within the international aeronautical telecommunications service and within aeronautical information documents.

Its content is simply tables of code/abbreviations and the applicable meaning(s)³. It is not foreseen that the implementation of the EUIR and its AIP will be affected by this document although the use of abbreviations/codes should adhere to

³ Generally only one meaning is included but for some acronyms more than one may be provided. The user must use the context of the surrounding text to ascertain the correct translation.

those provided. It is possible that a request to ICAO for further codes to be added may be required to introduce new elements such as FAB.

4.1.2.10 Doc 8697 – Aeronautical Chart Manual

ICAO Doc 8697 (Reference 8) provides guidance material in aspects of the aeronautical charting in order to assist States in implementing the Standards and Recommended Practices of Annex 4 – Aeronautical Charts.

4.1.2.11 Doc 9674 – World Geodetic System - 1984 (WGS-84) Manual

ICAO Doc 9674, the World Geodetic System 1984 Manual (Reference 9) provides guidance material on the provision of geographic co-ordinates referenced to the WGS-84 datum in order to assist States in the uniform implementation of the ICAO SARPS on WGS-84 as contained in Annexes 4, 11, 14 and 15.

4.1.3 EUROCONTROL

4.1.3.1 General

EUROCONTROL is the European Organisation for the Safety of Air Navigation. This civil and military Organisation, which currently numbers 32 Member States, has as its primary objective the development of a seamless, pan-European Air Traffic Management (ATM) system.

The European Convergence and Implementation Plan (ECIP) describes the agreed common actions to be taken by the EUROCONTROL States and other States participating in the European Air Traffic Management Programme (EATM) to apply the operational improvements set out in the EUROCONTROL ATM Strategy for the Years 2000+ (see 4.1.3.6). It is based on the requirement in the EUROCONTROL Revised Convention to achieve a uniform 'gate to gate' European ATM system. It takes as its foundation the need to set and realise quantifiable and measurable performance targets for the ATM key performance areas of safety, capacity, cost-effectiveness and the environment.

In general EUROCONTROL documentation is produced on behalf of the European Civil Aviation Conference (ECAC) States and is provided as guidance material only though the revised convention does allow for regulation if required. Much of this material is prepared as a result of actions established under the ECIP.

4.1.3.2 AIS Data Process and Static Data Procedures

The harmonised AIS Data Process (ADP) and its associated procedures, the Static Data Procedures (SDP), establish a set of guidelines which were agreed upon by ECAC States as representing "best" AIS practices for receipt, storage and publications of AIS Static Data. A benefit of the availability of these guidelines is to provide ECAC States with a baseline to which they can refer when developing their QA process. The ADP is also used as a benchmark within the general European AIS Database (EAD) Service Level Agreement (SLA).

The development phase of the SDP⁴ has been managed and undertaken by EUROCONTROL with the involvement of AIS experts from different States, therefore, the resulting SDP are truly harmonised. The SDP have been validated by ECAC State AIS.

At their time of production of the ADP the EAD concept was under development and it was therefore ensured that the procedures developed were harmonised with the processes in use both prior to and after the start of operation of EAD.

Furthermore, both the ADP and SDP have been developed to allow the capture and processing of aeronautical data to be undertaken by a different organisation to that publishing the information.

4.1.3.3 Operating Procedures for AIS Dynamic Data

Despite ECAC States considering that they provide the IAIP in conformity with the requirements of ICAO Annex 15 (Reference 4) for, significant differences of interpretation of the SARPS had been identified. It was therefore acknowledged that a common understanding of procedures for NOTAM creation is prerequisite for successful automated processing.

A project was established by EUROCONTROL to define a more detailed description. Its deliverable, the Operating Procedures for AIS Dynamic Data (OPADD) was developed to establish this common understanding⁵.

The procedures are intended for guidance and may be implemented as is, however, these procedures have led to an amendment proposal for ICAO Annex 15 (Reference 4) to obtain world-wide application and standardisation. Those elements of the amendment proposal accepted by ICAO have been incorporated within the latest edition of ICAO Annex 15 (Amendment 32).

The procedures for NOTAM creation also serve as a benchmark for the processing of incoming international NOTAM, in the context that where incoming international NOTAM are not prepared in accordance with these procedures, they can be manually processed in accordance with the principles and procedures laid down within the NOTAM Processing element of the document. This section is used as the default for harmonised NOTAM processing by the EAD Service Provider. Furthermore, the co-ordination or interface procedures to be applied between Static and Dynamic Data operations, to allow the harmonised maintenance of the AIP are also provided.

The principles and procedures related to maintaining database completeness and coherence, along with the description of messages associated with this function, are provided. These messages, such as request and reply messages, are required to fulfil the maintenance function. These messages are based upon the use of the Aeronautical Fixed Telecommunications Network (AFTN), whereas the use of other communication means, using alternative formats, could be envisaged.

This Deliverable also contains general procedures for SNOWTAM, ASHTAM and NOTAM Series F processing.

⁴ The Static Data Procedures may also be used for processing NOTAM up to the point of NOTAM creation at which time OPADD refers (see 4.1.3.3).

⁵ The first formal release of OPADD was made in January 2000. The deliverable is currently being revised at the request of the AIS Team.

4.1.3.4 EUROCONTROL ATM User Requirements

The EUROCONTROL ATM User Requirements Document (ATM URD) details the ATM Stakeholder Needs expressed by the Aviation Community during user consultation workshops held by EUROCONTROL in 1994 and 1998. These statements have been used as input to the development of the ATM Target Concept and the ATM Strategy for 2000+.

Reflecting a process of stakeholder consultation, the statements in the ATM URD document are not interpreted as precisely worded 'requirements' in the strict sense of the word, but rather as high level material to be taken into account to maximise stakeholder satisfaction in the continued development of ATM in Europe.

4.1.3.5 EUROCONTROL AIS User Requirements Document

The AIS User Requirements Document (AIS URD) was developed, by EUROCONTROL, to define the requirements of the users of a State's AIS and to identify what users expect to obtain from the service.

This document was created in accordance with directions received under the European Air Traffic Control Harmonisation and Implementation Programme (EATCHIP) AIS Domain (currently EATMP AIM Domain) and was drafted by a team from the AIS Planning and Operations Sub-Group. It was produced in the context of defining an AIS Concept, intended to provide the basis for an operational structure against which harmonisation and automation activities within the ECAC region may be developed.

Initially the AIS URD was modelled on the URD produced for the European ATM System (EATMS), the base requirements having been collected and developed from this, together with a number of ICAO, EUROCONTROL, EU, AIS and user organisation publications and papers.

4.1.3.6 EUROCONTROL ATM Strategy for the Years 2000+

The EUROCONTROL ATM Strategy for the years 2000+ was developed at the request of the Transport Ministers of the ECAC, to cater for the forecast increase in European Air Traffic which will demand an increase in ATM and airspace capacity.

The Strategy was adopted by the Ministers at their MATSE/6 meeting on 28 January 2000 and has since been updated in 2003. The Strategy describes the processes and measures by which the forecast demand may be satisfied while improving aviation safety.

The ATM 2000+ Strategy, published in two volumes, the first describing the needs, principles and major objectives which govern the Strategy, it outlines the main conceptual changes and the general management principles to be adopted. The second volume contains the detailed rationale for change and guidance on the activities that are needed to meet the Strategy objectives.

The strategy is seen as an input to the ICAO regional and global plans and capitalises on the revised EUROCONTROL Convention, the adherence of the European Community to EUROCONTROL and the SES initiative.

4.1.3.7 AIM Strategy for the years 2000+

The new systems, concepts and ATM techniques under development are contributing to improved safety, increased efficiency and greater cost effectiveness to users and the provision of Aeronautical Information is a core process that underpins all other elements of ATM. Present and future navigation and other ATM systems are data-dependent, all requiring access to global Aeronautical Information of a considerably higher quality and timeliness than is currently generally available. Aeronautical Information has therefore become a crucial and critical component of the present and future ATM system.

States' AIS have developed over the years to meet the needs of airspace users for comprehensive information on airspace configuration, aerodrome and navigation facilities and other particulars needed by pilots. However, it was understood that the AIS community had to accelerate its rate of development to keep abreast of the new requirements arising from the ATM 2000+ strategy.

This Aeronautical Information Management (AIM) Strategy has therefore been compiled to define the development of Aeronautical Information necessary to support implementation of the ATM Strategy. It has considered the nature of the future ATM operational environment and proposes the means by which those needs should be met.

4.2 National

Despite requests no specific information has been forthcoming regarding national legislation relating to the publication of aeronautical information with the following exceptions:

- For those States whose AIS operates as a public enterprise or is assigned to a private company there is often an official delegation of responsibility;
- Some States have a legal declaration as to the authorised originators of data;
- A few States currently have legislation which prohibits the provision of service by a non-national company.

The level of acceptance of the need to change as part of the implementation of the SES has, however, been high. The general consensus among the States being that local rules, working practices and legislation need to change as a result of the SES.

5 MILITARY

5.1 Background

Traditionally each State's military would publish their own aeronautical information, although typically referred to as the 'Military AIP', these publications would not usually follow the civil AIP in terms of structure. Such a 'deviation' is perfectly acceptable as military authorities are not bound by the Chicago Convention.

Recently moves have been seen to increase the access to military by civil users, this has led to the publication of non-sensitive information within the civil AIP of several States.

Military Authorities are users of the civil AIP, this acting as the vehicle for information passing from the civil authority to the military units. In some cases the military then reproduce selected information within their own publications, for example, some authorities produce manuals with the aerodrome information for all European airports to which their military are likely to fly.

5.2 Working Methods

Three distinct working methods may be seen:

Firstly, there are States whose military authority operates in complete isolation and there is no attempt made to share military information with the civil domain.

Secondly, there are States where the information is passed to the civil authority for publication after it has been derived independently; no collaboration exists in its origination.

Finally, in some States there is a full working collaboration between the civil and military units for the origination of aeronautical information. In its most co-operative form, there is one common AIS function within which there is both civil and military representation.

5.3 Provision of Information for Publication

In reality, the publication of military information should be treated no differently than any other type of information. Information is originated, processed and published as with any other type of information. The AIS is simply provided with the information which requires publication, if this is none, some or all of the military information is of no real consequence.

6 STATE COLLABORATIONS

6.1 General

There have already been several groups of States which work together to provide the required service whilst lowering costs through benefits of economies of scale.

The following sections outline some of these groupings and the functions which they perform.

6.2 Maastricht Upper Area Control Centre

Created under the auspices of EUROCONTROL, the Maastricht Upper Area Control Centre (UAC) provides the Air Traffic Control (ATC) service for upper-airspace for four States, namely:

- Belgium;
- Germany (in part);
- Luxembourg;
- The Netherlands.

This service has been in place since 1972. The control centre is responsible for all air-space above Flight Level 245 over the designated area. This has led to a more efficient use of the airspace and economic savings for the airlines which fly through the territory and in the provision of services to them.

6.3 Central European Air Traffic Service

The Central European Air Traffic Service (CEATS) is a new control service which is under current implementation. Once operational, due in the time-frame 2007-2010, an UAC, based in Vienna, Austria, will control all upper-airspace for the following eight States:

- Austria;
- Bosnia-Herzegovina;
- Croatia;
- Czech Republic;
- Hungary;
- Italy (in part);
- Slovak Republic;
- Slovenia.

The CEATS group of States have already demonstrated that they are keen to work together in other areas to bring about an optimal service such as the introduction of the CEATS Research, Development and Simulation Centre, which is tasked with:

- Validating the envisaged operational concepts for the future CEATS UAC and improvements to Air Traffic Services in the CEATS region;
- Promoting collaborative research and development for Air Traffic Services in the region.

6.4 Finland / Sweden

Finland and Sweden have shared the processing of received NOTAM messages since 1990 when they jointly developed a NOTAM system. This comprises two separate systems that are interconnected for reasons of redundancy.

Through use of these two systems the service is shared, Finland is responsible for one part of the world and Sweden for the rest, the processed NOTAMS being stored in a replicated database. Each State remains responsible for the creation and submission of its own NOTAM messages.

Two formal agreements exist to cover this working arrangement. Firstly there is a Letter of Agreement (LoA) regarding the economics and performance of the NOTAM System.

Secondly, a service agreement specifies the working arrangements between the two States, such as defining two annual meetings concerning the dividing of working tasks and harmonizing the handbook for operators.

As the system adheres strictly to the ICAO SARPS, it has not been necessary to document these aspects formally.

With the creation of the EAD there is some uncertainty regarding the future of this collaboration.

6.5 Belgocontrol (Belgium)

Belgium receives its NOTAM messages from Deutsche Flugsicherung GmbH (DFS) at Frankfurt. This arrangement is not captured formally and operates by way of a 'gentlemen's agreement'. There are plans for a Service Level Agreement to be established for the future.

7 DATA COLLECTION, PROCESSING AND DISSEMINATION

7.1 General

The following sections outline the general practices in place for the processing of aeronautical information from data origination through to publication.

The sections below which relate to the AIS activities are a brief over-view of the steps undertaken. A full description may be found within EUROCONTROL's AIS Data Process (ADP) (Reference 15).

7.2 Data Origination

Typically data is originated by, or on behalf of, the organisation responsible for the facility in question. For example, in some States the legally responsible body for data origination for an aerodrome is the airport operator.

It is the data originator who is generally responsible for the liaison with surveyors to obtain accurate and correct information.

Once a Data Originator has gathered all relevant information it is typically provided to two organisations which may, or may not, be located within the CAA or ANSP of the State. For example, the AIS for publication and other related information to be generated, e.g. procedure design, by the Air Traffic Service.

Information supplied to the AIS is normally via a pro-forma template as recommended by ICAO.

Data Originators often have little knowledge of the ICAO requirements for publication of information by the AIS. Furthermore, there appears to be a similar lack of understanding regarding the issue of timeliness. It appears that the late publication of information by an AIS is rarely as a result of a delay caused by the AIS itself, rather the information has either been delayed prior to release to the AIS or the change itself was planned with no regard given to the Aeronautical Information Regulation And Control (AIRAC) cycle.

The late provision of information, or equally the late withdrawal of a change, to an AIS is a major problem which has far reaching consequences throughout the aviation community.

7.3 Data Collection

Upon receipt of aeronautical data by the AIS it is typically logged and then undergoes assessment prior to being passed for processing. This simple, on receipt, check includes:

- Has the information been received in the correct format?
- Has the information been received from the appropriate source (i.e. was the originator authorised for providing information regarding the facility in question)?
- Is the information understood, are there any ambiguities?
- Is data subject to the AIP content?

Once these questions have been addressed it is passed for processing.

7.4 Data Processing

The amount of processing undertaken by a State AIS varies dramatically from State to State. Some States simply receive data and publish it in accordance with the requested effective date. At the other end of the scale, a State AIS may act as the originator for data, generating new instrument procedures etc.

A typical State will:

- Ensure that it is complete and consistent with the other related State data;
- Check that the data has been co-ordinated with neighbouring States;
- Decide how the data should be published (from the available IAIP products);
- Negotiate the date of effectivity/publication if information has been received too late for inclusion within the appropriate publication.

The data is then sent for publication. Previously this had been through a manual process; however, with the advent of the Aeronautical Information Exchange Model (AIXM) and systems which use it (such as the EAD) this task is increasingly being undertaken by entering the processed data within a database. Publication then takes place using this stored data.

7.5 Data Publication

The publication of data is generally achieved through the manual update of a document held within a word processor.

As use of the EAD becomes more prevalent this may change to use of more automated tools such as FrameAPS⁶ and smartGlobe⁷, both included as part of the EAD Client Interface Terminal (ECIT).

Once a product has been produced in draft, approval is normally sought by two sources:

- Head of AIS for the State;
- The Data Originator.

Once approval has been gained, the document is passed for publication and distribution.

7.6 Data Distribution

With the exception of the NOTAM family (AFTN messages), data is mainly distributed by paper and the postal service.

To this end, the distribution process normally comprises three phases:

- Reproduction;
- Collation;
- Dispatch.

⁶ FrameAPS is an AIP production tool produced by Mekon Ltd.

⁷ smartGlobe is a chart production tool produced by NedGraphics.

Some States have sub-contracted this work and from the point of producing a master document take no further action. This is not however the norm, many States performs the above activities within their own print shop.

Other technologies, such as distribution on CD-ROM, are becoming more commonly used but are typically additional tasks. However, States still offer a paper-based service. This situation is unlikely to change in the near to middle term as the technology, although fairly simple, is not available throughout the aviation world.

8 TECHNOLOGY

8.1 General

Today's world is increasingly being driven by the need for easy access to accurate information; the provision of Aeronautical Information is no exception. This has led to a number of initiatives to improve/replace the existing data flows; the main technological advances are detailed in the following chapters.

8.2 European AIS Database

The EAD provides a central repository of AIS data for the ECAC region. It is a service which has been established by EUROCONTROL and is operated, under license, by GroupEAD, a consortium of Frequentis, DFS, the German ATS provider and AENA, the Spanish ATS provider.

The EAD provides five main areas of functionality, namely:

- Static Data Operations (SDO) – The entry and extraction of AIP static data, mainly geo-spatial information.
- International NOTAM Operations (INO) – The entry and extraction of messages from the NOTAM family.
- Published AIP Management (PAMS) – The entry and extraction of AIP documents in a PDF format;
- Charting – Creation of Aeronautical Charts;
- Aeronautical Information Publication (AIP) – Creation of AIPs.

The first three functions are available for both Data Providers and Data Users; the later two are used by Data Providers.

The EAD provides two means by which a client may access the system to provide or use data.

Firstly, an EAD Client Interface Terminal (ECIT) is available which enables the user to access all functionality provided by the EAD. The ECIT should be considered as a gateway to information as all information is stored, entirely, within the EAD.

The second means of access is via the EAD System Interface (ESI). This enables a client to interface an existing, or new, client system to the EAD. Using this interface, the client is free to decide how data is stored locally, if at all, and is responsible for ensuring that any data held locally is consistent with that within the EAD. The ESI is being used by States to allow existing systems to provide and access data within the EAD.

8.3 State AIS Systems

The publication of Aeronautical Information has, until recently, remained a mainly human process. The main repository of data is the document itself, usually being produced using a word processor such as Adobe's Framemaker or Microsoft's Word.

The implementation of the EAD has to an extent held-back development of more automated State AIS systems. Many were reluctant to commit a significant

investment into a system that would not be able to interface to the EAD, the interface only becoming publicly available in recent years.

Despite this many AIS systems do exist, mainly in the area of NOTAM creation and processing. A very few States have implemented automated AIP productions systems.

With the status of EAD now in tentative operations, several States are either planning to, or have, migrated to its use and here a clear trend has been seen. Many States are using the ECIT to maintain Static Data but are using existing NOTAM system for the Dynamic Data, interfacing to the EAD using the ESI. This is mainly due to the ECIT offering an ability to manage Static Data which is not commonly in place already, whilst, as mentioned previously, NOTAM systems were more prevalent, often offering functionality which exceeds that available using the EAD.

8.4 AICM/AIXM

8.4.1 AICM

The Aeronautical Information Conceptual Model (AICM) provides a formal description of the information / data managed by the AIS. It is based on the ICAO Annex 15 (Reference 4) SARPS, on the content of the real world AIPs and on other relevant documents and industry standards, such as the ARINC 424 Specification.

8.4.2 AIXM

The AIXM comprises a data model (entity-relationship) and an exchange format (XML Schema). The AIXM data model has been created as an intermediate step between the AICM and the AIXM-XML Schema.

The AIXM data model addresses the following needs:

- it provides a data dictionary for the AIXM-XML Schema;
- it is often used as start point in the creation of a logical/physical database model.

The AIXM exchange format is an Extensible Markup Language (XML) specification intended for computer to computer exchange of aeronautical information. XML is a meta language, which can be used to describe the logical structure of wide variety of documents and data in different ways according to the application. This universal, flexible and extensible approach opens up an almost unlimited range of uses for XML, from word processing to electronic business and data archiving.

The AIXM exchange format is specified in the AIXM-XML Schema and currently, the AIXM-XML exchange format supports two types of data exchange:

- "Update" messages - containing information about new, changed or withdrawn aeronautical features;
- "Snapshot" messages - containing information about the versions of aeronautical features which are valid at a specified date and time.

8.5 xNOTAM

The xNOTAM is a project currently being undertaken by EUROCONTROL. Its primary task is to demonstrate that an electronic version, based upon XML, of the NOTAM message is possible. The main goal of this study is to prove that an XML based NOTAM would:

- Allows the automated update of an aeronautical database, be it on board, at the airport or in a ATC system;
- Enable the creation of better, shorter and more precisely tailored to the customer needs Pre-Flight Information Bulletins (PIB);
- Enable the development of new applications, such as graphical visualisation of NOTAM;
- Maintain backwards compatibility with the current NOTAM format.

A feasibility study has been conducted, the results of which has been placed in the public domain. The study shows that the xNOTAM, measured against the above objectives, is feasible

The XNOTAM project aims to deliver digitally updated information to any system, anywhere and at the appropriate time.

8.6 eAIP

8.6.1 *What is the eAIP?*

The EUROCONTROL electronic Aeronautical Information Publication (eAIP) is a specification for the publication and exchange of the AIP in electronic format.

- Specification: the eAIP defines an electronic format and the general process to use it;
- Publication: the eAIP is designed to be published, be it on screen or on paper and used by people;
- Exchange: to a certain extent, the eAIP can be used for computer-to-computer data exchange. However, the eAIP Specification does not offer the same capabilities for structured aeronautical data exchange as the AIXM. Nevertheless, it has provided a low cost entry into digital AIP media.

8.6.2 *What are the advantages of the eAIP?*

The implementation of an eAIP has advantages for both the Organisation producing the eAIP and for its Users, when compared to the current paper AIP.

Advantages for producers of an eAIP:

- Improved AIP (consistency, integrity and usability);
- 70-80% of users no longer ask for paper amendments (this has resulted from a recent survey);
- Possibility to easily create derived products (VFR guide, airport guide, etc.);
- Technological leap forward (XML is likely to become the "AIS language" in future);

- Reduced risk and cost as compared to isolated development of a proprietary electronic AIP format.

Advantages for users of an eAIP:

- possibility to visualise changes (both in text and graphics).
- Reduced maintenance effort (no time spent on page replacement at every amendment);
- No postal delays (if distributed through the Internet);
- Available at hand for the whole company (no need to go to the library) .

9 INTEROPERABILITY

9.1 Procedural

In order for the provider of an EUIR AIP to publish an accurate and consistent document, it is essential that the processes applied at all stages of its production are applied in a consistent manner.

To this end it is essential that common working practices and processes are implemented. To date several EUROCONTROL projects have developed guidelines to assist in this area, including the ADP/SDP and OPADD but on the whole the application of these standards remains optional. The enforcement of such standards would bring about a number of improvements including:

- The ability to allow staff to move more freely between services and hence provide better protection against peaks/troughs in resource requirements.
- Provide a more consistent and understood level of information provision.

9.2 System Connection

Under current regulation there is no necessity for an AIS system to be put in place and hence interoperability is limited. Unlike an ATM system where it may be necessary for controllers to view common screens and to communicate directly in real-time, the AIS is more related to the provision of information in advance of its effectivity. To this end the study has concentrated on the interoperability of AIS systems through the sharing of data rather than through joint, simultaneous, operations.

The transmission and reception of the NOTAM message is one clear exception to this rule as this is the most widely adopted digital message used throughout the ATM arena. Despite this, the manner in which it is created and received varies significantly and its content has not been well specified at a global level. For European States, EUROCONTROL OPADD (see section 4.1.3.3) has specified guidelines which, if applied, help to alleviate many of the problems brought about by this lack of specification.

The ARINC-424 standard also offers a widely used format by which digital aeronautical information may be shared. However, having being designed to meet the needs of flight management systems, its content is restricted to the data needed by this equipment, furthermore, it is normally only used to transport data downward from the commercial data providers to end users, very few systems being able to actually provide data in this format.

The creation of the EAD and the exchange formats used (AIXM) has brought about new opportunities for the sharing of data. Although few systems will be designed to communicate directly with other systems, many will be able to share data by using the AIXM as the exchange standard and the EAD as a portal.

Furthermore, the eAIP (see section 8.6) will allow States to provide their AIP in a format that allows the data to be shared and understood at a system level.

With the implementation of the EUIR and its associated AIP, the need to share data will become critical; the possible enforcement of standards such as the eAIP and/or AIXM must be considered.

The SES regulation relating to the interoperability (Reference 13) of systems can be used to assist the implementation of technical and operational standards. Such regulation could be used to further the ability for AIS systems to communicate their information.

9.3 Entities

Annexe A provides a detailed list of entities which may be found within AIPs published within the SES region.

For consistency and to aid comparison with the many databases now being created within Europe, the list of entities has been taken from that specified within the AICM.

Against each entity it is established whether the entity is applicable for the Terminal Movement Area (TMA), Lower or Upper Airspace.

It has been established that the following items either: appear within some European State AIPs; have been requested by the Stakeholders of the EUIR AIP or are known future requirements.

Entity	Source	Notes
Sector Definitions	Stakeholder Request / AIP Content.	Required by ATC and currently sources through paper documentation in addition to the AIP. Some conflict resolution is necessary to remove overlaps/gaps between sectors. Inclusion within the EUIR AIP will aid the introduction and execution of FAB based control.
Height Data	Future Need.	Required to permit modern navigation techniques to take place.
Terrain Data	Future Need.	Required to permit modern navigation techniques to take place.

Table 1: Additional Data Elements

The Sector definitions already appear within the definition of the AIXM, the later two, terrain and height data, are not yet sufficiently defined to be included in such a list.

9.4 Data Dictionary

Of the entities identified in section 9.3, above, all but the height and terrain data are already included within the AIXM and therefore its associated Data Dictionary.

As yet there is no accepted standard as to how height and terrain data will be originated, sources, processed, distributed and used. As a result it is too early to specify Data Dictionary elements for these as a clear specification must exist. As a result of this all entities above that may have data dictionary specification defined are included within EUROCONTROL's AIXM Data Dictionary.

To avoid duplication the Idata dictionary has not been reproduced here and the user is referred to the AIXM which may be referenced on the Internet at <http://www.eurocontrol.int/ais/aixm>

9.5 Quantity of Geospatial Information.

Annexe B provides an estimate of the quantity of geospatial information likely to be found within the EUIR AIP. This information is provided on a per SES State basis.

10 RESULTS OF QUESTIONNAIRE

10.1 The Questionnaire

In order to gain a better understanding of the current status and position of the AIS provided in Europe, a questionnaire was formulated and sent. This is found attached in Annexe C. The questionnaire was sent to the widest possible audience as an in-depth understanding was wanted. This includes responses from States who are not currently participating in the SES.

Thirty-two replies were received (up to 23/02/2004), which represented:

- Twenty-Three of the Twenty-Seven States participating in the SES;
- One State not currently participating in the SES;
- From EUROCONTROL;
- Six Military units.

The level of response received was good and shows that there is great interest in the introduction of the SES.

The following paragraphs provide an overview of the responses received where they are not State specific answers (e.g. the name of a State organisation). The statements given are anonymous and no information is provided for individual State responses.

10.2 Question 1

Is your AIS provided by:

- A State owned organisation;
- A State enterprise organisation;
- A private company.

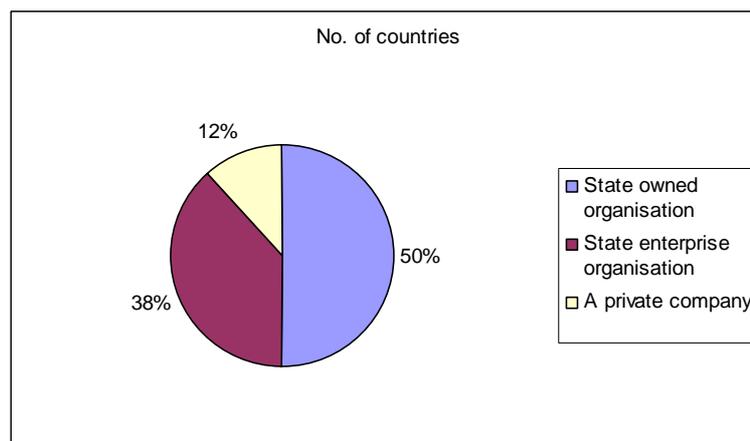


Figure 2: Response to Question 1

As can be seen, the traditional position of the AIS being provided by the State government is still the most numerous case but is much reduced. Government ownership still accounts for 88% of AIS although 38% are established as State-Enterprise organisation.

10.3 Question 2

Does your AIS have a presence on the Internet?

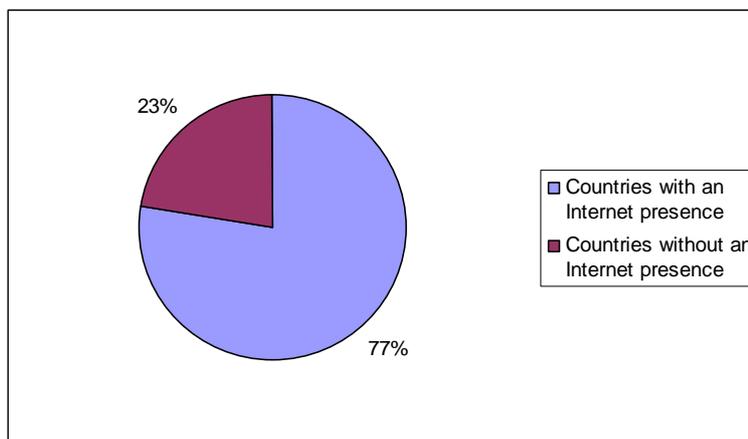


Figure 3: Response to Question 2

The vast majority of States' AIS now have a presence on the Internet. This shows a move toward the use of the Internet as an established mode of communications. This should be seen as indicative of a likely acceptance of new possibilities for AIS such as the eAIP and dissemination via the Internet.

10.4 Question 3

The AIS Manual, ICAO Doc 8126 (Reference 6) includes the following functions as being provided as part of an AIS. These are listed below. For each please indicate whether your State AIS includes this function:

- Publications – Preparation;
Reproduction;
Distribution.
- Cartography;
- International NOTAM Operation;
- Provision of foreign information (AIP);
- Provision of domestic information (AIP);
- Aerodrome AIS Units.

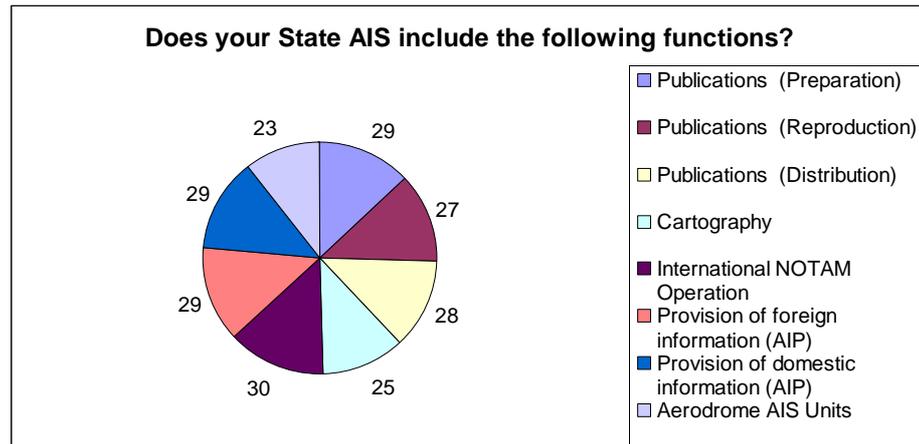


Figure 4: Response to Question 3

As may be seen, most States do provide all of the facilities that are specified within the AIS Manual. The two services which were less well covered by the AIS were Cartography and Aerodrome AIS Units. In the former case commercial companies were mainly used to provide the cartography. In the latter case, the Aerodrome AIS was responsible for provision of the service.

10.5 Question 4

Does your AIS provide any additional functions not listed above?

Although this answer may not be demonstrated by way of a graph, it did demonstrate a major difference in the activities undertaken by the AIS throughout Europe.

Many functions, too numerous to be listed here, are also included within the AIS, examples may be listed as follows:

- ICAO Sales Agent;
- Procedure Design;
- Survey;
- Fee Collection;
- Flight Planning and Flow Management;
- Meteorological Briefing;
- Aerodrome Reporting Offices (ARO);
- Operational and National Publications;
- Flight Clearances.

This wide range of additional functions may give some indication as to why previous assessments have shown a wide range in the percentage of route charges collected being allocated to the AIS by individual States.

10.6 Question 5

Are any of the staff within your AIS required to be licensed?

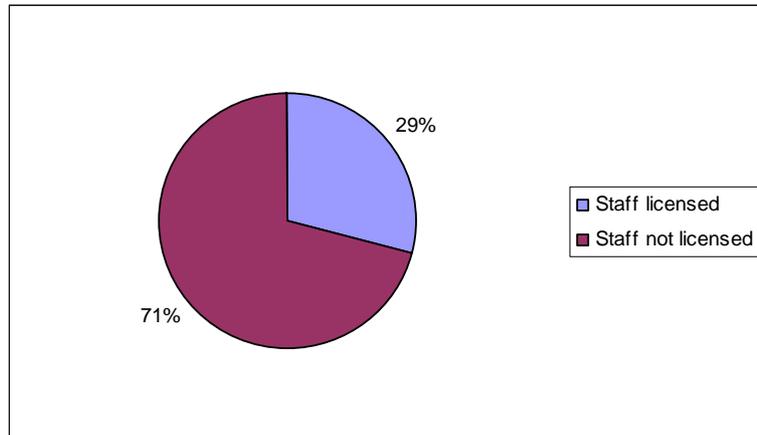


Figure 5: Response to Question 5

As can be seen, 29% of States require their AIS staff to be licensed. Although this is a relatively small percentage it is significant given that there is currently no requirement from ICAO for such licensing.

As there is currently no internationally recognised AIS staff qualification profile, it is not surprising that States have created and implemented their own standards. In addition, several have internal rules that AIS personnel should be licensed as an ATC Assistant.

10.7 Question 10

Is your AIS provided by another State or a commercial vendor either in full or part?

All States replied No to this question.

10.8 Question 11

Does your AIS operate in conjunction with another State?

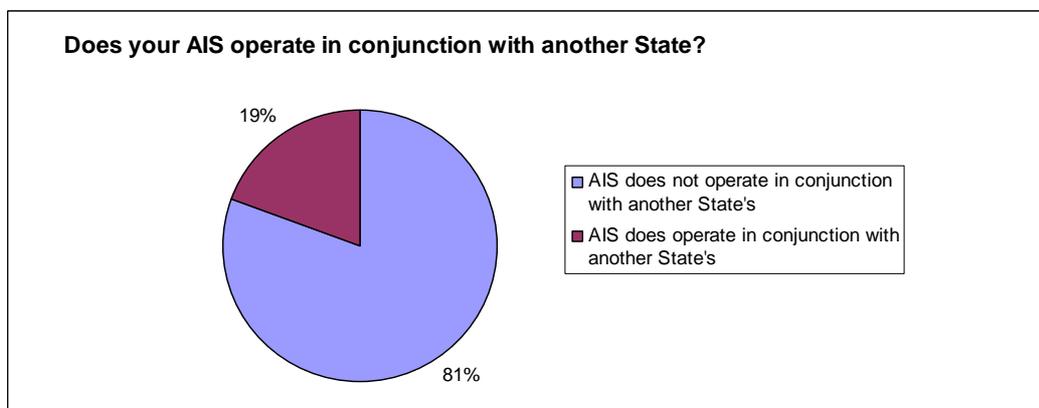


Figure 6: Response to Question 11

The majority of States replied No to this question; however a few States did operate in conjunction with other States. This could be broken down into three clear categories:

- Those States where the processing / publication of their AIP was delegated to another State;
- States where they were responsible for processing and publishing the aeronautical information for overseas territories;
- States who share the processing of NOTAM messages.

10.9 Question 13₍₁₎

Does your State Military organisation provide information to the civilian aviation community?

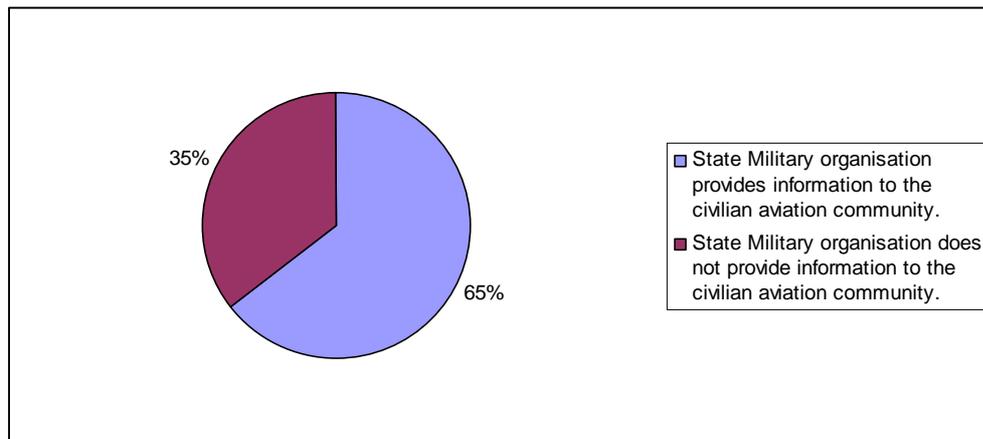


Figure 7: Response to Question 13₍₁₎

As may be seen from the figure, a significant proportion of States' Military are providing information to civil AIS.

10.10 Question 13₍₂₎

Does your civil AIS provide information to the Military community?

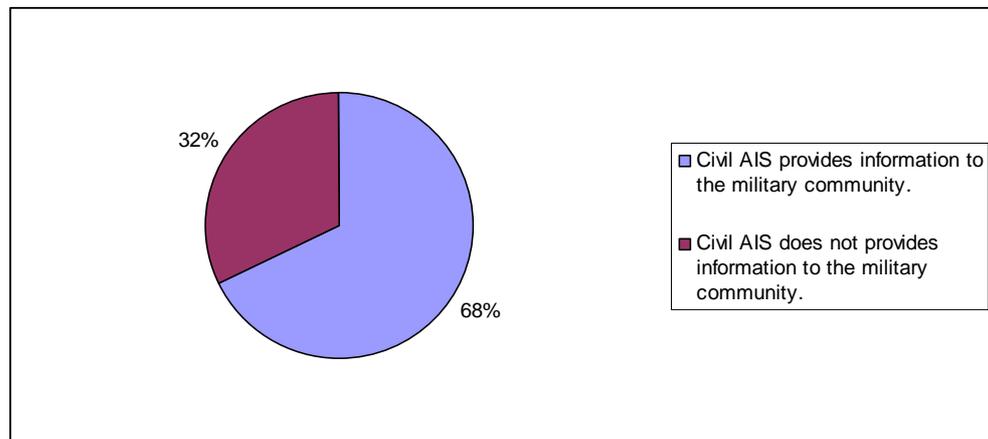


Figure 8: Response to Question 13₍₂₎

Interestingly, a similar proportion of State AIS' are providing information to the Military units. Furthermore only four States answered No to both questions. This leads the study team to believe that in many cases the flow of information is in one direction only.

11 ISSUES

11.1 General

This section presents issues that may be encountered during implementation of the EUIR and its associated AIP, identified during the first phase of the study.

Each provides the background behind the issue and a description of the problem which is foreseen.

It is envisaged that the recommendation made in the second phase of the study will address each of these issues and provide, where possible a recommendation of how they may be mitigated.

11.2 Delegation of Service

11.2.1 Background

ICAO permits the delegation of the AIS service under the terms of Annex 15 (Reference 4). This states in chapter 3.1.1:

“Each Contracting State shall:

- a) provide an aeronautical information service; or*
- b) agree with one or more other Contracting State(s) for the provision of a joint service, or*
- c) delegate the authority for the provision of the service to a non-governmental agency, provided that the Standards and Recommended Practices of the Annex are adequately met”.*

11.2.2 Issue

A number of issues have arisen with respect to this statement.

Firstly, would the EUIR AIP be provided under clause b) or c)?

Secondly, if b) can the EC, as the body responsible for the provision of the EUIR AIP, albeit delegated through competition to another body, be considered a Contracting State as it is not a State in the classical sense and has not signed the Chicago Convention?

Thirdly, if it is the final clause, c), which is used, the EC is a governmental agency not, as specified, a non-governmental one.

Finally, again if clause c) is used, the statement: *“delegate the authority for the provision of the service...”* has proved to be unclear. Some States take this to mean that part, or all, of their service may be delegated whilst other States have interpreted this as meaning the entire service.

In this later case, some States do not see that they are able, under the terms of the Chicago Convention to delegate part of their service to the publishers of the EUIR AIP.

ICAO has undertaken to research these issues.

11.3 Copyright

11.3.1 Background

There has been significant debate over the past few years as to whether a State may claim, copyright for the data which it publishes. Some States include a copyright statement within their AIP whilst others state that the information is required by the aviation community and is therefore made freely available with no restrictions.

Both are permitted under ICAO rules, Annex 15 (Reference 4) states "*In order to protect the investment in the products of a State's AIS as well as to better control their use, States may wish to apply copyright to those products in accordance with their national laws.*".

Copyright law is a complex area, especially given the number of countries included in the SES. However it is generally accepted that a fact may not be the subject of copyright and that only a work into which somebody's intellectual time has been invested may be subject to copyright.

The complexity increases if data is held within a system, for example, a database. It now becomes less clear what is meant by database, is it the system with data, is it the actual data stored, or is it just the system excluding data?

The EC, within its directive related to database copyright, defines a database as "*For the purposes of this Directive, 'database' shall mean a collection of independent works, data or other materials arranged in a systematic or methodical way and individually accessible by electronic or other means.*". Furthermore, this statement is clarified to specifically exclude the software, stating "*Protection under this Directive shall not apply to computer programs used in the making or operation of databases accessible by electronic means.*".

This clarifies the issue by removing the software element, the database now containing only the data. To this end the EC directive assists further by stating:

"The author of a database shall be the natural person or group of natural persons who created the base or, where the legislation of the Member States so permits, the legal person designated as the rightholder by that legislation."

"Where collective works are recognized by the legislation of a Member State, the economic rights shall be owned by the person holding the copyright."

"In respect of a database created by a group of natural persons jointly, the exclusive rights shall be owned jointly."

11.3.2 Issue

The first issue which must be considered is whether or not there is data to which copyright applies. In the case of aeronautical information, cases of both factual and designed data may be considered.

Firstly, the location of physical infrastructure, such as NavAids, Aerodromes and Runways cannot be disputed. Anybody with adequate equipment would be able to survey these facilities and, within a reasonable margin of tolerance, be able to derive the exact same position. Therefore the data published in this instance should be considered factual and therefore cannot be subject to copyright.

Secondly, many items such as the structure of airspace and instrument procedures have been designed and have therefore been the subject of an intellectual investment. It can be reasonably argued that the information relating to these items may be the subject of copyright.

Subsequent to this decision, should it be decided that there is data to which copyright may be attributed, and it is held within a database (which is in effectively what an electronic AIP is) the question must be answered as to who holds the copyright? Will it be the originator of the information or will it be the group of all organisations contributing to the SES EUIR?

11.4 Liability

11.4.1 Background

Under the Chicago Convention a State is responsible for the provision of its data either by doing so itself, jointly with another State, or through delegation to a non-governmental agency.

No matter which of these options is selected, the State remains responsible for the data published. ICAO Annex 15 (Reference 4) paragraph states "*The State concerned shall remain responsible for the information published.*".

Under current regulations, most States publish their own information and therefore this requirement has been met. Where a State has delegated the publication, the organisation who takes on the task is normally selected by the responsible State and is therefore regulated.

The first major change to AIS which has touched upon this area of liability is the EAD. Here a State remains liable for the entry of correct information into the database and the EAD Service has accepted the liability for the publication and hence any information errors which are introduced either within and by the EAD System or by the service in publication of the information.

11.4.2 Issue

Given the above requirement of ICAO, it is clear that not only is a State responsible for the collection and processing of data, but that even if the publication is made by another body the State remains responsible for the information published and therefore liable for any errors made.

If a single body is to publish the EUIR AIP, the States will be required to provide the data in some form. Once the publishing authority has accepted this data and uses it to provide an overall publication, who will be responsible and liable for the data? Should an error be introduced in the final publication, can the State whose territory the information relates to be held liable?

Furthermore, under the SES plans for certification of ANSPs, any body who seeks such certification must ensure that suitable insurance is in place to provide cover for any incidents for which they are accountable. The provision of the AIS is included within this proposal.

The solutions found for these liability issues when implementing the EAD may provide an indication of a likely way forward.

11.5 Costs / Charging

11.5.1 Background

The cost of providing a States' AIS is normally met through the allocation of a percentage of route charges collected, these also being used to provide the free copies of the IAIP required under ICAO Annex 15 (Reference 4).

The cost of reproduction and dissemination of additional copies of the IAIP is normally collected, at cost, through a charge being made to clients for the publications, usually through an annual charge.

11.5.2 Issue

The actual cost of publishing the IAIP is a small element of the costs allocated to a typical AIS. This may clearly be seen through studies into the distribution of route charges which have demonstrated that the AIS element ranges from around 2% for a State just publishing information to nearly 17% for a State whose AIS provides a more comprehensive range of services.

There will be an inherent cost in the production of an EUIR AIP which must be funded. Achieving a balance whereby the States receive an acceptable level of funding for the AIS yet the cost of the EUIR AIP is covered will be difficult. The route-charges cannot increase to fund an additional publication as the users will argue that they are already paying for the information and do not wish to do so twice.

It is envisaged that in the middle-term a cost reduction will be seen as some States begin to provide a joint AIS service and hence benefit from an economy of scale. This should be particularly true if and when a European AIP (maybe in the form of region volumes) is provided for lower airspace. This will be addressed in 2006.

11.6 Integrity

11.6.1 Background

ICAO specifies the level of integrity which must be achieved for differing classifications of data. Both definitions are contained with ICAO Annex 15 (Reference 4) Appendix 7.

These integrity levels may be summarised as follows:

<u>Data Classification</u>	<u>Integrity Level</u>	<u>Maximum Error Rate</u>
Routine	1×10^{-3}	1 in 1000
Essential	1×10^{-5}	1 in 100,000
Critical	1×10^{-8}	1 in 100,000,000

Table 2: ICAO Specified Integrity Levels

Furthermore, ICAO Annex 15 (Reference 4) specifies that:

- Data should be protected by a Cyclic Redundancy Check (CRC) during transmission, and

- That data should be traceable from publication back to its point of origin.

11.6.2 **Issue**

A significant contributory cause of a loss of integrity is the mainly manual processes in place within the Aeronautical Information origination and processing chain. It has been demonstrated through studies that these criteria are not being met and therefore data is not provided with the level of assurance that it should.

EUROCONTROL has launched a Data Integrity project the aim of which is to improve the integrity of published data such that it meets the needs of today's aviation community.

This project has already demonstrated that, in order to meet the high levels of integrity required, the automation of the processing of data requires the use of tools to provide a means of compliance.

Clearly there is a requirement for States to demonstrate compliance with the data integrity requirements and a pan-European regulation may be required. In such an event the EUROCONTROL's DIT would provide a means of compliance.

11.7 **Language**

11.7.1 **Background**

Each State publishes its Aeronautical Information in one or more languages, typically being English and any nationally recognised languages. This is often achieved in one of two ways:

- Firstly, each volume containing two columns on each page, one in English the other in a national language.
- Secondly, a separate version of each volume being published for each Language – this is normally seen where an AIP is published in more than two languages.

The publication in at least English is mandated through ICAO's Annex 15 (Reference 4), paragraph 3.6.1 which states "*Each element of the Integrated Aeronautical Information Package for international distribution shall include English text for those parts expressed in plain language.*".

11.7.2 **Issue**

Within the States which are participating in the SES, there are currently many different languages published within their AIPs. The cost of preparing the EUIR AIP in each of these languages would be high and would result in around twenty versions being required.

To this end it would appear that the publication in a limited number of languages could be a pragmatic way forward but could be unpopular with some users. Given that the EUIR AIP will relate only to upper airspace the use of a limited set of languages may be acceptable.

ICAO publishes its material in three languages which are commonly used in Europe, these being English, French and Spanish.

11.8 Provision – Paper and Electronic?

11.8.1 *Background*

Under the current working practices most elements of the IAIP are typically published as paper documents. This includes the AIP, its Amendments and Supplements and Aeronautical Information Circulars (AIC). Only the NOTAM is always issued electronically.

Already some States have started to issue AIPs in an electronic form although this is typically done in parallel to a paper version which is still made available.

Where States prepare an electronic document there are currently two main categories of electronic publications. Firstly, through technologies which recreate a document as it would look in paper, e.g. using Adobe's Portable Document Format (PDF), and secondly using modern data driven techniques such as XML.

EUROCONTROL's eAIP project supports the later type of publication type and may be considered far superior to the simple PDF type techniques in terms of, Cost; Convenience and Timeliness.

11.8.1.1 *Cost*

The costs of reproducing a paper AIP is significant, especially as it is usually presented double-sided and presented in a specially designed binder or binders. Furthermore, an AIP Amendment affecting several pages can incur a significant cost in shipping costs alone.

A CD-ROM, issued each AIRAC cycle, containing a full AIP can be produced for a very small cost. As the use of CD-ROM technology becomes more prevalent the associated costs are decreasing, already a fully burnt and packaged CD-ROM may be established and posted for around 1€.

11.8.1.2 *Convenience*

Even the larger European AIPs easily fit on a single CD-ROM and are therefore more convenient to store and use. Furthermore, as the CD-ROM released at each AIRAC cycle is typically a fully up-to-date AIP, there is no longer any need for the user to update the publication each month. This later point may, arguably, also improve safety.

11.8.1.3 *Timeliness*

The reproduction and collation of a paper AIP is time costly. In the typical process employed, a print master is produced and a test master page prepared by the printers. This is then checked by the AIS before permission is granted for the print job to be run. The time taken to print, collate and package the publications associated with an AIRAC cycle is therefore significant, with many AIS allowing two weeks for this process.

Given that a CD Writer is now a fairly common piece of equipment, a master CD can easily be produced by an AIS prior to dispatch to the CD-ROM producing company, thus removing the need for master copy to be produced and sent back for approval.

As the CD is digital media and exact copies are being produced, the integrity of the produced copies may easily be confirmed and is significantly less likely to contain errors than paper copies. The time to burn and package a large number of CD-ROMs is also much shorter than the production process associated with paper products.

Finally, electronic media is easily shared using technology such as the Internet and e-mail. In this way, reproduction and postage costs may be avoided if the end users are happy to access the AIP using these technologies.

11.8.2 Issue

The main issue with regard the publication of aeronautical information in electronic form is its legality under ICAO rules. ICAO Annex 15 (Reference 4) does not explicitly specify that the AIP shall be issues in a paper form but this is inferred through use of terms such as 'loose-leaf' and through the specification of the maximum page size.

In support of the use of electronic means ICAO Annex 15 (Reference 4), paragraph 4.5, states that "*AIP, AIP Amendments and AIP Supplements shall be made available by the most expeditious means.*".

Furthermore, ICAO Annex 15 also defines the term AIS product as "*Aeronautical Information provided in the form of the elements of the Integrated Aeronautical Information Package (excluding NOTAM and PIB), including aeronautical charts, or in the form of suitable electronic media.*".

11.9 Duplication of Data

11.9.1 Background

The current AIP structure assigns information to one of three sections, namely:

- General;
- En-Route;
- Aerodrome.

With the publication of a European wide AIP covering solely the upper flight region the existing En-Route section could be split between National and European publications. Those elements referring to lower airspace would be published by a State and those for upper airspace being published in the separate European publication.

11.9.2 Issue

Some aeronautical information, e.g. an En-Route NavAid, is required for use in both lower and upper airspace and hence should be published in both AIPs, leading to duplication. This duplication could be avoided by publication in only one of these documents but this would lead to inconvenience for users, i.e.:

- If the information were published in the National AIP the benefit of having the European-wide document is lost as users would still have to refer to the multitude of State publications for essential information.
- If the European-wide document is used to publish this information, users flying both solely within a State and solely within lower-airspace would have to refer to the upper-airspace AIP to fly. Many of these pilots may be

flying with AIP in the cock-pit and will not wish to take more than the minimum information necessary with them.

However, having stated that the duplication of data is needed from a practical point of view, ICAO Annex 15 (Reference 4), paragraph 4.2.1.1, states "*Each AIP shall not duplicate information within itself or from other sources.*". How these differing needs are met must be addressed.

11.10 Structure of Document

11.10.1 Paper

11.10.1.1 Background

The current definition of the structure of an AIP is provided in ICAO Annex 15 (Reference 4), Appendix 1. This separates the document into three main sections, General Information, En-Route and Aerodrome.

The structure specifies the chapters which should be included along with their content. Where no information exists or an element does not exist for one of the sections, a statement of which of these cases applied should be inserted.

Where additional information is needed, over and above that specified, it is permitted by ICAO with the stipulation that such information should be included in separate sections and not re-use the chapter numbering assigned to other data.

11.10.1.2 Issue

The structure specified by ICAO for an AIP does not fit that needed for an EUIR AIP. Whilst the addition of extra information (e.g. FAB border) is not seen as an issue, if the EUIR AIP were to use the standard ICAO template many of the sections would be blank. This may not be acceptable to the user from a practical perspective.

11.10.2 Electronic

11.10.2.1 Background

As yet there is no internationally accepted standard for the electronic exchange of AIP data. EUROCONTROL's eAIP programme is the most widely known standard despite only being in the early stages of its life. This allows all the data needed for an AIP, both geospatial and textual to be stored in an XML format and passed electronically from one point to another.

Several European States have already produced their AIP in an eAIP format, some making it publicly available on a web-site.

11.10.2.2 Issue

The eAIP schema is designed to store an entire AIP, which as has previously been noted in this document, the EUIR AIP may not be. A new eAIP schema may be required which permits different optional elements. If this option is taken,

then as far as practicable the EUIP eAIP and eAIP formats must be kept compatible.

11.11 Timeliness

11.11.1 Background

Aeronautical Information is generally published in compliance with the AIRAC rules which prescribe a 28 day cycle. This cycle exists to ensure that all users of aeronautical data have sufficient notice of changes to information to make necessary updates to the data in their systems/databases. This includes facilities such as:

- ATC systems;
- Flight Management Systems (FMS);
- Third-party charts.

In order to achieve this notice period, ICAO mandates the dates on which aeronautical information shall be updated (become effective) and the dates on which it shall be provided and disseminated.

This may be represented by the figure below:

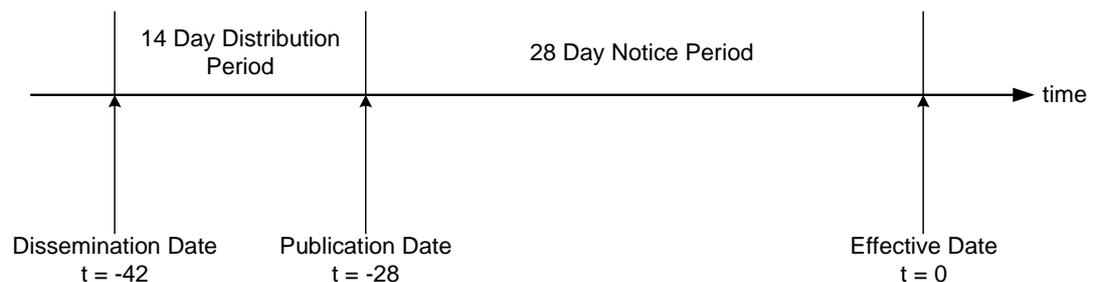


Figure 9: 28-day AIRAC Cycle

As can be seen, there is a 42-day period from when an update is disseminated until it becomes effective. This only applies for operationally significant data which, in the case of the EUIR AIP, equates to the vast majority of the information published. For major changes a “double AIRAC” cycle may be used. In this case a 56-day notice period is provided, leading to a 70-day period from dissemination to effectivity.

11.11.2 Issue

The provision of a EUIR AIP should not be seen to significantly increase this time period, nor to reduce the notice period available.

11.11.3 Recommendation

If the EUIR AIP is to be provided as an electronic document, there is no need for the printing and collation which currently takes place with State publications prior to dissemination. It may therefore be possible for all information necessary for the production of the EUIR AIP to be provided to the issuing authority at the start of the 42-day period. This provides the issuing authority with 14 days to prepare the EUIR AIP and to disseminate it via, for example, the Internet.

If it were necessary for dissemination to be made via traditional means, i.e. postal service, the above recommendation would not be a viable option.

11.12 Independence of Service

11.12.1 Background

During the research for this report, comment has been made by several stakeholders that the EUIR AIP service should be provided by a body independent of a State Authority.

11.12.2 Issue

A decision of this magnitude cannot be decided by this study alone as such decision has potentially far reaching consequences for other areas of the SES.

Although this issue will be passed to the EC to be assessed at a higher level than this study, it is the principle of the EC that:

- Service provision must be separated from the regulation;
- Provision of the EUIR AIP service will be provided through application of common market principles.

11.13 Future New Data Elements

11.13.1 Height Information

11.13.1.1 Background

To date it has only been required for the AIP to include the latitude and longitude elements of a position, in the majority of cases the height of a point not being required.

With the development of new means of navigation, height information is becoming increasingly necessary and it is therefore foreseen that this is likely to be included within the ICAO Annex 15 (Reference 4) requirements for inclusion within the AIP.

11.13.1.2 Issue

It is unclear at this stage how the requirements for height information will be specified and against what geodetic reference their specification will be made.

11.13.2 Terrain data

11.13.2.1 Background

It is understood that, through amendment 33 to ICAO Annex 15 (Reference 4), terrain data will be added to the list of information to be made available through the IAIP. This amendment will be incorporated during mid-2004.

11.13.2.2 Issue

It is unclear as yet what terrain data model will be used, where the data will be sourced and how it will be published.

11.14 Quality Management

11.14.1 Background

ICAO Annex 15 (Reference 4) has mandated that each States' AIS implements a formal Quality Management System (QMS), stating *"Each Contracting State shall take all necessary measures to introduce a properly organised quality system containing procedures, processes and resources necessary to implement quality management at each function stage as outline in 3.1.7 above. The execution of such quality management shall be made demonstrable for each function stage, when required."*

Furthermore, the recommendation is made *"The quality system established in accordance with 3.2.1 should be in conformity with the International Standards Organisation (ISO) 9000 series of quality assurance standards, and certified by an approved organisation."*

To date several ECAC States have implemented ISO 9001: 2000 in answer to this mandate, however, several States do not yet have this certification and some do not intend to seek it.

11.14.2 Issue

If an EUIR AIP is to be prepared by a central organisation, the quality of the products issued should be guaranteed and, as required by ICAO, a QMS put in place. ISO 9001: 2000 would appear to be the logical choice as this is ICAO's recommended system for an AIS.

However, as reliance will be made on the quality of the information supplied for publication, it is essential that each of the organisation that provide information for publication are certified for the activities which they perform.

11.15 Certification

11.15.1 Service

11.15.1.1 Background

Under the SES regulations it is intended that the providers of various services be certified, including those providing AIS. The regulation relating to Air Navigation Services (ANS) (Reference 11) states *"Whilst guaranteeing the continuity of service provision, a common system should be established for certifying air navigation service providers, which constitutes a means for defining the rights and obligations of those providers."*

In confirming that this applies to AIS, air navigation service providers is defined as *"any public or private entity, at Member-State discretion, providing air navigation services for general air traffic"* and air navigation services as meaning *"air traffic services; communication, navigation and surveillance services;*

meteorological services for air navigation; and aeronautical information services.”.

11.15.1.2 Issue

To date there is no defined standard for provision of AIS. If the certification of AIS is to be put in place as part of the SES, a defined service level must be created. Given the differing functions included within the AIS of the various European States this will be a significant task.

11.15.2 Staff

11.15.2.1 Background

ICAO Annex 1 (Reference 1) addresses the need for licensing of various staff roles however, under the ICAO SARPS there is no necessity for the licensing of AIS staff specified.

Nevertheless, ICAO Annex 15 (Reference 4) defines the requirements on AIS personnel - their skills and competencies to perform specific functions, performance assessment and training, within the context of a Quality System development. Under EUROCONTROL's AIS Automation & Harmonisation of European Aeronautical Data (AIS AHEAD) Programme the Common AIS Staff Profiling (CASP) Project was established to provide a reference framework of competencies for AIS personnel (AIS Competency Matrix based on a Functional Model) and series of Human Resources Management guidelines for use by ECAC States AIS.

11.15.2.2 Issue

Based on the ICAO recommendation ISO 9001 :2000 is the internationally recognised standard against which the certification of AIS (and EAD plans to be compliant) can be achieved. The CASP work could possibly act as the best point for ISO certificate maintenance and as a useful input for the States if licensing considered. One of the CASP benefits for interoperability and standardisation is improved staff mobility - internal and external. In due course it is expected this work will be endorsed by the AIS Team (AIST) and hence by the management of AIS within the State who will participate within SES.

12 PHASE 2

Having carried out the Phase 1 assessment and established a baseline understanding of the current situation, the study now moves to Phase 2.

Phase 2 will assess various options for the implementation of the EUIR and establish which of them may be considered workable.

For each workable option an assessment of their advantages and disadvantages will be carried out and the technology either available or required to support them established.

Having described the options an assessment will be carried out and a recommendation made as to the preferred solution for implementation.

The findings of this phase will be presented in the Phase 2 report (Reference 17).

13 REFERENCE DOCUMENTS

13.1 General

The following documents have been referenced within this report.

<u>Ref.</u>	<u>Title</u>	<u>Date/Issue</u>
1.	ICAO Annex 1	Ninth Edition July 2001
2.	ICAO Annex 4	Tenth Edition, December 2001
3.	ICAO Annex 10, Volume III	First Edition, July 1995
4.	ICAO Annex 15	Eleventh Edition July 2003
5.	ICAO Doc 7910	Edition 107, March 2003
6.	ICAO Doc 8126	Sixth Edition, 2003
7.	ICAO Doc 8400	Fifth Edition, 1999
8.	ICAO Doc 8697	Second Edition, 1987
9.	ICAO Doc 9674	Second Edition, 2002
10.	EC 2001/0060(COD): SES - The Framework Regulation	December 2003
11.	EC P5_TA(2003)0325: SES - The Service Provision Regulation	December 2003
12.	EC P5_TA(2003)0326: SES - The Airspace Regulation	December 2003
13.	EC P5_TA(2003)0325: SES - The Interoperability Regulation	December 2003
14.	Common AIS Staff Profiling	Edition 0.3, February 2004
15.	EUROCONTROL AIS Data Process	Edition 1.0, December 2002
16.	OPADD	Edition 1.0, January 2000
17.	STASYS SES UIR AIP Phase 2 Report	TBD.

Table 3: Documents Referenced

14 ABBREVIATIONS

<u>Acronym</u>	<u>Meaning</u>
ADP	AIS Data Process
AENA	Aeropuertos Españoles y Navegación Aérea
AFTN	Aeronautical Fixed Telecommunication Network
AIC	Aeronautical Information Circular
AICM	Aeronautical Information Conceptual Model
AIM	Aeronautical Information Management
AIP	Aeronautical Information Publication
AIRAC	Aeronautical Information Regulation And Control
AIRAC	Aeronautical Information Regulation And Control
AIS	Aeronautical Information Services
AIS AHEAD	AIS Automation & Harmonisation of European Aeronautical Data
AIST	AIS Team
AIXM	Aeronautical Information Exchange Model
ANSP	Air Navigation Service Provider
ARO	Aerodrome Reporting Office
ATC	Air Traffic Control
ATCO	Air Traffic Controller
ATM	Air Traffic Management
ATS	Air Traffic Services
CAA	Civil Aviation Authority
CASP	Common AIS Staff Profiling
CEATS	Central European Air Traffic Services
CRC	Cyclic Redundancy Check
DFS	Deutsche Flugsicherung GmbH
EAD	European AIS Database
eAIP	Electronic AIP
EATCHIP	European Air Traffic Control Harmonisation and Implementation Programme
EATMP	European Air Traffic Management Programme
EC	European Commission
ECAC	European Civil Aviation Conference

<u>Acronym</u>	<u>Meaning</u>
ECIP	European Convergence and Implementation Plan
ECIT	EAD Client Interface Terminal
ESI	EAD System Interface
EU	European Union
EUIR	European Upper Flight Information Region
FAA	Federal Aviation Authority
FAB	Functional Airspace Block
FMS	Flight Management Services
GA	General Aviation
IAIP	Integrated Aeronautical Information Package
ICAO	International Civil Aviation Organisation
INO	International NOTAM Operations
ISO	International Standards Organisation
LoA	Letters of Agreement
LPS	Letové prevádzkové služby Slovenskej republiky, štátny podnik
NavAid	Navigation Aid
NOTAM	Notice to Airmen
OPADD	Operation Procedures for AIS Dynamic Data
PAMS	Published AIP Management System
PDF	Portable Document Format
PIB	Pre-Flight Information Bulletin
QMS	Quality Management System
SARPS	Standards, Recommended Practices and Procedures
SDO	Static Data Operations
SDP	Static Data Procedures
SES	Single European Sky
SLA	Service Level Agreement
TMA	Terminal Movement Area
UAC	Upper-Area Control Centre
XML	Extensible Mark-up Language
xNOTAM	XML Notice To Airmen

Table 4: Abbreviations Used

ANNEXE A : DATA ENTITIES & DICTIONARY

A.1 INTRODUCTION

A.1.1 General

The following table presents a list of the entities identified within the AIXM and which it is considered adequately describe those elements of aeronautical data necessary for publication.

For each entity type its applicability to TMA, Lower and Upper Airspace is indicated by a ✓.

Those elements which are applicable to more than a single category may well require duplication between National and European wide publications.

<u>AIXM Entity</u>	<u>TMA</u>	<u>LOWER</u>	<u>UPPER</u>
AD_HP	✓		
AD_HP_ADDRESS	✓		
AD_HP_COLLOCATION	✓		
AD_HP_GND_SER	✓		
AD_HP_GND_SER_ADDRESS	✓		
AD_HP_GND_SER_TIMESHEET	✓		
AD_HP_NAV_AID	✓		
AD_HP_OBSTACLE	✓		
AD_HP_TIMESHEET	✓		
AERO_GND_LGT	✓		
AERO_GND_LGT_TIMESHEET	✓		
AIRCRAFT_CLASS	✓		
AIRSPACE	✓	✓	✓
AIRSPACE_ASSOC	✓	✓	✓
AIRSPACE_BORDER	✓	✓	✓
AIRSPACE_BORDER_CROSSING	✓	✓	✓
AIRSPACE_TIMESHEET	✓	✓	✓
AIRSPACE_VERTEX	✓	✓	✓
ANGLE_INDICATION	✓	✓	✓
APRON	✓		
APRON_GEOMETRY	✓		
APRON_SHAPE_POINT	✓		
AUTH_FOR_AIRSPACE	✓	✓	✓
CALLSIGN_DETAIL	✓	✓	✓
DESIGNATED_POINT	✓	✓	✓
DIRECT_FLIGHT		✓	✓
DISTANCE_INDICATION	✓	✓	✓
DME	✓	✓	✓
DME_LIMITATION	✓	✓	✓
DME_TIMESHEET	✓	✓	✓
EN_ROUTE_RTE		✓	✓

<u>AIXM Entity</u>	<u>TMA</u>	<u>LOWER</u>	<u>UPPER</u>
FATO	✓		
FATO_CLINE_POINT	✓		
FATO_DIRECTION	✓		
FATO_DIRECTION_ALS	✓		
FATO_DIRECTION_DECL_DIST	✓		
FATO_DIRECTION_LGT_SYS	✓		
FATO_DIRECTION_OBSTACLE	✓		
FATO_DIRECTION_STAR	✓		
FATO_LIGHT_GROUP	✓		
FATO_PROTECT_AREA	✓		
FATO_PROTECT_GEOMETRY	✓		
FATO_PROTECT_SHAPE_POINT	✓		
FLIGHT_CLASS	✓	✓	✓
FLOW_COND_COMBINATION	✓	✓	✓
FLOW_COND_ELEMENT	✓	✓	✓
FLOW_COND_ELEMENT_LVL	✓	✓	✓
FREQUENCY	✓	✓	✓
FREQUENCY_TIMESHEET	✓	✓	✓
FUEL	✓		
GATE_STAND	✓		
GEO_BORDER	✓	✓	✓
GEO_BORDER_VERTEX	✓	✓	✓
HOLDING_PROCEDURE	✓		
IAP	✓		
IAP_USAGE	✓		
IAP_USAGE_TIMESHEET	✓		
ILS	✓		
ILS_GP	✓		
ILS_GP_TIMESHEET	✓		
ILS_LLZ	✓		
ILS_LLZ_TIMESHEET	✓		
MKR	✓		
MKR_TIMESHEET	✓		
MLS	✓		
MLS_AZIMUTH	✓		
MLS_AZIMUTH_TIMESHEET	✓		
MLS_ELEVATION	✓		
MLS_ELEVATION_TIMESHEET	✓		
MSA	✓		
MSA_GROUP	✓		
NAV_SYS_CHECKPOINT	✓		
NDB	✓	✓	✓
NDB_LIMITATION	✓	✓	✓
NDB_TIMESHEET	✓	✓	✓
OBSTACLE	✓	✓	
OCA_OCH	✓		
OIL	✓		

<u>AIXM Entity</u>	<u>TMA</u>	<u>LOWER</u>	<u>UPPER</u>
ORG_AUTH	✓	✓	✓
ORG_AUTH_ADDRESS	✓	✓	✓
ORG_AUTH_ASSOC	✓	✓	✓
PASSENGER_FACILITY	✓		
PREDEFINED_LVL		✓	✓
PREDEFINED_LVL_COLUMN		✓	✓
PREDEFINED_LVL_TABLE		✓	✓
PROCEDURE_LEG	✓		
RTE_PORTION		✓	✓
RTE_SEG		✓	✓
RTE_SEG_USE		✓	✓
RTE_SEG_USE_LVL		✓	✓
RTE_SEG_USE_TIMESHEET		✓	✓
RWY	✓		
RWY_CLINE_POINT	✓		
RWY_DIRECTION	✓		
RWY_DIRECTION_ALS	✓		
RWY_DIRECTION_DECL_DIST	✓		
RWY_DIRECTION_LGT_SYS	✓		
RWY_DIRECTION_OBSTACLE	✓		
RWY_DIRECTION_STAR	✓		
RWY_LGT_GROUP	✓		
RWY_PROTECT_AREA	✓		
RWY_PROTECT_GEOMETRY	✓		
RWY_PROTECT_SHAPE_POINT	✓		
SEGMENT		✓	✓
SERVICE	✓	✓	✓
SERVICE_AT_AD_HP	✓		
SERVICE_IN_AIRSPACE	✓	✓	✓
SERVICE_ON_HOLDING_PROC	✓		
SERVICE_ON_IAP	✓		
SERVICE_ON_RTE_SEG		✓	✓
SERVICE_ON_SID	✓		
SERVICE_ON_STAR	✓		
SERVICE_TIMESHEET	✓	✓	✓
SID	✓		
SID_USAGE	✓		
SID_USAGE_TIMESHEET	✓		
SIGNIFICANT_POINT_IN_AS	✓	✓	✓
SPECIAL_DATE	✓	✓	✓
SPEC_NAV_STATION		✓	✓
SPEC_NAV_STATION_TIMSH		✓	✓
SPEC_NAV_SYS		✓	✓
STAR	✓		
STAR_USAGE	✓		

<u>AIXM Entity</u>	<u>TMA</u>	<u>LOWER</u>	<u>UPPER</u>
STAR_USAGE_TIMESHEET	✓		
SWY	✓		
TACAN	✓	✓	✓
TACAN_LIMITATION	✓	✓	✓
TACAN_TIMESHEET	✓	✓	✓
TFC_FLOW_RESTR		✓	✓
TFC_FLOW_RESTR_TIMESHEET		✓	✓
TFC_FLOW_RTE		✓	✓
TFC_FLOW_RTE_ELEMENT		✓	✓
TFC_FLOW_RTE_ELEMENT_LVL		✓	✓
TLOF	✓		
TLOF_GEOMETRY	✓		
TLOF_LGT_SYS	✓		
TLOF_SAFE_AREA	✓		
TLOF_SAFE_AREA_GEOMETRY	✓		
TLOF_SAFE_AREA_SHAPE_PT	✓		
TLOF_SHAPE_POINT	✓		
TWY	✓		
TWY_CLINE_POINT	✓		
TWY_HOLDING_POSITION	✓		
TWY_INTERSECTION	✓		
TWY_LGT_SYS	✓		
UNIT	✓	✓	✓
UNIT_ADDRESS	✓	✓	✓
UNIT_ASSOC	✓	✓	✓
UNIT_ASSOC_TIMESHEET	✓	✓	✓
VOR	✓	✓	✓
VOR_LIMITATION	✓	✓	✓
VOR_TIMESHEET	✓	✓	✓

This page is intentionally left blank.

ANNEXE B: GEOSPATIAL DATA QUANTITIES

B.1 INTRODUCTION

B.1.1 General

The following table provides an estimate of the amount of Geospatial Information present within each State who will operate within the SES.

The figures have been derived from the data contained within the EAD and will be revised as this database becomes more mature.

If a value is not present this indicates either:

- No data of that entity type has been entered within the EAD, or
- No data of that entity type exists within the State,

	<u>Austria</u>	<u>Belgium</u>	<u>Cyprus</u>	<u>Czech Republic</u>	<u>Denmark</u>	<u>Estonia</u>	<u>Finland</u>	<u>France</u>	<u>Germany</u>	<u>Greece</u>	<u>Hungary</u>	<u>Ireland</u>	<u>Italy</u>	<u>Latvia</u>	<u>Lithuania</u>	<u>Luxembourg</u>	<u>Malta</u>	<u>The Netherlands</u>	<u>Norway</u>	<u>Poland</u>	<u>Portugal</u>	<u>Slovak Republic</u>	<u>Slovenia</u>	<u>Spain</u>	<u>Sweden</u>	<u>Switzerland</u>	<u>United Kingdom</u>
AgaType									12												1						
AgIType																						5					
AhaType									100				12									159		24		4	
AhpType	109	38	5	62	55	13	58	439	476	56	18	22	96	3	9	2	2	26	59	54	67	15	13	69	187	58	191
AhsType									295													38		27			
AinType																						3					
AnaType	12	2	4	16	36		10	170	115		8	18	28	4			4	10	64	14	149	6	7	44	32	16	82
ApnType									41													23		3			
DinType																						11					
DmeType	32	25	6	29	35	8	58	187	119	84	23	22	107	12	8	4	5	24	131	45	25	14	5	167	77	33	161
DpnType																						27					
FaoType																										2	
FcpType																										2	
FdnType																										2	
FqyType																						127		16			
FulType									36													14		3			
GsdType																						145		2			
HpeType																						33					
IapType									362																		
IlsType									12													10		2		7	
IueType									362																		
MgpType																						16		3			
MkrType																						16		12			

	<u>Austria</u>	<u>Belgium</u>	<u>Cyprus</u>	<u>Czech Republic</u>	<u>Denmark</u>	<u>Estonia</u>	<u>Finland</u>	<u>France</u>	<u>Germany</u>	<u>Greece</u>	<u>Hungary</u>	<u>Ireland</u>	<u>Italy</u>	<u>Latvia</u>	<u>Lithuania</u>	<u>Luxembourg</u>	<u>Malta</u>	<u>The Netherlands</u>	<u>Norway</u>	<u>Poland</u>	<u>Portugal</u>	<u>Slovak Republic</u>	<u>Slovenia</u>	<u>Spain</u>	<u>Sweden</u>	<u>Switzerland</u>	<u>United Kingdom</u>
NdbType	19	17	3	21	29	13	85	181	117	49	24	26	83		4	5	3	21	111	48	28	19	7	102	121	6	135
NscType																							1				
OaaType									4												5		8		4		
OasType	2	2			4			1	4			2							2		2		3	4	5	2	2
OfaType																						15		6			
OilType									34													12					
OrgType	2	3	1	1	3	1	1	1	4	1	1	2	1	1	1	1	1	2	2	1	2	1	2	3	3	2	2
PfyType									229													50		21			
RcpType	34	48	12	44	78	14	126	460	387	98	42	31	198	8	14	2	4	50	120	62	70	20	7	162	196	56	382
RdaType									60													15		2		2	
RddType									256													75		24		16	
RdnType	46	98	12	46	78	24	156	572	416	114	44	32	214	8	20	4	4	58	128	88	70	24	6	164	201	68	507
RdsType																						248		60			
RIsType									183													8		13			
RpaType																						21					
RsgType	292	88	32	114	214	26	307	834	689	566	55	69	810	36	12	23	31	115	372	398	167	105	56	651	125	100	512
RsuType	333	142	36	177	280	40	598	1037	885	471	61	136	425	68	20	39	47	142	688	16	276	164	72	852	2	134	476
RwyType	60	49	6	26	39	12	79	301	219	60	22	16	108	4	10	2	2	29	64	46	54	12	3	82	186	34	259
SaeType																						33		32			
SahType																						73		37			

	<u>Austria</u>	<u>Belgium</u>	<u>Cyprus</u>	<u>Czech Republic</u>	<u>Denmark</u>	<u>Estonia</u>	<u>Finland</u>	<u>France</u>	<u>Germany</u>	<u>Greece</u>	<u>Hungary</u>	<u>Ireland</u>	<u>Italy</u>	<u>Latvia</u>	<u>Lithuania</u>	<u>Luxembourg</u>	<u>Malta</u>	<u>The Netherlands</u>	<u>Norway</u>	<u>Poland</u>	<u>Portugal</u>	<u>Slovak Republic</u>	<u>Slovenia</u>	<u>Spain</u>	<u>Sweden</u>	<u>Switzerland</u>	<u>United Kingdom</u>	
SerType																					89		29					
SiaType																						126		52				
SidType									418													352		93				
SpdType																						30		19				
SseType																						127						
SueType									418													352						
SwyType									42													2						
TcnType		7	1		8			37	50	18			43					9	16		14			15			27	
TlaType	51				9			2	23						1		2		1		22			1	35	1	4	
TlyType									107													30		16				
TwyType									67													59		14				
UacType																								32				
UasType	2	2			4				12			2										208		125	2	4	2	2
UniType	1	2	1	1	3	1	1	1	5	1	1	1	1	1	1		1	2	1	1	55	1	24	2	3	1	1	
VorType	11	14	2	9	13	4	26	94	67	44	10	5	57	5	4	2	1	10	39	20	18	5	2	72	31	12	51	

This page is intentionally left blank.

ANNEXE C: QUESTIONNAIRE

C.1 INTRODUCTION

C.1.1 General

The following pages present the questionnaire which was used to gain and compile information used in the production of this study report.

Thanks is given to those States who responded.

Name Position Organisation E Mail address

<u>Ref</u>	<u>Question</u>	<u>Response</u>	<u>Notes</u>
1.	<p>Is your AIS provided by:</p> <ul style="list-style-type: none"> • A State owned organisation • A State enterprise organisation • A private company 	<p>Yes/No Yes/No Yes/No</p>	
2.	<p>Does your AIS have a presence on the Internet?</p> <p>If Yes, please provide the web address in the notes section</p>	Yes/No	
3.	<p>The AIS Manual (ICAO Doc 8126) includes the following functions as being provided as part of an AIS. These are listed below. For each please indicate whether your State AIS includes this function:</p> <ul style="list-style-type: none"> • Publications – Preparation Reproduction Distribution • Cartography • International NOTAM Operation • Provision of foreign information (AIP) • Provision of domestic information (AIP) • Aerodrome AIS Units <p>If No to any function, please provide details in the notes sections of how and by whom these functions are provided.</p>	<p>Yes/No Yes/No Yes/No Yes/No Yes/No Yes/No Yes/No</p>	

<u>Ref</u>	<u>Question</u>	<u>Response</u>	<u>Notes</u>
4.	Does your AIS provide any additional functions not listed above? If Yes, please provide details in the notes sections of these additional functions.	Yes/No	
5.	Are any of the staff within your AIS required to be licensed? If Yes, please provide details of the role(s), and the licensing arrangements in the notes sections.	Yes/No	
6.	Within your State, which organisation is responsible for the regulation of AIS ? Please describe the main tasks of this organisation with respect to AIS regulation.		
7.	Within your State, which organisation is responsible for the provision of civil AIS ?		
8.	If the organisations under point 6. and 7. are the same, please describe if and how the regulative and service provision tasks are separated.		
9.	Within your state, who is responsible for the provision of military AIS?		
10.	Is your AIS provided by another State or a commercial vendor either in full or part? If Yes, please provide details in the notes sections.	Yes/No	

<u>Ref</u>	<u>Question</u>	<u>Response</u>	<u>Notes</u>
11.	Does your AIS operate in conjunction with another State? If Yes, please indicate which State(s) in the notes section & outline the working arrangements	Yes/No	
12.	If you answered yes to the previous question, please provide details of the reason for this union and explain how this is reflected within any national regulatory material.		
13.	Does your State Military organisation provide information to the civilian aviation community or does your civil AIS provide information to the military community? If Yes, please provide details in the notes sections.	Yes/No	

Thank you for taking the time to complete this questionnaire.

Please return this questionnaire by **30th.January 2004**, via e-mail, directly to the consultants STASYS, who carry out the study for the European Commission:

Name: Roy Langridge

e-mail Address: roy.langridge@stasys.co.uk

Further communication in the course of this study will be directed towards your organisation's point of contact (see cover letter by the European Commission from 19. December 2003).

This page is intentionally left blank.