STASYS

www.stasys.co.uk

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

Phase Two Report

Analysis of Possible Solutions for the Provision of the EUIR AIP

Tables of Contents

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), covering airspace above Flight Level 285, to overcome the fragmentation of airspace. A consequence of this is the need to provide consolidated Aeronautical Information relating to the EUIR, including the publication of a single Aeronautical Information Publication (AIP) 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 publication of Aeronautical Information for the EUIR. This includes the evaluation of the feasibility of the provision of Aeronautical Information including the institutional, legal, technical and operational implications.

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

1.2   Purpose of Document

This document provides the findings of Phase 2 of the above study. This phase has identified possible solutions for the provision of Aeronautical Information for the upper airspace of the SES region. These solutions are provided in terms of where, how and with what technology the EUIR AIP[1] may be implemented. Recommendations are made based upon consultation with Stakeholders, the EC and EUROCONTROL[2].

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 the solution for the EUIR AIP to also address the lower airspace, possibly the terminal control area and airports.

The SES is currently foreseen to include the European Union (EU) Member States and Associated States[3], 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 SES, either through gaining membership of the EU or by inclusion as further associated States.

Hereafter follows a list of current SES States (referred to as the SES States):

---

[1] Within the context of this study, the EUIR AIP is used to refer to the AIP itself along with related Amendments and Supplements, Aeronautical Information Circulars and NOTAM messages.
[2] EUROCONTROL is the European Organisation for the Safety of Air Navigation.
[3] Two States, Norway and Switzerland have agreed a legal position with the EC regarding membership of the Single European Sky.

Members of the European Union:

Austria	Greece	Poland
Belgium	Hungary	Portugal
Cyprus	Ireland	Slovak Republic
Czech Republic	Italy	Slovenia
Denmark	Latvia	Spain
Estonia	Lithuania	Sweden
Finland	Luxembourg	United Kingdom
France	Malta	
Germany	The Netherlands	

Associate States, in particular:

Norway	Switzerland

This provides a total SES coverage as shown below:
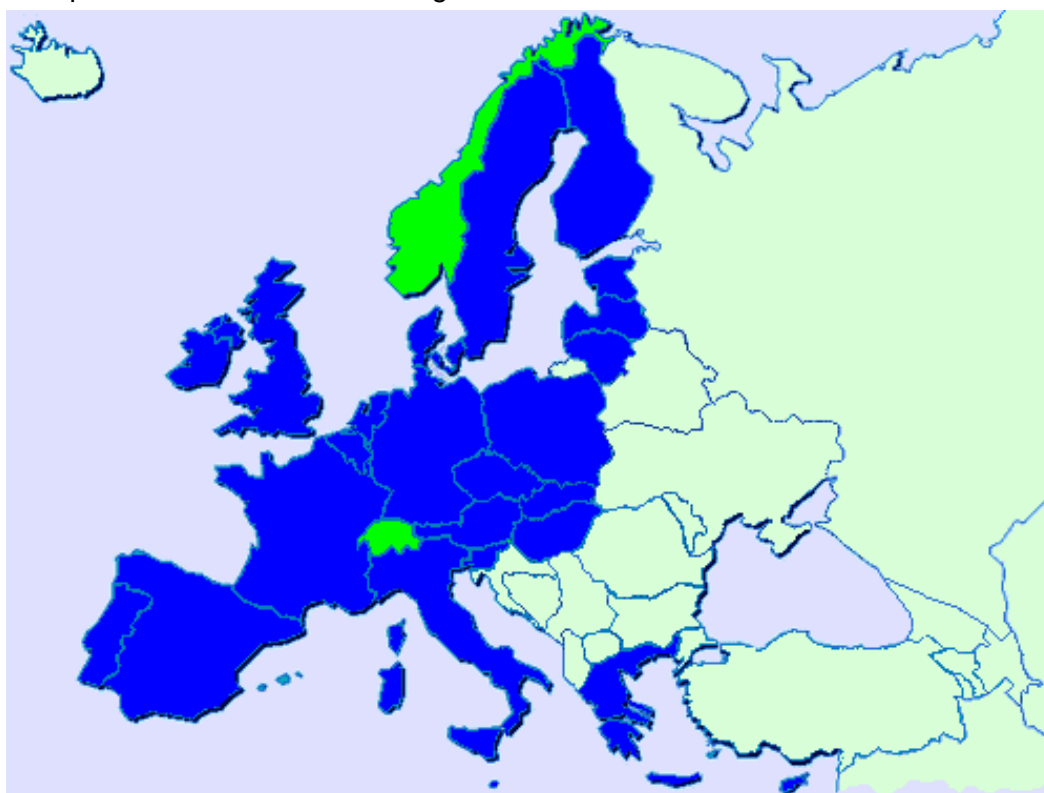
Figure 1: Single European Sky Coverage

2 BACKGROUND

2.1 The Single European Sky

The Single European Sky will be a harmonised and integrated Air Traffic Management (ATM) network, providing for the 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.

It is recognised that the introduction of RVSM in 2002 has contributed significantly to the provision of additional airspace capacity. Nevertheless, such is the forecast increase in air traffic that it is considered that airspace capacity issues will return to the forefront in the medium term.

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 the safety of flights.

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 (AO) and Air Navigation Service Providers (ANSPs).

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 means of the Integrated Aeronautical Information Package (IAIP), in accordance with the International Civil Aviation Organisation's (ICAO) Annex 15 (Reference 1), which is published typically on a per State basis[4]. 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;

---

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

2. As the airspace is typically organised by a State within its own geographical borders, the organisation of this airspace, in relation to the airspace structure of its neighbouring States, may be inefficient. Consequently, 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 IAIP[5] for the EUIR.

2.3 Objective of Study

This study identifies a number of possible solutions for the provision of Aeronautical Information for the EUIR and makes 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.

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 present 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. The findings of this phase have been reported in the Phase 1 Report (Reference 2).

2.4.2 Phase Two

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

2.4.3 Phase Three

The selected method for implementation of the EUIR AIP is elaborated from which draft legislation will be prepared.

---

[5] Excluding Pre-Flight Information Bulletins

3 LOCATION OF EFFORT

3.1 General

The following sections discuss the various ways in which the aeronautical data may be made available, starting from the point of origination to publication. The process has been divided into four actions: Data Origination, Data Collection, Data Processing and Data Publishing.

Within this chapter consideration has only been given to where the actions are fulfilled, with no regard being given to how, or what, technology is used - these topics will be considered in later chapters. This is a deliberate policy such that the thoughts of the reader are not swayed by implementation issues.

For each action a number of possible locations for where the action is undertaken are assessed and discussed. The locations considered are:

- Within a State;
- Within a State Grouping;
- At a European Level.

Although there are a limited number of State groupings in place today it is foreseen that the number is likely to grow in the future. It is logical to consider that, in future, those States who work together to operate a Functional Airspace Block (FAB) would fulfil this grouping.

The European Level is considered to mean a single entity covering the whole of SES airspace, most probably the publisher of the EUIR AIP.

For each option a list of the advantages and the disadvantages may be found in Annexe A.1.

3.2 Data Origination

The origination of data has been considered as outside the scope of this study. Typically Data Originators include, amongst others, Aerodrome Operators, Procedure Design Offices and the operators of infrastructure such as Navigation Aids (NavAids).

A EUROCONTROL study, undertaken by the Navigation Domain, has addressed the Data Origination Processes.

3.3 Data Collection

3.3.1 General

A typical State has many different Data Originators whose information must be brought together for publication. The act of Data Collection is two fold:

- To request data from the Data Originators;
- To react to changes of information initiated by Data Originators.

Annexe A.1.2 provides the advantages and disadvantages in tabular form where the choice of State, State Grouping and European Level for Data Collection may be compared.

3.3.2   State

This reflects the current situation today, where in the vast majority of cases the State Authority, or its delegated representative, liaises with each of the Data Originators within the State to collect the information necessary for publication.

3.3.3   State Grouping

There are already some groups of States which co-operate, although as yet few in the AIS domain, and a logical extension of these arrangements would be for these same groupings to jointly collect the aeronautical data.

As the concept of FABs is to be implemented, this will increase the number of State co-operatives and provide further logical groupings.

3.3.4   European Level

It is possible that a European organisation could collect all data pertaining to the SES.

3.4   Data Processing

3.4.1   General

During the Data Processing stage the data originated is checked for completeness, should be validated and verified, used to derive further data if necessary and co-ordinated with the other internal data and that of neighbouring States.

Annexe A.1.3 provides the advantages and disadvantages in tabular form where the choice of State, State Grouping and European Level for Data Processing may be compared.

3.4.2   State

This again reflects the typical situation encountered today. A State, having collected the data, processes the information to the point where it is considered of be complete, accurate, have integrity and be timely and, therefore, of sufficient quality for publication.

3.4.3   State Grouping

A few examples of State groupings operating at the Data Processing stage already exist although usually for a limited amount of the IAIP, typically Notice to Airmen (NOTAM). It is foreseen however that, in the future, more of these strategic alliances will be arranged.

3.4.4   European Level

A single European Body would be responsible for receiving the data from the Data Collector(s) and processing it to ensure that it is, for example, fully co-ordinated and consistent.

3.5 Data Publishing

3.5.1 General

After data has been processed it must be presented to the users in a form which is acceptable – this is typically through production of the IAIP elements specified by ICAO. The production of these documents is the Data Publication phase.

Annexe A.1.4 provides the advantages and disadvantages in tabular form where the choice of State, State Grouping and European Level for Data Publishing may be compared.

3.5.2 State

With few exceptions, it is the State who is responsible for the Data Publication phase of AIS processing. In a very few cases this has been delegated either to another State, or to a commercial company.

3.5.3 State Grouping

It is known that discussions have been held regarding the joint publication of Aeronautical Information by groupings of States. To date this has only occurred in a very minimal way with some States delegating this phase to neighbouring States.

However, it is likely that, in the future, more States will look to produce integrated products.

3.5.4 European Level

If an AIP is to be provided for the EUIR then there is inevitably the need for some AIS products to be prepared at a European Level, such as the AIP itself and supporting information, such as NOTAM.

4   SUPPORTING TOOLS / TECHNIQUES

4.1   General

This chapter addresses 'how' the data may be processed at each step, addressing different possibilities of ways of working. Once again, specific technological implementations, e.g. the eAIP, are not mentioned within the section.

4.2   Data Collection

4.2.1   Electronic Media

The traditional passing of information from point-to-point by paper is no longer considered suitable for today's technologically advanced world. The use of paper and the consequential need to re-enter data on numerous occasions has been proven to be an area of risk, resulting in a reduction in the integrity for data.

In the future the provision of data by Data Originators to Data Collectors must be made using electronic media. The benefits offered include:

- Avoidance of need to re-type data and hence the introduction of human errors;
- Ability to protect data against corruption;
- Faster dissemination;
- Lower production and distribution costs.

4.2.2   Cyclic Redundancy Checks

It is a requirement of ICAO Annex 15 (Reference 1) that Aeronautical Information is protected in storage and during transfer by the application of Cyclic Redundancy Check (CRC) validation.

A CRC value forms an additional piece of information which is calculated from data and which may be recalculated at any point. Should the data have been changed in any way, accidental or otherwise, there is a high likelihood that the CRC value recalculated would be different. The possibility of changed data resulting in the same CRC value depends upon the bit-size of the CRC. In order to offer the protection of data as specified in ICAO Annex 15 (Reference 1), 1×10^{-8}, a 32-bit CRC is necessary. No CRC algorithm is mandated by ICAO within this Annex, consequently, an agreement is needed on a single Pan-European CRC Algorithm[6].

4.3   Data Processing

4.3.1   Procedures

In order to allow a consistent process to be applied throughout the Aeronautical Data chain, from Data Origination through to Data Publication, procedures shall

---

[6] A 32-bit CRC algorithm is specified by ICAO for Microwave Landing Systems in ICAO Annex 10 and this is currently in common use within the AIS community and is contained within the EUROCONTROL Data Quality Tool Set (DQTS) and could be made available as a separate tool if so requested by the EC.

be put in place to specify the work required. This should provide a process map containing all transaction points and the actors involved.

These procedures shall not only specify what work shall be carried out, but also the logging of meta-data to ensure the full traceability of data and that conformance to these procedures can be demonstrated as and when required.

Ideally these procedures should be implemented as one element of an ISO 9001:2000 Quality Management System (QMS).

4.3.2 Cyclic Redundancy Checks

It is a requirement of ICAO Annex 15 (Reference 1) that, upon storage, Aeronautical Information has CRC values associated with it such that, when extracted from storage, the integrity of the data may be confirmed.

During the Data Processing phase, whenever the data is stored, CRC values should be calculated and stored as part of the data set.

4.3.3 Central Repository

During the Data Processing phase the use of a central database containing all European data is recommended. Such a database may be used to assist co-ordination and provide a means of checking consistency not only within a State's data but with those of neighbouring States.

4.4 Data Publishing

4.4.1 Electronic media

A means of publishing the EUIR AIP by electronic media is an essential part of the SES requirements. The key requirements for publication of an EUIR AIP are:

- Flexible use;
- Covers upper airspace but the application may be extended to include lower airspace;
- Allows the production of a paper AIP if required;
- Allows the use of digital media / merging etc. to remove human processing errors;
- Allows the combination of data from many States.

4.4.2 Central Repository

A central repository may be used during the data publication phase to act both as a source of information and to be a reference database against which the publication is validated.

The use of such a repository may be determined by its contents. An AIP contains several different sorts of information:

- Geospatial data, e.g. positional data;
- General information, e.g. Addresses;
- Operating rules and procedures, e.g. National Laws;
- Supporting text.

To date, repositories are typically only used to hold data of the first two types, therefore restricting their use to being more suitable to act as a reference source for quality assurance purposes only.

4.5 Data Distribution

4.5.1 *Electronic Media*

The use of electronic media, including networks, for the distribution of the EUIR AIP is an essential element of the proposals to support the SES. Such a media allows the distribution of the information to take place more efficiently, allows the integrity of data to be maintained and lowers costs.

4.5.2 *Cyclic Redundancy Checks*

As discussed in section 4.2.2, ICAO Annex 15 (Reference 1) mandates the use of CRC validation for aeronautical data during transmission.

4.5.3 *Central Repository*

A central repository may be used as a repository through which the EUIR AIP may be accessed and distributed.

5 TECHNOLOGY / TOOLS AVAILABLE OR PLANNED

5.1 General

The preceding chapters have discussed where work will be undertaken and how it should be achieved without reference to the many technological solutions available today. This is a deliberate act to ensure that the solutions available, and their possible implementations, are not unduly influenced by the technology available. The technology should meet the needs. A need should not be created to meet the available technology.

For each of the actions identified in chapter 3 above, the technology and tools available or currently planned for the near future, that may assist meeting the needs identified in chapter 4, are listed.

5.2 Data Collection

5.2.1 Data Integrity

EUROCONTROL has established a project, the Data Integrity (DI) project, to improve the integrity of data such that the requirements of ICAO Annex 15 (Reference 1) may be met. This is being addressed through the specification of improved standards, training and by provision of supporting tools to provide a means of compliance. This latter support is being provided by way of the Data Integrity Tool (DIT) which may be used by States if they do not have already suitable tools and processes in place.

Application of this EUROCONTROL material ensures:

- That data is protected against:
  - Corruption of data;
  - Malicious intervention during transfer;
  - Receipt from incorrect sources.
- That the ICAO required data integrity values are met in the supply of information to the AIS;
- That an audit trail is provided thus allowing the full traceability of data to be assured.

5.2.2 Data Quality Tool Set

The Data Quality Tool Set (DQTS), commissioned by EUROCONTROL, provides a set of tools for use during the data processing chain. Amongst these tools is a 32-bit CRC Tool which would allow the integrity of data to be checked during the transfer step from Data Originator to Data Collector and during any onward transmission.

5.3 Data Processing

5.3.1 Data Integrity Process

Through use of the material provided by EUROCONTROL's DI project, the operations necessary for the handling of Aeronautical Information may be defined by a central body which, in turn, results in a tightly controlled process being applied.

Furthermore, as the internal processes typically contain more than one step, a full data audit chain is maintained and the data is protected against corruption between each step.

5.3.2   Static Data Procedures

EUROCONTROL's Static Data Procedures (SDP) provide a generic definition of the activities required to be undertaken to process aeronautical data from the point of receipt at an AIS to the point of publication.

In order to be implemented within a State, they must be instantiated for that State. This step includes:

- Clear identification of who is responsible for each role defined within the process;

- Where the process allows more than one possible way of working, identification of which choice is adopted within the State;

- Implementation of a local procedure for maintaining the required audit trail.

Although by this instantiation the process employed by States can vary, these variations are minimal and the quality of the end publication should achieve an acceptable minimum standard.

5.3.3   Operating Procedures for AIS Dynamic Data

The EUROCONTROL Operating Procedures for AIS Dynamic Data (OPADD) provide a clear and unambiguous description of the manner in which the NOTAM family of Aeronautical Fixed Telecommunications Network (AFTN) messages (hereafter just referred to as NOTAM message) should be issued.

The OPADD becomes effective from the point at which a decision has been made that the creation of an NOTAM message is necessary.

OPADD has been adopted throughout the ECAC region although with some reservations and deviations. The adoption of its recommendations, without fail, would provide the guaranteed standard for creation of NOTAM messages and, consequently, the unambiguous understanding of them upon receipt.

5.3.4   European AIS Database

The European AIS Database (EAD) provides a reference set of geo-spatial aeronautical data and NOTAM messages for the ECAC region and a repository of published AIPs. It may be used to plan, co-ordinate and to act as the main repository of such data.

The functionality provided may be used to process the received data and, if using the EAD Client Interface Terminal (ECIT), through use of the commercial products provided, produce an AIP. This does however require the user to add text to the geospatial information contained within the EAD Static Data Operation (SDO) database.

The International NOTAM Operation (INO) functionality provided may be used to provide a means of processing outgoing NOTAM messages, an essential part of the EUIR Service.

5.3.5   Data Quality Tool Set

The EUROCONTROL's DQTS provides tools which may be used during the processing of data. Tools provided include:

- Distance calculations;
- Bearing calculations;
- Intersection calculations.

Although it does not seem appropriate to mandate the use of the DQTS, its tools have been fully tested and approved. The recommended use of the DQTS should be considered as consistently derived data would then be seen across Europe.

5.4 Data Publishing

5.4.1 *Electronic AIP*

EUROCONTROL's Electronic AIP (eAIP) provides the ideal means by which the EUIR AIP data may be published. Through its underlying technology, Extensible Markup Language (XML), the data and the ability to view it are decoupled, allowing users to view data in the most suitable format.

By publishing the EUIR AIP and by providing a means of viewing the data in a traditional format the needs of the majority of users could be met. Users who wish to view data differently, or to view, and possibly print, only a sub-set of the data would be able to do so by creating their own viewer.

Whilst the eAIP does not support the temporality of information for the purposes of the EUIR AIP this is not pertinent as the AIP presents information applicable from a single point in time, typically the Aeronautical Information Regulation and Control (AIRAC) effective date.

5.4.2 *xNOTAM*

The XML Notice To Airmen (xNOTAM) will provide a means of updating Aeronautical Information in real-time. Furthermore, for those States who are unable to handle the processing necessary for xNOTAM, it may automatically be transformed into an ICAO compliant NOTAM.

5.4.3 *European AIS Database*

The EAD provides two possible uses at the Data Publishing stage:

- Firstly, to act as the data source for publication although it must be remembered that the EAD is a database containing, in the main, geospatial data only.
- Secondly, to act as a reference database of quality assured data against which the EUIR AIP product may be checked.

5.5 Data Distribution

5.5.1 *Internet*

The Internet provides a key means by which Aeronautical Information could be published in an electronic form. Technologies provide flexibility in the way in which the information is provided, including:

- As source data which may be used by other computer systems;
- As electronic documents which may be read by humans;
- Protected such that only authorised sources may access it;
- Charged for through use of electronic shops.

Through use of the Internet the distribution time may be significantly reduced and, should it be required, both AIRAC cycle and current valid information could easily be provided.

Currently the use of the Internet as a primary means is not permitted by ICAO. However, a working group is currently examining its possible use.

5.5.2 CD-ROM

The use of CD-ROMs allows information to be provided to users who do not have Internet access or for it to be accessed from locations where Internet access is not available, for example, in the cock-pit.

Replication and distribution of CD-ROMs is becoming cheaper and these could be provided as a supplementary means to Internet provision.

5.5.3 E-mail

One disadvantage of the Internet is that it is viewed, by the user, on an on-demand basis. This means that, should updated or new information become available, the user would only become aware of this when they next viewed the pages.

E-mail would be able to address this in one of three ways:

- Firstly, users could possibly subscribe to receive the EUIR AIP by e-mail. In its native form this would be too large for many servers to handle, but, by providing it in sections and compressing it, this may be overcome.

- Secondly, an initial, complete EUIR AIP, load could be provided by CD-ROM after which point only the updates, in the form of a delta load are received by e-mail.

- Finally, users could subscribe for notifications to be received as and when updates are made to the information. This could even be tailored such that notifications were only generated for specific types of update, for example, for a restricted geographical area or for limited data types.

It can be argued that the use of unregulated[7] e-mail is not safe as there is no guarantee that the intended recipient does obtain the information. To overcome this, e-mail should not be used as the primary means of notifying users where the safe operation of flight could be affected through the non-receipt of an e-mail.

5.5.4 European AIS Database

Whatever electronic format the EUIR AIP is made available in, the EAD could be used to provide the distribution method. This may be achieved in the following three ways:

- Through sending out the AIP via the EAD System Interface (ESI);

- By storage of the AIP and allowing access via the ESI functionality;

- By storage of the AIP and allowing access via the ECIT.

These possibilities may require some increase to the current functionality of the EAD, however, they do fit with the general principles of its provision.

The EAD also permits two means of connection, via dedicated lines which form part of the EAD Network and via the Internet.

---

[7] Some systems implement a peer-to-peer connection for transfer of mail which can offer a more secure means of connection.

5.5.5 Paper

Although it is intended to avoid paper as much as possible, it may still be necessary to provide the EUIR AIP in a paper form to some users who are unable to receive electronic media.

5.5.6 Data Quality Tool Set

Once again the CRC function provided by the DQTS may, subject to the agreement of EUROCONTROL, be used to protect data against a loss of integrity during its final distribution to the end-user. For those users whose knowledge of, for example, computer systems is limited, additional software could be provided to:

- Check the content of an AIP against an attached CRC prior to allowing its display;

- Provide an installation script which copies the AIP to a selected area of a computer and validates the copy.

5.5.7 Data Integrity Process

If the publication distribution is performed in an electronic form, it may still be protected through use of a means of compliance such as EUROCONTROL's DI project or a similar system. This would only be used in the case where the next data user would be using electronic tools to view the data.

6   PROPOSED SOLUTIONS

6.1   General

The following sections present various proposals which, in the view of the study authors, would allow the EUIR AIP to be prepared whilst meeting the various criteria specified by ICAO, the EC and Stakeholders.

6.2   Location of Effort

6.2.1   General

Solutions have been made for the location at which effort is undertaken for the collection, processing, and publication of aeronautical data. For each of these phases, the solution made has been assessed, taking into consideration the advantages and disadvantages discussed in Chapter 3, whilst accounting for the flexibility needed to meet the existing working practises in place today.

6.2.2   Data Collection

Data Collection should remain at an individual State level unless States elect to work together in a State Grouping, perhaps based on the FAB groupings that are expected to be formed in the future.

The reasons behind this proposal are three fold:

- The existing information flows and transaction points within States are effective and no new structure is required, therefore avoiding issues of discontinuity and uncertainty associated with the change process;

- The existing data management structures will remain and, as such, the management processes remain at an acceptable level;

- At a Data Processing level, potential problems associated with different languages are avoided and consequently so is the risk of information being misunderstood.

6.2.3   Data Processing

In the first instance, in order to allow the implementation of the EUIR AIP to proceed quickly and easily, it is proposed that the Data Processing initially remain at a State level. However, in time and with the introduction of FABs, it may be more efficient for States to undertake their Data Processing in the form of a State Grouping.

This proposal has been made in the light of the current situation in AIS and the likely developments to be seen in the future.

Currently there is a limited, but growing, compatibility between systems, based mainly on the EAD and potentially the eAIP. Furthermore, as the SES's Interoperability Regulations take effect, interoperability will improve.

6.2.4   Data Publishing

6.2.4.1   General

Two forms of publication are needed, National Publications and European Publications, the latter being in the form of the EUIR AIP and its supporting documents.

6.2.4.2 National Publications

It seems the most logical solution that, initially, the body who processes the data continues the process and performs the related publication phase.

The proposal is, therefore, that a State or State Grouping would consolidate the information and prepare publications as is the case today. However, it is considered likely that, with the introduction of FABs, States may wish to centralise their activities in order to obtain the available economies of scale.

6.2.4.3 European Publications

It is proposed that a unitary body is tasked with the harmonisation, editing and publication of Aeronautical Information associated with the EUIR. No proposal is made as to the body responsible for this provision.

It is considered that the determination of the appropriate body is the responsibility of the EC or a delegated agency and that it should be based upon the laws of competition and service provision of the EC as modified by SES legislation.

6.2.5 Conclusion

As may be seen, a single proposal for the location of effort has been made.

The study has concluded that the means to provide the AIP should be centralised, in order to meet the mandates required by the contract. In consequence, although a number of options have been considered, only one possible option is viable.

The main reasons for this proposal are:

1. The SES regulation states that "*Without prejudice to the publication by Member States of aeronautical information and in a manner consistent with this publication, the Commission, in close cooperation with EUROCONTROL, shall coordinate the development of a single aeronautical information publication relating to the EUIR, taking account of relevant ICAO requirements*". As such, a State has the right to elect to continue publication of its aeronautical information as they do today, in addition to the publication of the EUIR AIP.

2. The processes in place today for the provision of AIS within Europe are generally seen as being good, only lacking integration in the final stage of publication.

3. It is the policy of the EC that the decision of States to work together in some form of collaboration is left for these States to make.

4. The number of languages and organisations involved within the SES territory is significant and this adds to the complexity of the data handling.

5. The collaboration of States in the processing of aeronautical information will lead to cost savings for the States involved.

Nevertheless, the solution proposed provides a flexible way forward which meets the needs of the varying national and regional working collaborations in place today, the SES and its Stakeholders.

This proposal outlined above may be represented by the data flow presented in Figure 2 below.
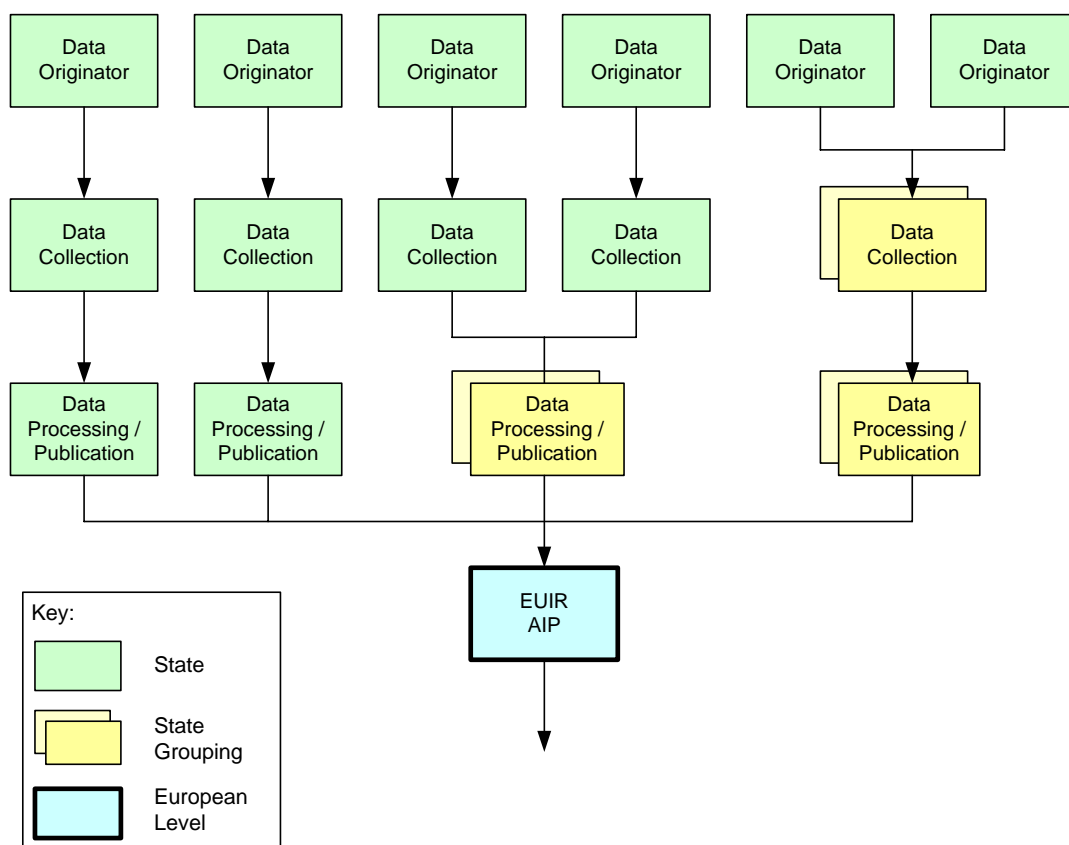
Figure 2: Recommended Data Flows

Such an arrangement also allows flexibility to meet the varying demands of today and those foreseen in the future. Figure 2 represents the data flow from Data Originator through provision of National AIP information to the publication of an EUIR AIP. It could apply equally to Military bodies or, in the future, States who have combined to provide a FAB. Furthermore, if a single body was established or existed to originate the airspace design for the whole SES, this would become another thread of Data Origination, Data Collection and Data Processing / Publication, operating in compliance with the scheme outlined in Figure 2.

6.3 Technical Solutions

6.3.1 General

During the study a number of possible technical solutions were established. These combine those technical elements considered best suited for application within the preparation of the EUIR AIP and build upon the proposed solution for the location of effort discussed above.

In developing these proposals a number of prime considerations were taken into account. These include:

1. The need to handle large quantities of Aeronautical Information in the preparation of the EUIR AIP;

2. The need to reduce / avoid increases in the time taken to prepare the EUIR AIP over and above that needed today;

3. Make use of technologies which are already in use within States or for which States are showing a good level of acceptance;

4. Avoid making changes to the current way of working which may degrade the level of service seen today, even if in the short term;

5. Solutions shall be compliant with the SES regulations currently existing and planned for the future;

6. The solutions should be scaleable to allow further States, including those outside the ECAC region, to join the SES should they so wish.

By addressing these key considerations, four possible solutions were established which are felt, to a greater or lesser extent, to achieve these key aims. Each of these is presented below.

The advantages and disadvantages of each may be found in Annexe A.2.

6.3.2   Solution 1

Solution 1 presents a possible means of implementing the EUIR AIP based upon the use of the EAD.

Its process flow may be described thus:

1. Each State or State Grouping prepares its Aeronautical Information as described above.

2. The processed Aeronautical Information is entered, either by way of an ECIT or through a system to system connection using the ESI, into the EAD SDO database.

3. The State or State Grouping also prepares a paper AIP which is entered, in the form of a PDF version, into the EAD Published AIP Management System (PAMS) functionality. This again is undertaken either by way of an ECIT or using the ESI.

4. The EUIR AIP Provider extracts the necessary geospatial data from the EAD SDO database, using an ESI interface with the necessary supporting text being identified from the National AIPs. This will be a manual process with both sets of data being combined with agreed EUIR specific text to produce the EUIR AIP.

5. The EUIR AIP is then created, published as both an eAIP for distribution directly to clients, and as a PDF version which may be stored within the EAD PAMS functionality.
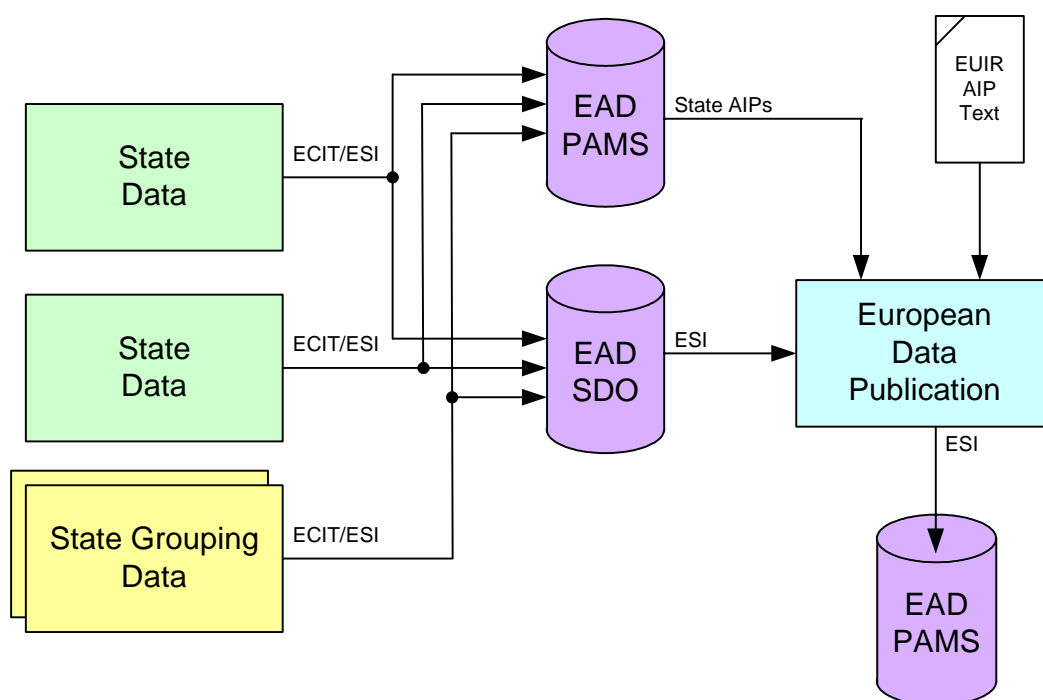
Figure 3: Possible Solution 1

6.3.3   *Solution 2*

Solution 2 presents a second possible means of implementing the EUIR AIP also based upon the use of the EAD.

Its process flow may be described thus:

1. Each State or State Grouping prepares its Aeronautical Information as described above.

2. The processed Aeronautical Information is entered, either by way of an ECIT or through a system to system connection using the ESI, into the EAD SDO database.

3. The State or State Grouping also prepares its AIP Text which is entered into a new EAD function. This again is undertaken either by way of an ECIT or using the ESI.

   It should be noted that this option requires the States to perform activities over and above those either currently or planned to be carried out. Furthermore, there would be the need for any systems connected to the EAD to be modified to allow the additional information to be stored.

4. The EUIR AIP Provider extracts the necessary geospatial data from the EAD SDO database and necessary AIP text from the new repository, using an ESI interface and combines this with agreed text to produce the EUIR AIP.

5. The EUIR AIP is then created, published as both an eAIP for distribution directly to clients, and as a PDF version which may be stored within the EAD PAMS functionality.
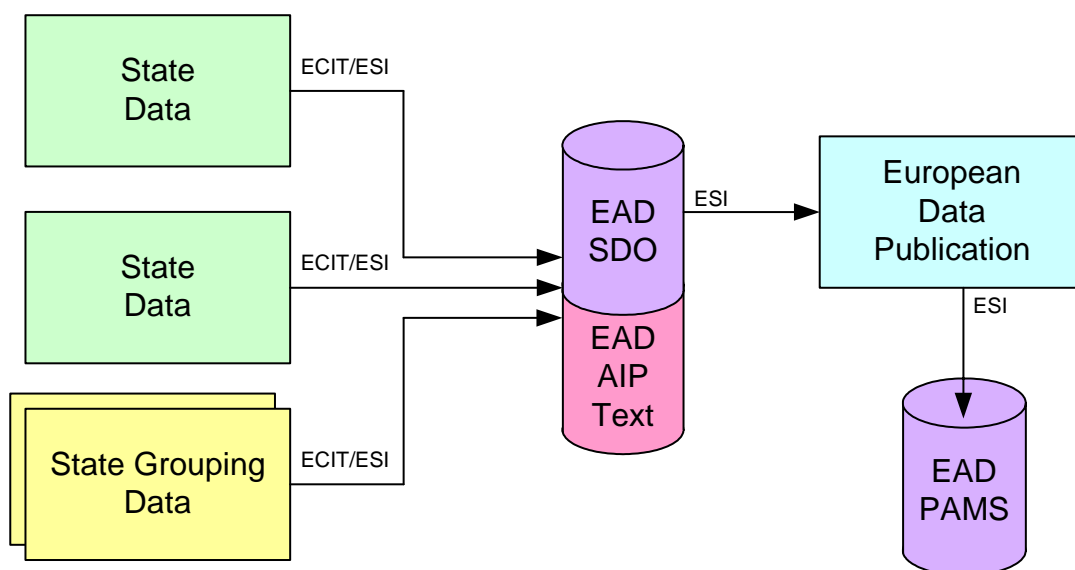
Figure 4: Possible Solution 2

6.3.4   Solution 3

Solution 3 presents a third possible means of implementing the EUIR AIP which is not based upon any system architecture but does make use of EUROCONTROL's eAIP standard.

Its process flow may be described thus:

1. Each State or State Grouping prepares its Aeronautical Information as described above in the form of an eAIP.

2. The processed Aeronautical Information is passed to the EUIR AIP Service Provider. This transmission may be by way of the Internet, e-mail or through use of a private network.

3. The EUIR AIP Provider uses tools and processes to merge the various National eAIP documents into a single EUIR AIP, again in the form of an eAIP.

4. The EUIR eAIP is then validated against the content of the EAD SDO. This will again be through the use of tools and the ESI to access the EAD data.

5. The EUIR eAIP is distributed to the end users. This distribution may be carried out through use of a paper document or again through use of the Internet or e-mail.
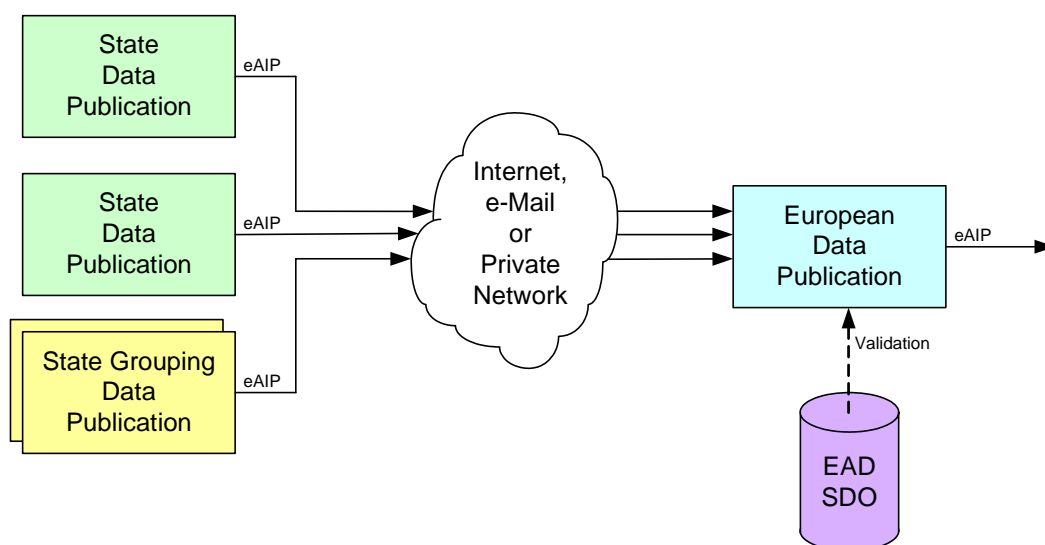
Figure 5: Possible Solution 3

6.3.5   *Solution 4*

Solution 4 presents a further means of implementing the EUIR AIP which combines the use of both the EAD and EUROCONTROL's eAIP standard.

Its process flow may be described thus:

1. Each State or State Grouping prepares its Aeronautical Information as described above in the form of an eAIP.

2. The eAIP is entered, either by way of an ECIT or through a system to system connection using the ESI, into the EAD PAMS database.

3. The EUIR AIP Provider uses tools and processes to merge the various National eAIP documents into a single EUIR AIP, again in the form of an eAIP.

4. The EUIR eAIP is then validated against the content of the EAD SDO. This will again be through the use of tools and the ESI to access the EAD data.

5. The EUIR eAIP is stored, using an ESI link, within the EAD PAMS database, making it available through the EAD distribution channels.
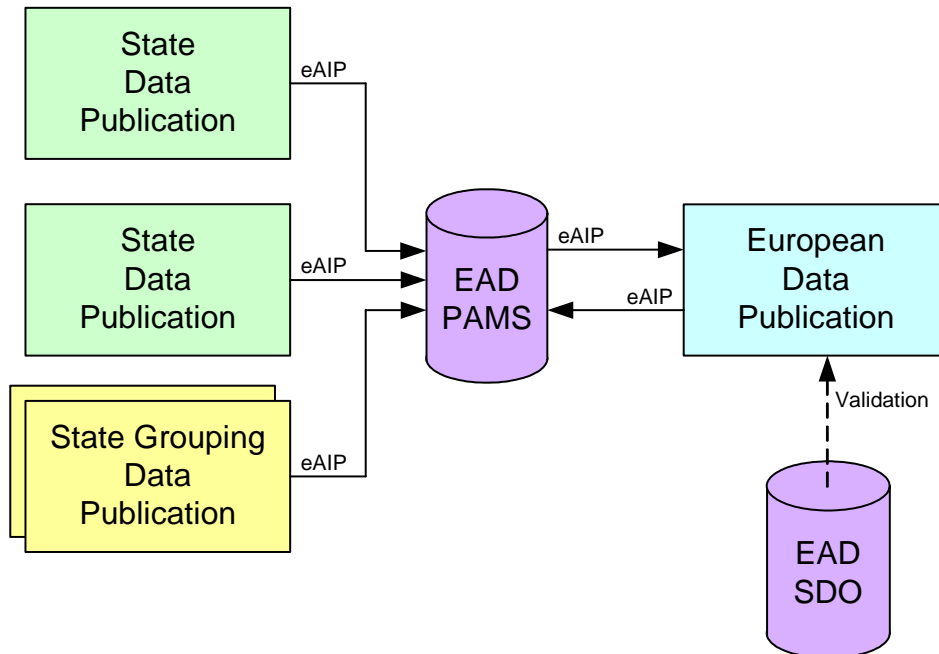
Figure 6: Possible Solution 4

6.4　　Impact Assessment

6.4.1　General

This impact assessment has been carried out in accordance with the guidelines issued by the European Commission.

The EC has concluded that the traditional methods of establishing the impact of changes, which were mainly costs based, do not fully capture the nature of the impacts, which are often more biased toward quantitative rather that qualitative measures.

To this end, the guidelines call for an initial impact assessment to be carried out, the results of which are provided here.

6.4.2　Context

This assessment has been carried out in the light of the framework established by the SES legislation. It has been assumed that what the mandates specify shall be provided and that options that do not meet these prime principles shall not be considered.

To facilitate the assessment, the following baseline conditions were established:

- The SES will exist;
- There will be an EUIR;
- A single AIP for the EUIR will be provided;
- States will still be permitted to publish their own Aeronautical Information;
- States will migrate to the use of EAD as prescribed in European Convergence and Implementation Plan (ECIP) INF01 (See 8.2.1);
- States will provide an eAIP as prescribed in ECIP INF03 (see 8.2.2).

6.4.3　Impact on State Authorities

6.4.3.1　Considerations

As States shall be permitted to continue publishing their own Aeronautical Information, the solution chosen must make this possible. In order to facilitate this, the fundamental processes in place today must continue, even if in a slightly modified manner.

The EUIR AIP Service Provider must receive all relevant information from the individual States such that the European wide product may be produced. Whilst the States could provide this in the form of the paper AIPs, as is the case today, this is not considered appropriate given the quantity of data to be assessed and merged and the inherent risks of error.

It is therefore desirable that the Aeronautical Information is provided in an electronic form and that the generation of this has benefit for the State Authorities.

6.4.3.2　Impact of Proposed Solutions

6.4.3.2.1　Common Impacts

A State Authority may experience a reduction in the number of copies of an AIP which it distributes, although given the need for the lower airspace information

which it publishes, this is questionable. It is possible that some users who currently subscribe to the State's AIP to obtain upper airspace information will instead obtain the EUIR AIP as the main source of this data. It has, however, been identified that the majority of users who require access to upper airspace information also require knowledge of the lower airspace and aerodromes. If a user has previously sourced this information from a State's AIP then it is highly likely that this will continue to be the case.

Whilst it may be considered that a reduction in the number of AIPs issued by a State may equate to a loss of income this should not be the case. The cost of preparing an AIP is the same whether one copy or one hundred are distributed, this cost also being met by route charges. Furthermore, ICAO Annex 15 (Reference 1) indicates that a State should only charge the cost of reproduction and distribution of its AIP. Therefore, a reduction in copies distributed, and hence income obtained, should see an equal reduction in the cost of preparation.

6.4.3.2.2   Solution 1

With solution 1 (see 6.3.2) there is no impact on the work process of States.

Solution 1, however, only provides some of the necessary information in an electronic form, the EUIR AIP Service Provider being required to extract the missing information from the paper form of the AIP. The extraction of such information would be a manual process and therefore may lead to the injection of human errors, a loss of integrity and a consequential increase in risk.

6.4.3.2.3   Solution 2

Solution 2 (see 6.3.3) would have an impact on the working processes of States as additional information, over and above that currently planned, would require entry into the EAD.

Having entered this additional information into the EAD it is considered highly likely that States would then amend their processes for production of their AIP to make use of this same functionality.

6.4.3.2.4   Solution 3

Several States in the SES region have already developed an eAIP and many more plan to do so. ECIP INF03 (see 8.2.2) requires States to implement an eAIP and therefore it is considered that Solution 3 (see 6.3.4) would have no impact on the working processes of States.

6.4.3.2.5   Solution 4

Solution 4 (see 6.3.5), from a State Authority point of view, is identical to Solution 3. As such, the impacts addressed in 6.4.3.2.4, above, apply.

6.4.4   Impact on Users

6.4.4.1   General

Aeronautical Information is used by a number of different user groups, the SES affecting each in subtly different ways. The impact on each will not be significantly different despite the solution selected as each result in the same end product.

6.4.4.2 Commercial Aviation

With regards to the publication of EUIR AIP, commercial aviation is unlikely to see a direct impact. Most operations are carried out using a Flight Management System (FMS) and as such, pilots make use of Aeronautical Information contained within data cartridges. The positive impacts on the providers of these cartridges (see 6.4.4.5) will indirectly impact the commercial aviation Stakeholders.

6.4.4.3 General Aviation

For the purpose of this study, the General Aviation (GA) user group may be split into two categories, those who fly in upper airspace and those who do not, the latter being a far larger percentage of the group.

Those GA users who do not fly within upper airspace will see no impact from the solutions offered.

For those GA users who fly within upper airspace, the presentation of the Aeronautical Information will have a direct impact. The entire EUIR AIP will be a considerable document and therefore not suitable for use in a paper form, in its entirety, within a cockpit.

Phase 3 of the study must address the presentation needs, allowing users to obtain upper flight information related to a limited region.

6.4.4.4 Military

The impact on Military users will vary depending upon the type of flight undertaken. For combat aircraft whose flights are undertaken solely in lower and military restricted airspace there is unlikely to be any impact. However, for flights that are undertaken within upper airspace an impact may be seen, this being dependent upon the equipment of the aircraft.

For those military aircraft equipped with RNAV equipment there should be minimal impact as described in 6.4.4.2 above. Where no RNAV equipment is fitted, the impacts seen by GA (see 6.4.4.3) in upper airspace are likely to apply.

6.4.4.5 Commercial Data Providers

This is the user segment that will probably benefit most from the proposals made for an EUIR AIP. Given the sheer amount of information, electronic media will be the only viable means of publication.

As a result, the Commercial Data Providers will be able to receive fully co-ordinated data for the SES Region which may, through use of tools, be extracted directly into their system database. Through such a method, the necessity to retype the data is removed, offering resource savings and there is a reduction in the risk of human errors.

6.4.5 Impact on Systems / Tools

6.4.5.1 General

The solutions proposed have all been developed to make maximum reuse of existing investments whilst achieving the objectives of the SES.

To capitalise on today's working practises and environment, it has been necessary to propose further development of some items. The following sections outline the impacts for each solution.

6.4.5.2 Solution 1

This Solution (see 6.3.2) only makes use of existing technologies and therefore has no impact on the existing tools and systems in place today.

A system, possibly an ECIT, would have to be used by the EUIR AIP Service Provider to produce the AIP. This is not seen as a major factor as many solutions already exist, which could be used.

6.4.5.3 Solution 2

In order for Solution 2 (see 6.3.3) to be implemented, an increase in the functionality of the EAD system is needed. New functionality either as part of the SDO database or as a standalone element (EAD is used by more than SES Member States) would be required to hold those elements of an AIP which are non-geospatial (mainly text).

This would also require both the ECIT and any client systems using ESI to be updated also.

A system, possibly an ECIT, would have to be used by the EUIR AIP Service Provider to produce the AIP. This is not seen as a major factor as many solutions already exist, which could be used.

During the study, considerable resistance to any increase in the functionality of EAD has been expressed by a significant number of Stakeholders and this should be taken into account in the decision making.

6.4.5.4 Solution 3

For Solution 3 (see 6.3.4) to be implemented, further development of EUROCONTROL's eAIP standard may be required to provide a schema definition that allowed the EUIR AIP to be produced. This is most likely to only be in the area of mandatory/optional fields and is not foreseen as a major issue.

Furthermore, the development of a new tool to automatically combine the contributing States' eAIPs into a single EUIR eAIP would be required. This would also be required to validate the content against the EAD SDO database.

Whilst this tool does not exist, it is not foreseen as a major problem. Phase 3 of the study will address this further, establish how it could be developed and the likely time and cost implications.

6.4.5.5 Solution 4

Solution 4 (see 6.3.5) is a further refinement of Solution 3 and the impacts addressed for Solution 3 in 6.4.5.4 above apply.

Furthermore, the EAD PAMS functionality would require minor enhancement to allow the storage and distribution of eAIPs. This expansion is already planned and therefore the impact of this requirement should not be considered in the decision making.

6.4.6 EUIR AIP Costs

6.4.6.1 Implementation

Further analysis of the cost of implementing the EUIR AIP must be carried out during the early implementation phase. A number of possible activities may already be identified, although not quantified. These include:

- Migration to EAD;
- eAIP Implementation;

- Implementation of the tools needed to prepare the EUIR AIP.

The costs associated with some of these activities, especially the first two, should not however be considered as contributing to the cost of the EUIR AIP. States have already agreed to undertake these activities and therefore the costs are incurred whether the EUIR AIP exists or not.

As part of Phase 3 the cost of implementation must be addressed further. Although it is unlikely that during this phase the cost will be ascertained, a plan which will lead to a cost being estimated should be derived.

It is clear that the end-users will not accept a situation where they are paying increased route charges for the implementation of a different version of the Aeronautical Information which they already receive. This is especially so where the airspace user groups are considered. The biggest contributors to route charges are the commercial airlines, the vast majority of which fly using complex FMS. For them the benefit of the EUIR AIP is slight and therefore cost savings minimal.

6.4.6.2 Service Provision

It has been an objective of the study to ensure that the proposed solutions offer a low-cost solution to avoid adding to the on-going Service Provision costs.

Given that the States are permitted to still prepare and publish their own AIP material and during the study it has become apparent that they wish to do so, the existing State incurred costs are not likely to be reduced without collaboration between Authorities.

As such, collaboration is a secondary aim of the SES and is not mandated. Under a worst case scenario, each State continues to incur the current costs associated with AIP preparation.

The production of the EUIR AIP, and therefore an additional publication, is therefore a new cost over and above those already funded by route charges.

As addressed earlier, airspace users will not accept an increase in their current costs. This is especially so, at a time when the aviation community has been struggling to operate within a hostile financial environment.

Again, until a further assessment is made of the EUIR AIP implementation, quantifiable costs are not available. As with implementation costs, some of the key activities and resource requirements are, however, already known. These include:

- Staffing costs;
- Cost of AIP preparation;
- Cost of infrastructure.

These costs will all be in addition to any costs already incurred in the publication of Aeronautical Information within the SES region.

The various solutions impact these requirements in differing ways. Solution 1 will be labour intensive and therefore have a higher staffing requirement than the other three which are all more suited to automation.

Solutions 2 and 4 provide the most scope for full automation with resource only being required for tasks such as conflict resolution and NOTAM preparation.

Once a solution has been selected, Phase 3 of the study will address these Service Provision costs in more detail. The EC will be required to address the funding issues. A number of options are already foreseen, some more acceptable to Stakeholders than others. These include:

- Can cost savings elsewhere in the SES be used to fund the EUIR AIP?
- Is a separate levy charged for the EUIR AIP leading to its cost being distributed amongst only those airspace users who wish to use it?
- Are route charges increased slightly to fund what could be a low cost operation?

It should be remembered that this Study relates to the feasibility of the implementation of the EUIR AIP. Many questions have been raised but not answered during the first two phases of the Study. Phase 3 may address some, but not all, and inevitably further questions will be raised.

It is recommended that consequent to completion of this study, further work in the context of the required functionality, safety analysis, cost/benefit calculation, staff qualification / Service Provider licensing, is undertaken.

The application of EUROCONTROL's Reorganisation (EORG) business model is suggested, the study reports equating to the feasibility phase.

7   RECOMMENDATIONS

7.1   General

The following section details the recommendations of the Study with respect to the Location of Effort, Technical Solution and other considerations.

These recommendations have been developed through discussion with the EC, EUROCONTROL, ICAO and the SES Stakeholders. It is believed that the recommended way forward will provide the benefits of a single EUIR AIP without fundamental change to the current working practices of the States. It is considered that the AIS provision in Europe is efficient, and that the only omission is a means to integrate the required information, into a single AIP.

Other studies within the scope of the SES are addressing the more efficient use of airspace. It is assumed that the outcomes of these studies will be factored into the requirements for the harmonised publication of Aeronautical Iinformation in Europe.

7.2   Location of Effort

7.2.1   *General*

As addressed earlier in section 6.2, for a number of significant reasons, only one proposed solution has been made and therefore forms the basis of the recommendation.

The recommendation is outlined thus:

1. A State initially remains responsible for the collection of data. Thereafter, if States wish to work together as small groupings, maybe on an FAB basis, this would be encouraged as it would greatly aid the process flow. Such a grouping will be dependent upon many factors, not least the size of the States involved, languages used and the number of Data Originators involved.

2. Once the data has been collected its processing remains within the State, or, if preferred by the States, within a State Grouping.

3. The processed data is then published by the Data Processor in the form of a National, or in the case of a State Grouping, Multi-National AIP. The State may also publish the AIP as a paper document in English and, if desired, in National Language(s). As a single publication will present all upper airspace data, there is no operational necessity for a National publication to present the EUIR information, relating to the territory covered. It is thought that it would be acceptable for this information to be made available in a National AIP, if it is in a National language.

4. Finally, the Service Provider will use the AIPs produced by the SES constituent States to produce the EUIR AIP.

7.3   Technical Solution

As discussed earlier, four possible technical solutions were outlined. Only one of these can form the basis of a recommendation which will, if accepted, be further developed during Phase 3 of the study.

The technical solution has been selected upon a number of key criteria:

- Ease of implementation;
- Minimum change to the existing systems;
- Leverage of existing systems by the States, including the EAD;
- Flexibility and adaptability;
- Ability to migrate to lower airspace; terminal airspace and airports, if required.

Having assessed the advantages and disadvantages of the various proposals, listened to the feedback received from Stakeholders both during the two workshops held and from private comments raised outside of these meetings, a recommended way forward has been selected. This recommendation is for Solution 4 which, to recap, was based upon the use of the eAIP standard for information exchange and the EAD for validation and distribution.

The reasons for this selection may be outlined thus:

A key factor in selecting the proposed solution was the role that the EAD could play. As stated earlier in this report, it is essential to note that the EAD contains only a subset of the required AIP information (mainly geo-spatial data) and that the necessary (legal) supporting text is not contained within the database. As the provision of such information would result in the modification of the EAD, a significant number of Heads of European AIS advised strongly against taking this course of action.

For these reasons, the modification of the EAD was discounted.

Nevertheless, the full leverage of the present capabilities of the EAD was considered essential and the proposed solution is designed to accommodate this requirement.

The use of the eAIP provides a baseline for the digital transfer of a complete AIP, an aim of ICAO and endorsed by the Air Navigation Bureau in December 2003.

By using eAIPs as the source of National Aeronautical Information and validating the combined EUIR eAIP content against that held within EAD's SDO database, a validation step is possible which, although not likely to establish many issues, adds to the integrity of the product.

It offers a low cost, expedient methodology by which the EUIR AIP may be established. There is no need for the creation of further systems, simply the need for the development of tools to allow the merging of eAIP data to be automated.

7.4   Other Considerations

7.4.1   Existing Rules and Arrangements

The above recommendations have a minimal impact on the existing arrangements for service provision in place today. Each State would continue to provide the service that is available today, operating under the existing rules.

Nevertheless there would be some impact and areas of possible change / effect relating to:

- Time – the eAIP may need to be made available to the EUIR AIP provider before the current date of distribution, typically 42 days before the AIRAC effective date. This should not have a major effect as the information is normally known and processed prior to this date, allowing the traditional paper publications to be printed and collected prior to this distribution date;

- Publication – it is possible that the eAIP published by each State would no longer have an operational requirement to contain the upper airspace information;

- Certification – the SES requires that AIS Providers are certificated; this is an additional need and is equally applicable whatever solution is implemented.

7.4.2   *Data Quality and Means of Publication*

7.4.2.1   *Duplication of Data*

The recommended solution will result in the duplication of data relating to the Upper Airspace, being published in both the State and EUIR eAIP. However, the application of style-sheets may be used to limit the data which may be viewed, or indeed, to produce another eAIP which does not contain the duplicated information in a State publication.

This issue needs to be further addressed during Phase 3 of the study as this duplication is currently against the requirements of ICAO. However, given the SES regulation's stipulation that a State may continue to publish its own data and the need for the EUIR AIP, this duplication cannot be avoided, no matter what solution is proposed.

7.4.2.2   *Timeliness*

As previously stated, the use of the eAIP should allow the EUIR AIP Provider to prepare an EUIR eAIP in the time allowed by the constituent States to reproduce paper copies of their National AIP. Through such utilisation of time there should be no increase in the current time allowances.

Where an impact may be seen is if there is a need for the eAIP to be produced in paper form by the EUIR AIP Provider. This requirement must be addressed ahead of the implementation of the EUIR and with ICAO. Although it is certain that some users will require paper copies of information, how these are reproduced and distributed may be addressed in several ways.

One possible solution would be for each subscribing State to receive the eAIP using technology such as the Internet and to produce the necessary paper copies locally.

The benefit of this would be to remove the resource requirement to manually update the paper documents as, in effect, the electronic distribution would provide a new version of the documents for each AIRAC cycle or as and when required.

7.4.2.3   *Integrity*

The use of the eAIP will allow the integrity of the data published by States to be maintained through to the EUIR AIP publication stage.

As addressed earlier it is recommended that ahead of the implementation phase of the EUIR AIP, consideration is given to how the integrity of the data provided by States may be improved.

7.4.3   User Requirements

The main user requirements are specified within ICAO material and supported and supplemented by documents published by the EC and EUROCONTROL.

The solution proposed allows these requirements to be met with the few exceptions (e.g. duplication of information) which have been raised in the Phase 1 and Phase 2 reports. These are being addressed with the relevant bodies and are, on the whole, not affected by the selection of a specific solution, rather being relevant to the EUIR AIP however it is prepared.

7.4.4   Data Provision

The EUIR AIP will obviously comprise all necessary Aeronautical Information relating to the EUIR. This will comprise upper routes and support infrastructure such as NavAids. The scope of the proposed EUIR AIP is provided in the Phase 1 report (Reference 2). A technical specification, based on full Stakeholder involvement, will be required as an early component of an implementation project.

Given this amount of data it is not a practicable solution to propose its primary publication as a paper document. The physical size and cost of such a publication would be unviable without considering the inherent risks in the retyping of the data it contains by its users.

The current trend, now fully supported by ICAO, is for the publication of AIP information in an electronic form, with one single paper copy being made available to each State upon request.

In this context, the EUIR AIP should also be issued primarily as an electronic document, using the eAIP format.

It will be necessary for some Stakeholders to use a paper version of some of the information contained within the EUIR AIP. During implementation of the EUIR AIP, consideration should be given to the means by which users are able to access a limited amount of the EUIR data, for example, on a State-by-State basis.

Through use of the EAD PAMS functionality for publication and distribution of the EUIR AIP, a world-wide customer base may have access to the information. Access may be made through use of the EAD Public User Interface which is unrestricted and does not require the users to register. Nevertheless, issues of liability and Intellectual Property Rights (IPR) will need to be addressed.

7.4.5   Language

It is recommended that the EUIR AIP be published in the English Language only for simplicity and ease. States, if required, could continue to publish the Upper Airspace information, pertaining to that airspace over their territory, in National languages.

It is proposed that States be permitted to translate the EUIR AIP into National languages if required although they would clearly be responsible and liable for any errors made during the translation process.

In making this recommendation the current situation has been considered. Today English is the common language used to publish information for the Upper Airspace, furthermore it is the only language mandated by ICAO for publication.

National languages are only used on a per State basis. The recommendation made therefore sees no loss of information or capability over that currently available. It ensures that the costs incurred in publication of the EUIR AIP are contained by avoiding the need to translate the EUIR AIP into the 19 languages in use, in addition to English.

7.4.6   Subscription

If the EUIR AIP is to be delivered by a method which requires the Provider to transmit the information, some method of subscription shall be provided. This would not be required if the EUIR AIP is made freely available through a medium such as the Internet. However, the economic impact on the AIS Providers would have to be established and perhaps compensated for.

7.4.7   Human Resources

The impact on human resources of introducing the proposed solution is limited as it does not foresee or enforce a significant change over today's working arrangements.

There are two areas where impact may be experienced, details of which are provided in the following sections.

7.4.7.1   Provision of the EUIR AIP Service

The provision of an EUIR AIP and its associated infrastructure will require staffing although, operationally, it is envisaged that this will be in limited numbers. The initial implementation will require development of processes, procedures and supporting tools to establish the first releases of the EUIR AIP. This can be undertaken on a pan-European basis. The OPADD and similar projects could provide a role-model to be followed. Subsequently, much of the task should be automated and hence require a low level of staffing.

A NOTAM message will also be required to support the EUIR AIP. However, given that, in its initial form, only the Upper Airspace is included, the number of NOTAM to be issued will be very low. To this end it may not be cost effective for the Provider to offer an H24 solution unless they already do so. A more cost-effective solution may be for the NOTAM service related to the EUIR AIP to be delegated or sub-contracted to a Service Provider with an H24 NOTAM service.

7.4.7.2   State Groupings

If States wish to work together to offer a joint AIS then economies of scale could be obtained. This may result in a reduction in the human effort required to meet the demand of individual State AIS and provide resources to undertake additional added value work.

7.4.8   SDP

The quality of data published in the EUIR AIP shall be Quality Assured to ensure it is consistent no matter where it is originated and processed. The use of procedures can assist in specifying and maintaining a consistent approach to the origination and handling of data.

The origination of data has been considered outside the scope of this study, subsequently the area of interest is the collection, processing and publication of Aeronautical Information. The SDP whose scope covers these activities exist

and their use is recommended for consideration to support the implementation of the EUIR AIP.

7.4.9 OPADD

As the definition of NOTAM messages within ICAO Annex 15 (Reference 1) is generally accepted as being insufficient, an improved procedure must be applied in the preparation of NOTAM messages by the EUIR AIP Provider.

The OPADD presents such a procedure which is in use throughout the ECAC region. It is recommended that this same document be used by the EUIR AIP Provider.

7.4.10 Data Integrity / Traceability

The ICAO mandates for the integrity of data shall be met. This will require the implementation of processes, throughout the data processing chain, which ensure that these levels are maintained. Furthermore, the traceability of data shall also be guaranteed from its point of origination to publication.

The need to meet these requirements may dictate that a mandate is put in place which requires each State to implement and demonstrate compliance. Such a mandate would ensure that:

- Consistent levels of integrity are maintained and made demonstrable throughout the multitude of processing threads which will lead to the production of an EUIR AIP;

- The traceability may be maintained electronically and hence provided as part of any audit or investigation;

- Changes to the requirements (e.g. an increased integrity level) may be more easily implemented throughout the chain.

The precise requirements must be determined at an early stage of the implementation phase.

8 TIMESCALES

8.1 General

This chapter presents the likely timescales for implementation of the EUIR AIP. This has been based upon the current status, the ECIP objectives established by EUROCONTROL and the likely impact on ICAO SARPS and therefore the need to request amendment by ICAO.

8.2 Related ECIPs

There are two ECIP objectives which affect the implementation of the EUIR AIP, namely INF01 and INF03.

8.2.1 ECIP INF01 – Implement the EAD

INF01 provides for the migration of States to the EAD and, therefore, the provision of their data within the system. This ECIP offers a number of lines of action, two of which are of particular interest.

8.2.1.1 INF01-ASP03 – Migration of all remaining ECAC States to EAD.

This line of action will ensure that all ECAC States, and therefore all States currently participating within the SES, are migrated to the EAD and hence that their data is available within the EAD SDO database.

Due date: December 2006

8.2.1.2 INF01-MIL01 – Migration of Military Authorities to EAD.

This line of action will ensure that Military Authorities, and therefore those who wish to include their data within the SES EUIR AIP, are migrated to the EAD and hence that their data is available within the EAD SDO database.

Due date: December 2008

8.2.2 ECIP INF03 – Implement Improved Aeronautical Information

INF03 provides for the implementation of improved Aeronautical Information. Amongst several lines of action is the establishment, by States, of an Electronic AIP in EUROCONTROL's eAIP format. Two particular lines of action are of interest:

8.2.2.1 INF03-ASP04 – Implement and provide the eAIP.

Although this ECIP intends that all ECAC States provide an eAIP by the end of this year, it is understood that it is only being used to ensure that those States who wish to prepare an eAIP do so using the EUROCONTROL standards developed.

Due date: December 2004

8.2.2.2 INF03-MIL02 – Implement and provide the eAIP.

The true intent of the ECIP is not understood. It is unclear whether it is intended that all Military Authorities provide an eAIP or only those who wish to. Further investigation is on-going.

Due date: December 2004

8.3   Timeframe

In order to implement the recommended solution, the following timeframe is proposed:

ID	Task Name	2005				2006				2007				2008			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Migrate States to EAD																
2	Migrate Military to EAD																
3	Prepare State eAIP																
4	Prepare Military eAIP																
5	Implement Processes and Procedures																
6	Implement Tools																
7	Trial EUIR AIP																
8	Operational EUIR AIP																

Figure 7: Proposed Timeframe for EUIR Implementation

The following should be noted with respect to this proposed timeframe:

1. Not all Military Authorities will have migrated to the EAD by the time the EUIR AIP is firstly trialled and then becomes operational. This is not seen as problematic as the data will be provided via the eAIP and only the validation step will not be possible.

2. The time allowed for both Military and State Authorities to implement the eAIP is longer than that specified by the ECIP.

9 IMPLEMENTATION & SERVICE PROVISION

9.1 General

In order to provide the EUIR AIP service it is clear that additional tasks must be performed over and above those performed today.

This additional work may be classified under two categories:

- Implementation
- Service Provision

The EC has made it clear that the provision of the EUIR AIP would be organised under market conditions, most likely through the use of a tender process.

It is the recommendation of this study that this provision be divided as identified above. The reasons for this are five fold:

1. The implementation is a one-off activity and may be established by bodies that do not have, nor wish to have, the capability to perform Service Provision.

2. Those organisations whose expertise is Service Provision and not systems implementation may concentrate on those aspects.

3. By separating the Service Provision from implementation it will be clearly seen which costs are associated with each element. If the tender was combined then, although the overall cost may not be affected, the balance may not be represented accurately.

4. By having separate tenders it will be easier for the Service Provider to be changed in the future.

5. All potential Service Providers are bidding to provide the same service, with the same tools/processes, thus allowing easy comparison.

The following sections outline the likely content of each tender:

9.2 Implementation

Define the formal processes and procedures to be applied by the Service Provider in executing the task of preparing the EUIR AIP and its associated IAIP elements (AIP Amendments and Supplements, AIC and NOTAM).

Software tools will most probably need to be developed to allow the eAIPs issued by the SES States to be combine into a single product and validated against the content of the EAD SDO database.

9.3 Service Provision

The provision of an EUIR AIP and its associated IAIP products on a monthly basis, as regulated under the AIRAC cycle.

The Service Provider will be expected to ensure that a H24 NOTAM operation is available either directly or through delegation to another body.

All ICAO and SES criteria for Service Provision, including Quality Certification and Staff Licensing, must be met.

10   COSTS

10.1   General

At this stage of the study, producing definitive cost estimates has proven difficult. A number of reasons may be cited, which include:

- Uncertainty regarding cost of implementation;
- Unknowns regarding location of service;
- Early stage of migration to EAD by SES Member States.

It is desirable however to indicate some likely cost for the implementation and Service Provision of the EUIR AIP. To facilitate this, estimates have been provided which although not quantified, allow a comparison between the likely costs associated with each option.

A cost estimate of Nil indicates that no additional effort is foreseen over and above that already in place today or planned through ECIPs.

10.2   Implementation

The table below presents the likely implementation cost for each solution for both the State and EUIR AIP Service Provider.

The costs provided have been ascertained through requests for estimates to EUROCONTROL for enhancement of their EAD and eAIP solutions.

Solution	Costs	
	State	EUIR AIP Service Provider
Solution 1	Nil	Information awaited.
Solution 2	No estimate possible.	Information awaited.
Solution 3	Nil	Information awaited.
Solution 4	Nil	Information awaited.

Table 1: Implementation Costs

As may be seen, no estimate has been possible for the State implementation costs associated with Solution 2. This is because of the many diverse solutions in place today, the lack of information regarding planned migrations to the EAD and the differing State costs for implementation.

10.3   Service Provision

Two sets of figures for Service Provision have been provided. It is foreseen that the initial few releases of the EUIR AIP will require more effort as the processes and procedures are refined and staff are trained. Therefore, two sets of figures are presented. The first, provided in Table 2, presents the likely average cost of effort for the initial AIPs, the second set, in Table 3, present the on-going month-on-month costs.

The Service Provision has been estimated by a team of experienced AIS Operational Staff and technical experts. The figures presented below are to allow comparison of likely effort but do relate to quantifiable amounts. For example, it is thought that effort for the ongoing Service Provision for Solution 2 is double that associated with Solution 1.

The units used are arbitrary and should be used for comparison between solutions.

Solution	Cost of Effort	
	State	**EUIR AIP Service Provider**
Solution 1	Nil	6.0
Solution 2	1.0	4.5
Solution 3	Nil	2.5
Solution 4	Nil	2.0

Table 2: Service Provision Costs – Initial AIPs

Solution	Costs	
	State	**EUIR AIP Service Provider**
Solution 1	Nil	3.0
Solution 2	0.5	2.0
Solution 3	Nil	1.5
Solution 4	Nil	1.0

Table 3: Service Provision Costs - Ongoing

11 REFERENCE DOCUMENTS

11.1 General

The following documents have been referenced within this report.

Ref.	Title	Date/Issue
1.	ICAO Annex 15	Eleventh Edition, July 2003
2.	Phase 1 Report – STA/R/0359/0005	May 2004

Table 4: Documents Referenced

12 ABBREVIATIONS

Acronym	Meaning
AFTN	Aeronautical Fixed Telecommunications Network
AIP	Aeronautical Information Publication
AIRAC	Aeronautical Information Regulation And Control
AIS	Aeronautical Information Services
AIXM	Aeronautical Information Exchange Model
ANSP	Air Navigation Service Provider
AO	Airport Operator
ATM	Air Traffic Management
ATS	Air Traffic Services
CRC	Cyclic Redundancy Check
DIT	Data Integrity
DIT	Data Integrity Tool
DQTS	Data Quality Tool Set
EAD	European AIS Database
eAIP	Electronic AIP
EC	European Commission
ECAC	European Civil Aviation Conference
ECIP	European Convergence and Implementation Plan
ECIT	EAD Client Interface Terminal
EORG	EUROCONTROL's Reorganisation
ESI	EAD System Interface

Acronym	Meaning
EU	European Union
EUIR	European Upper Flight Information Region
FAB	Functional Airspace Block
FMS	Flight Management System
GA	General Aviation
IAIP	Integrated Aeronautical Information Package
ICAO	International Civil Aviation Organisation
INO	International NOTAM Operation
IPR	Intellectual Property Rights
NavAid	Navigation Aid
NOTAM	Notice to Airmen
OPADD	Operating Procedures for AIS Dynamic Data
PAMS	Published AIP Management System
QMS	Quality Management System
SARPS	Standards, Recommended Practices and Procedures
SDO	Static Data Operation
SDP	Static Data Procedures
SES	Single European Sky
XML	Extensible Markup Language
xNOTAM	XML Notice To Airmen

Table 5: Abbreviations Used

This page is intentionally left blank.

ANNEXE A: ADVANTAGES AND DISADVANTAGES

A.1　INTRODUCTION

A.1.1　General

The following tables provide details of the advantages and disadvantages for each of the options discussed in Chapter 3.

The advantages and disadvantages are derived from two sources. Firstly, through information obtained through the study and, secondly, by addressing the issues raised within the Phase 1 Study Report.

The tables are presented in the following form:

- Statement – the point under consideration;

- Comment – context of the statement;

- State – service provided by a State Level;

- State Grouping - service provided by a State Grouping;

- European Level - service provided at a European Level.

In order to assist the reader, colour is used to identify whether the service provision is seen as being advantageous (**Green**), disadvantageous (**Red**) or neutral (**Blue**).

A.1.2   Data Collection

Statement	Comment	State	State Grouping	European Level
Current Situation	Staying with the current situation must be considered as it is in place, works and is seen to do so well.	Good – already here today.	Limited – some States already operate in this way and would be a small change in some instances.	Poor – this would represent a major change over the current situation.
Relationship With Data Originators	In order to best obtain data and to clarify its intention, the Data Collector will build relationships with the Data Originators. The more Data Originators the more difficult this relation building becomes.	Good – relatively few originators to liaise with.	Limited – a significant number of Data Originators will be contacted by the grouping.	Poor – many Data Originators with which liaison is required.
Language	Problems with language barriers may become an issue. There is no requirement for a Data Originator to speak English as they do not commonly face an international customer.	Good – few languages generally experienced.	Limited – there may be some problems, depending on grouping.	Poor – knowledge of many languages will be required.
Single Point of Contact for all European Data	Currently there are many points of contact for the collection of data in SES area. Having a reduced number may offer advantages.	Not possible as there is a point of contact in every State.	Limited – although not a single point of contact there would be a reduced number.	Good – one point of contact for all Data Originators throughout Europe.

Statement	Comment	State	State Grouping	European Level
Number of Data Originators	Each State has many Data Originators. As the Data Collection becomes more centralised the greater the number of Data Originators that must be liaised with, the greater the potential for problems. The sheer size of the number of communications paths may prove difficult.	Small number of communications paths.	Manageable number of communications paths.	High number of communications paths.
Cost Saving	Economy of scale can offer savings.	None – each State must replicate the service of every other State.	A cost saving may be made through the combination of current services into a single function within each Group.	Although a cost saving may be seen through the combination of services it is thought that the other problems identified will not lead this to be the optimal solution with respect costs.
Delegation of Service	If a State does not provide its AIS Service but relies upon another body to supply this service it must delegate the service.	Not required as the State is performing the service.	Required and currently permissible under ICAO.	Required but may not yet be allowable under ICAO.
Copyright	Not Applicable at the Data Collection Stage.	Not Applicable	Not Applicable	Not Applicable

Statement	Comment	State	State Grouping	European Level
Liability / Accountability	A State is liable for the data published, whether by itself or through a delegated body. However, if a delegated body introduces erroneous data they must be held accountable.	**Rests with State for all activities.**	**State liable for the origination of the data. Grouping must be accountable for any errors introduced in processing.**	**State liable for the origination of the data. European Level must be accountable for any errors introduced in processing.**
Costs / Charging	The costs of service provision must be met by the charges levied.	**The funding of State service is normally from the standard Charges collected.**	**The funding of such groupings is normally derived by the constituent States from the standard Charges collected.**	**Funding of a European Service must be addressed. This is an additional service and its costs are not currently included in any charges which would have to be reallocated.**
Integrity	The integrity of the data must be assured and meet the requirements of ICAO Annex 15.	**Dependent upon the processes in place.**	**Dependent upon the processes in place.**	**Dependent upon the processes in place.**
Provision (Paper / Electronic)	Not Applicable at the Data Collection Stage.	Not Applicable	Not Applicable	Not Applicable
Duplication of Data	Not Applicable at the Data Collection Stage.	Not Applicable	Not Applicable	Not Applicable
Structure	Not Applicable at the Data Collection Stage.	Not Applicable	Not Applicable	Not Applicable

STASYS
www.stasys.co.uk

Statement	Comment	State	State Grouping	European Level
Timeliness	The delivery of information on time is critical. Efficient data flows must be used to ensure that it is achieved in time.	**Poor – if communications were required between the publisher of the EUIR AIP and the Data Originator this would need to be carried out through the State.**	**Poor – if communications were required between the publisher of the EUIR AIP and the Data Originator this would need to be carried out through the State.**	**Good – the publisher of the EUIR AIP can be in direct communications with the Data Originators.**
Independence of Service	During the study the issue of independence of service has been raised by Stakeholders. The relevance of this within the SES has not been established.	**Must be addressed outside of study.**	**Must be addressed outside of study.**	**Must be addressed outside of study.**
Quality Management	ICAO specifies that the provider of the AIS must have implemented a QMS. This impact of this issue is not affected by the location of Data Collection.	**A Quality Management Processes must be put in place.**	**A Quality Management Processes must be put in place.**	**A Quality Management Processes must be put in place.**
Certification	Not Applicable at the Data Collection Stage.	**Service will need to be certified – this is not currently the case.**	**Service will need to be certified – this is not currently the case.**	**Service will need to be certified – this is not currently the case.**

A.1.3 Data Processing

Statement	Comment	State	State Grouping	European Level
Current Situation – No Change	Staying with the current situation must be considered as it is in place, works and is seen to do so well.	**Good – already here today.**	**Limited – some States already operate in this way and would be a small change in some instances.**	**Poor – this would represent a major change over the current situation.**
Relationship With Neighbouring States	In order to best co-ordinate data with neighbouring States, the Data Processor will build relationships with the neighbour States.	**Poor – many neighbour - neighbour relationships will exist.**	**Limited – a lesser number of neighbours - neighbour relationships will exist given that some states will be within the Group.**	**Good – the only neighbouring States will be those non-SES States who border SES airspace.**
Language	Problems with language barriers may become an issue.	**Good – few languages generally experienced.**	**Limited – there may be some problems, depending on grouping.**	**Poor – knowledge of many languages will be required.**
Single Point of Contact for all European Data Processing and co-ordination.	Currently there are many points of contact for the processing of data in SES area. Having a reduced number may offer advantages.	**Not possible as there is a point of contact in every State.**	**Limited – although not a single point of contact there would be a reduced number.**	**Good – one point of contact for all Data Processing throughout Europe.**

STASYS
www.stasys.co.uk

Statement	Comment	State	State Grouping	European Level
Cost Saving	Economy of scale can offer savings.	None – each State must replicate the service of every other State.	A cost saving may be made through the combination of current services into a single function within each Group.	A cost saving may be made through the combination of current services into a single function serving Europe.
Delegation of Service	If a State does not provide its AIS Service but relies upon another body to supply this service it must delegate the service.	Not required as the State is performing the service.	Required and currently permissible under ICAO.	Required but may not yet be allowable under ICAO.
Copyright	Not Applicable at the Data Collection Stage.	Not Applicable	Not Applicable	Not Applicable
Liability / Accountability	A State is liable for the data published, whether by itself or through a delegated body. However, if a delegated body introduces erroneous data they must be held accountable.	Rests with State for all activities.	State liable for the origination of the data. Grouping must be accountable for any errors introduced in processing.	State liable for the origination of the data. European Level must be accountable for any errors introduced in processing.

Statement	Comment	State	State Grouping	European Level
Costs / Charging	The costs of service provision must be met by the charges levied.	**The funding of State service is normally from the standard Charges collected.**	**The funding of such groupings is normally derived by the constituent States from the standard Charges collected.**	**Funding of a European Service must be addressed. This is an additional service and its costs are not currently included in any charges which would have to be reallocated.**
Integrity	The integrity of the data must be assured and meet the requirements of ICAO Annex 15.	**Dependent upon the processes in place.**	**Dependent upon the processes in place.**	**Dependent upon the processes in place.**
Provision (Paper / Electronic)	Not Applicable at the Data Collection Stage.	Not Applicable	Not Applicable	Not Applicable
Duplication of Data	Not Applicable at the Data Collection Stage.	Not Applicable	Not Applicable	Not Applicable
Structure	Not Applicable at the Data Collection Stage.	Not Applicable	Not Applicable	Not Applicable
Timeliness	The delivery of information on time is critical. Efficient data flows must be used to ensure that it is achieved in time.	**Poor – if communications were required between the publisher of the EUIR AIP and the Data Processor this would need to be carried out through the State.**	**Poor – if communications were required between the publisher of the EUIR AIP and the Data Processor this would need to be carried out through the State.**	**Good – the publisher of the EUIR AIP can be in direct communications with the Data Processor.**

STASYS
www.stasys.co.uk

Phase 2 Report

Statement	Comment	State	State Grouping	European Level
Independence of Service	During the study the issue of independence of service has been raised by Stakeholders. The relevance of this within the SES has not been established.	**Must be addressed outside of study.**	**Must be addressed outside of study.**	**Must be addressed outside of study.**
Quality Management	ICAO specifies that the provider of the AIS must have implemented a QMS. This impact of this issue is not affected by the location of Data Collection.	**A Quality Management Processes must be put in place.**	**A Quality Management Processes must be put in place.**	**A Quality Management Processes must be put in place.**
Certification	Not Applicable at the Data Collection Stage.	**Service will need to be certified – this is not currently the case.**	**Service will need to be certified – this is not currently the case.**	**Service will need to be certified – this is not currently the case.**

A.1.4 Data Publishing

Statement	Comment	State	State Grouping	European Level
Current Situation – No Change	Staying with the current situation must be considered as it is in place, works and is seen to do so well.	Good – already here today.	Limited – some States already operate in this way and would be a small change in some instances.	Poor – this would represent a major change over the current situation.
Language	In what Languages can the EUIR AIP be published?	Good – National languages may easily be used in publication.	Limited – although more National languages may still be published.	Poor – the costs of translating an entire AIP into National languages would prove high and a large number of the translators required.
Cost Saving	Economy of scale can offer savings.	None – each State must replicate the service of every other State.	A cost saving may be made through the combination of current services into a single function within each Group.	A cost saving may be made through the combination of current services into a single function serving Europe.
Delegation of Service	If a State does not provide its AIS Service but relies upon another body to supply this service it must delegate the service.	Not required as the State is performing the service.	Required and currently permissible under ICAO.	Required but may not yet be allowable under ICAO.
Copyright	The issue of copyright is not affected by the location of publication.	Not applicable.	Not applicable.	Not applicable.

Statement	Comment	State	State Grouping	European Level
Liability / Accountability	A State is liable for the data published, whether by itself or through a delegated body. However, if a delegated body introduces erroneous data they must be held accountable.	**Rests with State for all activities.**	**State liable for the origination of the data. Grouping must be accountable for any errors introduced in publication.**	**State liable for the origination of the data. European Level must be accountable for any errors introduced in publication.**
Costs / Charging	The costs of service provision must be met by the charges levied.	**The funding of State service is normally from the standard Charges collected.**	**The funding of such groupings is normally derived by the constituent States from the standard Charges collected.**	**Funding of a European Service must be addressed. This is an additional service and its costs are not currently included in any charges which would have to be reallocated.**
Integrity	The integrity of the data must be assured and meet the requirements of ICAO Annex 15.	**Dependent upon the processes in place.**	**Dependent upon the processes in place.**	**Dependent upon the processes in place.**
Provision (Paper / Electronic)	The decision of whether to publish in Electronic or Paper form is not affected by the location of publication.	Not applicable.	Not applicable.	Not applicable.
Duplication of Data	The need to duplicate data whilst avoiding unnecessary duplication is unaffected by the location of publication.	Not applicable.	Not applicable.	Not applicable.

Statement	Comment	State	State Grouping	European Level
Structure	The structure of the EUIR AIP is only of relevance to this document.	Not applicable.	Not applicable.	Not applicable.
Timeliness	The delivery of information on time is critical. Efficient data flows must be used to ensure that it is achieved in time.	**Time is affected by the location of previous steps.**	**Time is affected by the location of previous steps.**	**Time is affected by the location of previous steps.**
Independence of Service	During the study the issue of independence of service has been raised by Stakeholders. The relevance of this within the SES has not been established.	**Must be addressed outside of study.**	**Must be addressed outside of study.**	**Must be addressed outside of study.**
Quality Management	ICAO specifies that the provider of the AIS must have implemented a QMS. This impact of this issue is not affected by the location of Data Collection.	**A Quality Management Processes must be put in place.**	**A Quality Management Processes must be put in place.**	**A Quality Management Processes must be put in place.**
Certification	Not Applicable at the Data Collection Stage.	**Service will need to be certified – this is not currently the case.**	**Service will need to be certified – this is not currently the case.**	**Service will need to be certified – this is not currently the case.**

A.2   TECHNICAL SOLUTIONS

A.2.1   General

The following tables provide details of the advantages and disadvantages for each of the options discussed in Chapter 6.3.

The advantages and disadvantages have been established both through assessment against the requirements of the SES and the comments raised by Stakeholders through the differing forums established during the Study.

The tables are presented in the following form:

- Statement – the point under consideration;

- Comment – context of the statement;

- Solution 1 to Solution 4 – the various technical solutions presented.

In order to assist the reader, colour is used to identify whether the service provision is seen as being advantageous (**Green**), disadvantageous (**Red**) or neutral (**Blue**).

Statement	Comment	Solution 1	Solution 2	Solution 3	Solution 4
Reliance on systems	Any solution which relies upon another system or systems carries some risk as this solution is outside the scope of the SES.	**Relies upon the use of the EAD for key functions.**	**Relies upon the use of the EAD for key functions.**	**Only reliance on systems is use of EAD SDO for validation. This could be considered optional.**	**Relies upon the use of the EAD for validation and distribution functions only.**

Statement	Comment	Solution 1	Solution 2	Solution 3	Solution 4
Use of current EAD functionality	Any increase to the current EAD functionality will introduce risk and costs.	**No increase in EAD functionality required.**	**Requirement for increase in EAD functionality to hold all supporting text for SES member AIPs**	Not Applicable	**Small increase in the EAD PAMS functionality to include the storage of eAIP documents. Already planned.**
Automated processes	The use of as much automated processing as possible will help minimise costs and maintain the integrity of data.	**Heavy reliance on manual processing.**	**Yes – automated processing should be capable of producing the EUIR AIP.**	**Yes – automated processing should be capable of producing the EUIR AIP.**	**Yes – automated processing should be capable of producing the EUIR AIP.**
Single Repository	The provision of a single repository for all aeronautical data in Europe has benefits.	**All information would be provided via the EAD.**	**All information would be provided via the EAD.**	**No – data remains distributed and non-centralised.**	**All information would be provided via the EAD.**
Electronic Output[1]	The use of electronic media is considered key given the quantity of data involved.	**No – the only output would be PDF files which are not considered electronic media.**	**No – the only output would be PDF files which are not considered electronic media.**	**Yes – the eAIP is used which provides a true electronic document.**	**Yes – the eAIP is used which provides a true electronic document.**
Simple Distribution	A large amount of data must be passed both between States and to users of the EUIR AIP.	**The EAD provides a means of both sourcing State information and providing it to end users.**	**The EAD provides a means of both sourcing State information and providing it to end users.**	**The means of providing information both from States to the EUIR AIP Provider and to the end users must be addressed.**	**The EAD provides a means of both sourcing State information and providing it to end users.**

---

[1] Electronic media is used to mean a computer literate / manipulable form. PDF files are considered an electronic means of holding a paper document only.

This page is intentionally left blank.