



SINGLE EUROPEAN SKY
(SES) REGULATION

**REGULATORY APPROACH
FOR THE**

***SURVEILLANCE PERFORMANCE AND
INTEROPERABILITY REQUIREMENTS***

DOCUMENT CONTROL

DOCUMENT CHANGE RECORD

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

Edition Number	Edition Date	Reason for Change	Pages Affected
0.1	16-10-06	First Draft	All
0.2 – 0.5	22-03-07	Subsequent Drafts following internal comments	All
0.6	28-03-07	Update following comments from the Review Group	All
0.7	30-03-07	Quality Check	All
0.8	12-07-07	Update following formal consultation	All
0.9	30-07-07	Internal review of the updated version	All
1.0	11-09-07	Released Edition	All

Status: Released	Edition No: 1.0	Date: 11 September 2007	Document No: SES/IOP/SPI/REGAP/1.0
-------------------------	------------------------	------------------------------------	---

TABLE OF CONTENTS

DOCUMENT CONTROL	1
TABLE OF CONTENTS	2
EXECUTIVE SUMMARY	4
1. INTRODUCTION	6
1.1 Surveillance Performance and Interoperability Mandate	6
1.2 Document Purpose and Scope	6
1.2.1 Purpose	6
1.2.2 Objective	6
1.3 Development of the Regulatory Approach	7
1.4 Consultation	7
1.5 World wide coordination	8
2. BACKGROUND	9
2.1 Introduction	9
2.2 SPI Environment	9
2.2.1 Operational environment	9
2.2.2 Technical environment	9
2.2.3 Surveillance architecture	10
2.2.4 Current situation and expected developments	11
2.2.5 Institutional environment	12
2.3 Benefits of the regulatory action	14
3. INTEROPERABILITY ANALYSIS	16
3.1 Subjects covered by regulatory provisions	16
3.2 Subjects outside the scope of the implementing rule	18
4. OPTIONS FOR THE REGULATORY APPROACH	20
4.1 Introduction	20
4.2 Option 1	20
4.2.1 General description	20
4.2.2 Regulatory coverage of option 1	20
4.3 Option 2	21
4.3.1 General description	21
4.3.2 Regulatory coverage of option 2	22
4.4 Option 3	22
4.4.1 General description	22
4.4.2 Regulatory coverage of option 3	23
4.5 Summary	23
5. CONFORMITY ASSESSMENT ANALYSIS	24
5.1 General issues	24
5.2 Determination of conformity assessment requirements for EATMN systems	24
5.3 Determination of conformity assessment requirements for EATMN constituents	25
5.4 Airborne constituents	25
5.5 Development process	26
6. ANALYSIS OF IMPLEMENTATION CONDITIONS	27
6.1 Dates of implementation	27
6.2 Transitional arrangements	27

6.3	Applicability Criteria.....	27
6.4	Exemption procedures	28
6.5	Conclusions.....	28
7.	IMPACT ASSESSMENT	29
7.1	Introduction.....	29
7.2	Stakeholders affected.....	29
7.2.1	<i>Air Navigation Service Providers (ANSPs)</i>	29
7.2.2	<i>Commercial Aircraft operators</i>	29
7.2.3	<i>Private Aircraft Operators</i>	29
7.2.4	<i>Military Authorities and 'State' Aircraft Operators</i>	30
7.2.5	<i>Supervisory Authorities</i>	30
7.2.6	<i>Equipment Manufacturers</i>	30
7.3	Economic and Efficiency Impact	30
7.3.1	<i>Common Provisions</i>	30
7.3.2	<i>Specific Option 1 Provisions</i>	34
7.3.3	<i>Specific Option 2 Provisions</i>	34
7.3.4	<i>Specific Option 3 Provisions</i>	36
7.4	Safety Impact	37
7.5	Impact on Civil/Military Organisation	37
7.5.1	<i>Common Provisions</i>	37
7.5.2	<i>Specific Option 1 Provisions</i>	38
7.5.3	<i>Specific Option 2 Provisions</i>	39
7.5.4	<i>Specific Option 3 Provisions</i>	39
7.5.5	<i>Short to Medium Term Aircraft Equipage Requirements</i>	40
7.6	Summary and Recommendations	40
8.	OBJECTIVES AND SCOPE OF THE DRAFT IMPLEMENTING RULE.....	42
8.1	Objectives.....	42
8.2	Scope	42
8.3	Refinement of the Essential Requirements	42
9.	ARTICULATION OF DRAFT IMPLEMENTING RULE WITH COMMUNITY SPECIFICATIONS.....	44
10.	OVERALL STRUCTURE OF THE DRAFT IMPLEMENTING RULE.....	45
ANNEX I	46

EXECUTIVE SUMMARY

The Regulatory Approach document is one of the deliverables required by the European Commission's mandate, having two main objectives. The first is to outline the headlines of the regulatory provisions and to identify and analyse the subjects that shall be covered by the draft implementing rule on surveillance performance and interoperability requirements in order to achieve the objectives of the mandate while the second is to propose several options for the development of the draft implementing rule complementing the relevant essential requirements.

It is considered that the essential requirements that are relevant to the surveillance performance and interoperability requirements implementing rule are:

- Seamless operation – complemented by addressing the end-to-end performance requirements of the surveillance systems within EATMN as well as the interoperability requirements related to the exchange of surveillance data.
- Support for new concepts of operation – refined through the identification of requirements supporting the current as well as the foreseen surveillance technologies and allowing the deployment of new functionalities.
- Safety – complemented by ensuring the availability of surveillance information of better and consistent quality and by the formalization of the overall assessment of the performance of surveillance systems.
- Civil-military co-ordination – refined by addressing the interoperability of the surveillance data when this is exchanged by different stakeholders (including civil and military).

The implementing rule will provide the proper regulatory tools and the associated Community enforcing mechanisms to ensure that the surveillance systems within the EATMN have the right level of interoperability and harmonised end-to-end performance in given environments.

This will be done by defining end-to-end performance requirements applicable to surveillance systems (e.g. in terms of accuracy, integrity, availability, etc) allowing the possibility for the systems to use different technologies in such a way as to improve the overall quality of service. The identification of the interoperability requirements will allow the exchange of data between the surveillance systems without providing unnecessary levels of technical detail. The implementing rule will also harmonise the methods used to assess the overall performance of the surveillance systems leading to increased confidence in the quality of the surveillance data.

The options proposed for formal consultation provided an increasing regulatory coverage, starting from the harmonisation and the consolidation of the current practices and leading up to the support for the foreseen surveillance technologies and the deployment of new functionalities:

- Option 1 – was aiming at harmonizing and consolidating the current “best practices” by putting them in a clear regulatory framework.
- Option 2 - its objective was not only to consolidate and formalize the current “best practices” (as option 1) but also to support the MSI implementing rule and facilitate the introduction of Mode S elementary surveillance in the SES airspace, maximising its benefits. In addition, mandatory carriage of Mode S transponders (and appropriate certification of the aircraft) was to further support the deployment of Wide Area Multilateration (WAM) systems by providing the Aircraft ID and the 24 bit address.
- Option 3 – built on option 2, facilitating the introduction of Mode S elementary surveillance in the SES airspace but it also allowed for new

technologies/functionalities (e.g. EHS, ADS-B out) to be further deployed based on common needs/criteria.

Among the proposed options it was considered that Option 3 brought the greatest overall benefit by allowing the interoperability with the current and foreseen surveillance technologies and by allowing the introduction of new functionalities in the SES airspace based on harmonised criteria. Therefore it was recommended to follow this option for the further development of the draft implementing rule and associated material.

This recommendation was clearly supported by the outcome of the formal consultation that took place between 2 April and 4 June 2007. The objective of the consultation was to allow States, stakeholders and interested parties to express their formal views on the draft regulatory approach and their preference for one of the proposed options. The results of the consultation show that 74% of the expressed opinions support the development of the implementing rule based on option 3, as recommended by EUROCONTROL. During the development of the Implementing Rule based on this option, coordination with stakeholders outside the SES area will take place in order to facilitate coherent and harmonized requirements as well as coordinated implementation dates/conditions ensuring global interoperability.

1. INTRODUCTION

1.1 Surveillance Performance and Interoperability Mandate

The purpose of the European Commission's mandate is to develop an implementing rule on the surveillance performance and interoperability (SPI) requirements of the European Air Traffic Management Network, EATMN. This will ensure putting into place the proper regulatory framework in order to ensure the interoperability and efficiency of the surveillance systems within the EATMN. This regulatory framework will identify provisions concerning the performance and interoperability requirements addressing, as applicable, the ANS providers and the airspace users, the conformity assessment and associated procedures, the implementation dates and transitional arrangements as well as the safety aspects, thus ensuring a seamless operation and a harmonized level of performance for the surveillance systems within the EATMN.

Due to the wide scope that surveillance systems cover, a phased approach for the development of the regulatory framework is envisaged. In the development phase of this implementing rule, the scope of the performance requirements identified will be limited to surveillance applications where 3 and 5 NM separation minima are provided. In due time, once performance requirements relative to other surveillance applications/separations are available, it will be possible to amend the implementing rule as appropriate in order to address them.

1.2 Document Purpose and Scope

1.2.1 Purpose

The Regulatory Approach document is one of the deliverables required by the European Commission's mandate. Its purpose is to outline the headlines of the regulatory provisions and to identify and analyse the subjects that shall be covered by the draft implementing rule in order to ensure the desired interoperability as well as to propose several options for the development of the draft implementing rule.

Following the 1st written consultation of the stakeholders, as required by the European Commission's mandate, one of the options proposed in the Regulatory Approach is to be retained and used as basis for the development of the draft implementing rule and associated documents.

1.2.2 Objective

The document has two main objectives. The first objective is to provide an interoperability analysis, identifying the subjects that have to be included in the implementing rule so as to ensure the desired interoperability, thus defining the regulatory coverage and the "skeleton" of the implementing rule. Based on this regulatory coverage, several possible options are identified this leading to the second main objective of the document, that is, to provide several possible options that may be followed for the development of the implementing rule itself and of the associated material. These options are subject to an initial impact assessment and presented to the stakeholders in the context of a written consultation. The comments of the stakeholders collected during this consultation allowed the selection of one of the options, providing the most suitable approach for the development process.

Beside the main issues identified above, the other high level objectives of the Regulatory Approach are:

- To clarify the objective and the scope of the rule
- To provide an analysis of the conformity assessment aspects

- To analyse the possible implementation conditions in terms of implementation dates and transitional arrangements
- To propose an articulation between the rule and the Community specifications to be nominated as its means of compliance
- To define the overall structure of the rule.

1.3 Development of the Regulatory Approach

The Regulatory Approach document has been developed by the Implementing Rule Drafting Group set up by EUROCONTROL as described in the initial plan for the achievement of the draft implementing rule for surveillance performance and interoperability requirements.

1.4 Consultation

Before the start of the drafting of the Regulatory Approach document, the focal points nominated by stakeholders as the points of contact for the SPI Mandate were involved in an informal written consultation on a questionnaire addressing the possible scope and coverage of the implementing rule. The results of the consultation (see Annex I for the conclusions of this consultation) were then used during the development of the draft Regulatory Approach.

The resulting document was submitted to a formal consultation according to the ENPRM process. The objective of the consultation was to allow States, stakeholders and interested parties to express their formal views and feedback on the draft regulatory approach in general and in particular on the regulatory coverage defining the content of the future implementing rule as well as on the preference for one of the options proposed for the development of the implementing rule.

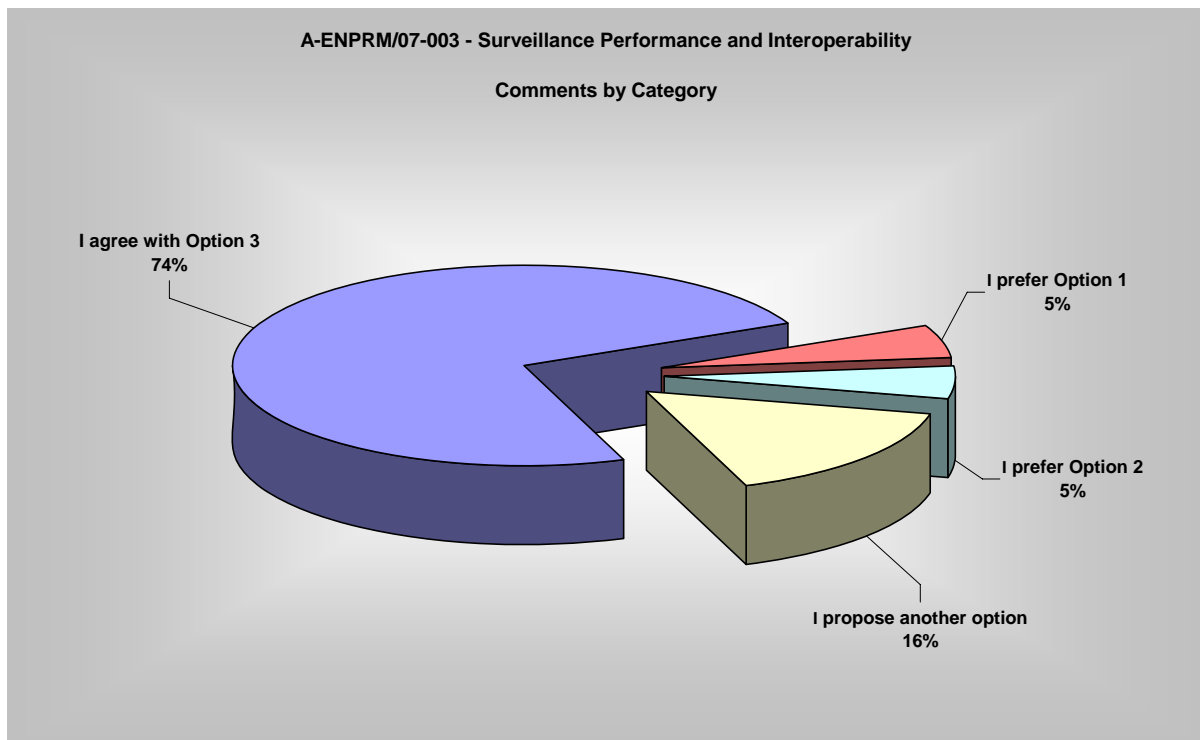
The consultation triggered comments from some 38 Stakeholders. The scope and depth of the input received provided a very useful feedback, with responses received from air navigation service providers, civil and military authorities, airspace users, industry as well as from professional associations.

A very good level of support (more than 73% of the responses) was received for option 3 recommended by EUROCONTROL as this option will allow the interoperability of the airborne equipment with all the current and developing surveillance technologies. Among the responses that were not explicitly in favour of option 3, several positions pointed towards an intermediate option between 2 and 3 or indicating a possible support for option 3, subject to the acceptance by the operators and longer implementation dates for ADS-B and in general subject to a better visibility of the requirements derived from this option, that are intended to be included in the rule. The responses received from the aircraft operators indicated a full support for option 3 provided the standardisation, certification and implementation requirements applicable to the ground systems are identified.

The number of responses from each category of Stakeholder is shown in the table below:

A-ENPRM/07-003 - Surveillance Performance and Interoperability Requirements Comments received by Stakeholders						
	I agree with Option 3	I prefer Option 1	I prefer Option 2	I propose another option	Total by Stakeholder	%
Authority (Civil & Military)	10	0	1	2	13	34,2%
Service Providers (ANSPs)	11	2	1	2	16	42,1%
Airspace Users	5	0	0	0	5	13,2%
Airport Operator	0	0	0	0	0	0,0%
Industry	1	0	0	0	1	2,6%
Other	1	0	0	2	3	7,9%
Total Received Comments by Category	28	2	2	6	38	100%
Percentage (%)	73,7%	5,3%	5,3%	15,8%	100%	

The preference for the proposed options was as follows:



1.5 World wide coordination

During the development of the implementing rule, coordination with stakeholders outside the SES area will take place in order to facilitate coherent and harmonized requirements as well as coordinated implementation dates/conditions ensuring world-wide interoperability.

2. BACKGROUND

2.1 Introduction

The objective of this section is to put into context the subject of surveillance performance and interoperability by providing a description of the current environment in terms of operational, technical and institutional aspects. This is then followed by a high level identification of the anticipated benefits of the regulatory actions in the context of the SPI Mandate.

2.2 SPI Environment

2.2.1 Operational environment

The surveillance function provides the ability for the Air Traffic Management (ATM) system to identify aircraft and determine their position accurately to enable the provision by the ATC of adequate separation between them. More fully, surveillance can be defined as the technique for the timely detection of targets and the determination of their position and identity (and, if required, supplementary information) and the timely delivery of this information to users in support of the safe control and separation of targets within a defined area of responsibility. Therefore, surveillance systems are essential elements of Air Traffic Control (ATC) operations and the data provided is a fundamental enabler for efficiency, capacity and safety.

Aircraft still fly on fixed routes and are cleared by the ground air traffic controllers prior to any manoeuvre. Currently, radar services are used for the separation of aircraft throughout the majority of the European airspace in en route and terminal areas (in some cases radar services are also used for the airport surveillance as well). This ensures efficient handling of increasing traffic volumes in a safe, orderly and expeditious manner. Air Navigation Service Providers (ANSPs) are still primarily responsible for maintaining separation between aircraft. The performance of the surveillance system has to enable controllers to be able to provide these separation standards, as appropriate, at all times. However it should be noted that there are areas in Europe, especially those with reduced traffic density where no surveillance is provided as the deployment of a surveillance systems would not be beneficial or there are areas where technologies other than radar are used in order to provide the surveillance function.

2.2.2 Technical environment

Radar positional data currently constitutes the principal means for the surveillance function, and the radar coverage must be comprehensive enough to facilitate the maintenance of the separation standards across boundaries and to ensure a high quality, reliable provision of services. This has been achieved to date by deploying Primary Surveillance Radar (PSR) and Secondary Surveillance Radar (SSR) systems or sharing data from existing facilities. Most radar chains contain a radar data processing system, which includes some form of tracking. Surveillance Data Processing and Distribution (SDPD) systems process the data from radars to provide information to controller workstation positions on aircraft trajectories. These systems accept information from surveillance sensors, process the information to develop the 'best' estimate of the position of a target and supply this information to users including other SDPD systems. This information includes plot and track information, vertical position, predicted position, identity, vectors and speed. The holistic surveillance function provides a Traffic Situation picture that is seamless and can be shared. The current EUROCONTROL Standard for Radar Surveillance in en-route airspace and major terminal areas specifies coverage and performance requirements for radar (duplicated secondary surveillance radar coverage for en-route airspace and duplicated secondary surveillance radar coverage and single primary surveillance radar coverage for major terminal areas). However, new systems using Automatic Dependent Surveillance - Broadcast (ADS-B) and Wide Area Multilateration (WAM) techniques are now also starting to be deployed. In the oceanic airspace, Automatic Dependent Surveillance – Contract (ADS-C) has started to be

deployed for monitoring purposes and in order to update the flight plan data (however this application is not used for tactical interventions or for the provision of “radar like” separations).

It should be noted that the content of the EUROCONTROL Standard for Radar Surveillance is currently being reviewed and rewritten so as to provide the technical basis for a Specification which will aim to specify the minimum required performance of ATM Surveillance Systems in a technology independent way so as to be applicable to any surveillance system design relying on any technology.

2.2.3 Surveillance architecture

Surveillance systems and components currently comprise the following:

- Surveillance sub-system on the Aircraft including:
 - Aircraft data generation (e.g. altimeter and GNSS interfaces...)
 - Aircraft interface such as SSR transponders (e.g. Modes A, C and S, ADS-B);
- Surveillance sub-system on the Ground including
 - Sensors such as: PSR, which is independent and non-co-operative; SSR (including Mode S) and WAM which are independent and co-operative; ADS - Broadcast, which is dependent and co-operative;
 - Data processing and distribution systems including multi-sensor tracker (Surveillance Data Processing) and Data Distribution systems;
 - Interface to the user

A view of surveillance architecture is shown in the Figure below (note that the air-to-air surveillance is outside the proposed scope of the implementing rule as identified in the present document):

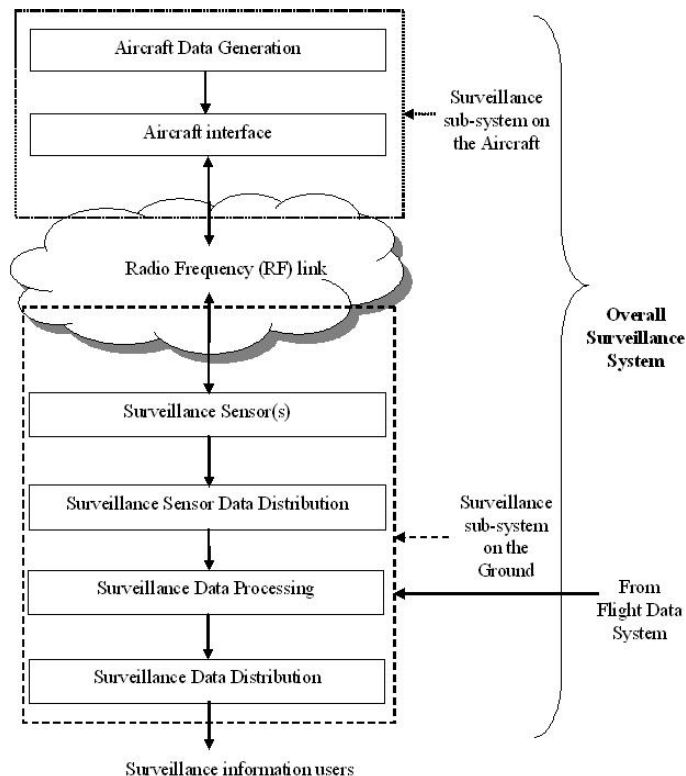


Figure 1: Surveillance Model

2.2.4 Current situation and expected developments

The ICAO European Region is currently characterised by the use of the following surveillance systems:

- SSR Mode A, C and S in terminal and en-route continental airspace;
- Diminishing use of PSR, particularly outside of terminal airspace;
- ADS-B and WAM in some parts.

Note: ADS-C is also used in some parts of the Oceanic airspace in the ICAO North Atlantic Region.

There is likely to be an evolution of the current surveillance infrastructure through the exploitation of the benefits of new technologies as they become available. However, as the ATM community is extremely safety conscious it is expected that the transition from current system to future systems will be “evolutionary” rather than “revolutionary” and that both surveillance systems will operate side-by-side during a transition phase.

A Surveillance Strategy for ECAC (version 2.0. of 18.11.2005) was developed by EUROCONTROL with numerous contributions from stakeholders, in order to provide a reasoned and achievable evolution of the surveillance infrastructure so as to meet anticipated future requirements. The strategy is based on the use of various technological surveillance solutions allied to the anticipated context and performance requirements for particular geographical areas. It provides an evolutionary and achievable path from the current SSR based infrastructure, which can be described as cooperative independent surveillance to an infrastructure using dependent cooperative surveillance technique (ADS-B) where the position information is primarily based upon GNSS, combined where and when required with a layer of cooperative independent surveillance, such as SSR Mode S and Wide Area Multilateration,.

However it is very important to note that the strategy is only guidance material for stakeholders and that it does not place regulatory (mandatory) requirements on the ECAC States.

The strategy foresees that each area of airspace needs to determine its own surveillance requirements depending on the specific issues to be addressed. It recognises that in high density areas, the early introduction of SSR Mode S is seen as essential to overcome the limitations of the current SSR systems and allow capacity to increase whilst at least maintaining current levels of safety.

The first step in the introduction of SSR Mode S in Europe is known as Mode S Elementary Surveillance (ELS), followed by the Mode S Enhanced Surveillance (EHS) that builds upon the concept of ELS. Mode S ELS is being deployed initially within the airspace of Belgium, France, Germany, Luxembourg, the Netherlands, Switzerland and the United Kingdom and it is expected that other European States will upgrade to Mode S at a later stage. EHS, supporting the extraction and the downlink of additional aircraft derived data (ADD), is essential to improve safety nets and increase capacity through the implementation of controller support tools. The carriage of Mode S ELS transponders is already mandatory for IFR/GAT flights in designated airspace of France, Germany, Belgium, Netherlands, Luxembourg, and Switzerland from 31 March 2007. Similarly the carriage of EHS transponders is mandatory (with certain exemptions) in designated airspace notified by Germany, U.K. and France for IFR/GAT flights by fixed wing aircraft with a maximum take-off mass greater than 5,700 kg or a maximum cruising true airspeed in excess of 250 kts.

In parallel air-to-air surveillance data exchange and the introduction of co-operative ATS applications is envisaged (however, it should be noted that air-to-air surveillance is outside the proposed scope of the implementing rule).

The strategy is based on the following principles:

- An independent surveillance system to track non-cooperative targets where and when required. This will be provided by PSR unless and until an alternative solution is required and developed;
- An independent surveillance system to track cooperative targets. This can be enabled by SSR Mode A/C or SSR Mode S or Wide Area Multilateration (It should be noted that, when compliant with ICAO SARPs, a Mode S transponder will always reply to SSR Mode 3/A interrogators and thus only one type of transponder needs to be carried by an aircraft. This is pertinent to aircraft, required to equip with Mode S transponders, which still need to operate in non-Mode S airspace);
- Dependant cooperative surveillance based upon ADS-B providing positional data of suitable quality. The common, internationally recommended 1090 MHz Extended Squitter ADS-B data link will be used;
- An increasing use of ADD;
- Usage of ADS-C in remote and oceanic areas only;
- An increasing use of ADS-B and/or Airport Multilateration at aerodromes is also foreseen, and particularly the use of the Advanced Surface Movement Guidance and Control System (A-SMGCS).
- The increasing use of surveillance data onboard of “ADS-B in” equipped aircraft to support Air Traffic Situational Awareness (ATSAW) and Spacing applications and later Separation applications, thereby also introducing the capability of increased delegation of responsibility for separation to the flight crew.

The surveillance strategy foresees the continued need for SDPD systems, which will require updating to process and deliver the new information to surveillance users as the new systems become operational.

2.2.5 Institutional environment

This section presents, without being exhaustive, the main players relevant to the institutional/regulatory issues associated with the surveillance domain.

2.2.5.1 ICAO

International standards and recommended practices (SARPs) for surveillance systems are set by ICAO in annexes to the Convention on international civil aviation done at Chicago on 7 December 1944. The implementation of a surveillance system is a State responsibility but contracting States to the Convention are expected to follow the SARPs to ensure interoperability. In particular Annex 10 (Aeronautical Telecommunications) Volume IV contains SARPs for surveillance radar. However, elements of Volume I (Radio Navigation Aids), Volume III Part I (Digital Data Communications Systems) and Volume V (Aeronautical Radio Frequency Spectrum Utilization) are relevant to the provision of surveillance, as are elements of Annex 2 (Rules of the Air) and Annex 11 (Air Traffic Services). In addition, ICAO Doc 4444 - Procedures for Air Navigation Services (PANS) ATM sets out complementary procedures to the SARPs. Recommendations governing the use of radar are contained within ICAO Doc 7030 (European Regional Supplementary Procedures) and ICAO Doc 9426 (Air Traffic Services Planning Manual). It should be noted that the ICAO Regional Supplementary Procedures (SUPPS) mentioned above form the procedural part of the Air Navigation Plan. They are developed to meet those needs of specific areas which are not covered in the worldwide provisions and complement the statement of requirements for

facilities and services contained in the Air Navigation Plan publications.. Requirements for airborne surveillance equipment are specified in Annex 6 (Operation of Aircraft). Applicable documents are also ICAO Doc 9684 (Manual of the Secondary Surveillance Radar (SSR) Systems), ICAO Doc 9688 (Manual on Mode S Specific Services), ICAO Doc 8071 Volume III (Manual on testing of radio navigation aids) (Testing of surveillance radar systems), Doc 9816 (Manual on VHF Digital Link (VDL) Mode 4) and ICAO Doc 9871 (Technical Provisions for Mode S Services and Extended Squitter) (currently under development, to be published soon). Mention could also be made of ICAO Doc 9830 (Manual on Advanced Surface Movements, Guidance and Control).

ICAO Doc 4444, including proposed amendments, requires that surveillance systems used in the provision of air traffic services shall have a very high level of reliability, availability and integrity. The possibility of system failures or significant system degradations which may cause complete or partial interruptions of service shall be very remote. Back-up facilities shall be provided. It also requires that multi-radar systems, i.e. systems utilizing more than one radar sensor, should have the capability to receive, process and display, in an integrated manner, data from all the connected sensors. Radar systems should be capable of integration with other automated systems used in the provision of ATS, and should provide for an appropriate level of automation with the objectives of improving the accuracy and timeliness of data displayed to the controller, and reducing controller workload and the need for verbal coordination between adjacent control positions and ATC units. Radar systems should provide for the display of safety-related alerts and warnings, including conflict alert, minimum safe altitude warning, conflict prediction and unintentionally duplicated SSR codes. States should, to the extent possible, facilitate the sharing of radar information in order to extend and improve radar coverage in adjacent control areas.

With specific reference to SSR, Annex 10 Volume IV recommends that administrations should co-ordinate with appropriate national and international authorities those implementation aspects of the SSR system that will permit its optimum use. In order to permit the efficient operation of ground equipment designed to eliminate interference from unwanted aircraft transponder replies to adjacent interrogators (defruiting equipment), States may need to develop co-ordinated plans for the assignment of pulse repetition frequencies (PRF) to SSR interrogators.

The Air Navigation Bureau (ANB) of ICAO develops technical studies for the Air Navigation Commission (ANC) as well as recommendations for SARPs relating to the safety, regularity and efficiency of international air navigation. The ANB provides general direction to regional offices on issues relating to air navigation plans, ICAO SARPs and PANS. However, ICAO is now working towards moving away from technical SARPs to a different method based on required performance criteria. For surveillance systems this is called Required Surveillance Performance (RSP). The new focus will be on functionality, leaving standards and interoperability to industry. The change will result in a three tier hierarchy of requirements and specifications as follows:

- ICAO SARPs comprising broad, high-level requirements;
- The SARPs will be augmented by technical specifications published as appendices to the Annexes;
- Detailed technical specifications will appear in separate documents published by ICAO or other organisations.

A framework for the development of RSP for surface, air-ground and air-air surveillance is currently being produced within ICAO and it is proposed to express, in terms of performance requirements, the characteristics of the application, the system and the sub-systems as follows: accuracy, availability, integrity, latency, update rate, continuity and coverage.

The Aeronautical Communication Panel (ACP) develops SARPs as well as guidance material for air-ground and ground-ground aeronautical communications, both voice and data. It also develops the draft ICAO position for ITU Radiocommunication Conferences and coordinates, as required, the ICAO input to meetings of the ITU Study Groups and Regional Telecommunication Organizations. The ICAO Position aims at protecting aeronautical spectrum for radio-communication and radionavigation systems required for current and future safety-of-flight applications.

ICAO publishes Doc 9718, which is the Handbook on Radio Frequency Spectrum Requirements for Civil Aviation including Statement of Approved ICAO Policies.

2.2.5.2 ITU

Although ITU and WRC activities are outside the scope of this IR, it is nevertheless important to recall their roles.

The ITU's continuing role in managing the radio-frequency spectrum ensures that radio-based systems continue to function smoothly and provide reliable wireless services. It is the ITU's Radiocommunication Sector (ITU-R) that is charged with determining the technical characteristics and operational procedures for a huge and growing range of wireless services.

In their role as global spectrum coordinator, the Member States of the Radiocommunication Sector develop and adopt the Radio Regulations, a voluminous set of rules which serve as a binding international treaty governing the use of the radio spectrum by some 40 different services around the world. The Sector also acts, through its Bureau, as a central registrar of international frequency use, recording and maintaining the Master International Frequency Register. ITU-R is responsible for coordinating efforts to ensure that the communication, broadcasting and meteorological satellites in the world's increasingly crowded skies can co-exist without causing harmful interference to one another's services.

Since the global use and management of frequencies requires a high level of international cooperation, one of the principal tasks of ITU-R is to oversee and facilitate the complex inter-governmental negotiations needed to develop legally binding agreements between sovereign states. These agreements are embodied in the Radio Regulations and in regional plans adopted for broadcasting and mobile services. The Radio Regulations apply to frequencies ranging from 9 kHz to 400 GHz and they describe how the spectrum may be used and shared around the globe. World Radiocommunication Conferences (WRCs) are held every two to three years and it is the job of WRCs to review, and, if necessary, revise the Radio Regulations.

However, it should be noted that the proposed Regulatory Approach is not impacted nor has a direct influence on the ITU role and the associated mechanisms as it is not felt necessary to supplement these mechanisms.

2.3 Benefits of the regulatory action

The implementing rule will provide the proper regulatory tools and the associated Community enforcing mechanisms to ensure that the surveillance systems within the EATMN have the right level of interoperability and harmonised end-to-end performance in given environments.

The approach of the implementing rule towards the performance aspects aims at ensuring a consistent level of performance applicable in given environments with known traffic characteristics. It will define precise end-to-end performance requirements (e.g. in terms of accuracy, integrity, availability, etc) in areas where 5 or 3 NM separation standards are used in a technology independent way allowing the possibility of the systems to accommodate the progressive availability of new sources of surveillance information in such a way as to

improve the overall quality of service. The identification of the interoperability requirements at the right level of detail will allow the exchange of relevant, accurate, consistent and coherent data between the surveillance systems without providing unnecessary levels of technical details.

The implementing rule will also bring a clear added value by clearly identifying obligations for the stakeholders with regard the implementation dates/conditions as well as by formalising the conformity assessment aspects and the methods used to assess the overall performance of the surveillance systems. This will lead to a harmonised and coherent deployment across the Member States of surveillance systems compliant with the regulatory provisions and to increased confidence in the quality of the surveillance data contributing to increased confidence in the applied separation standards.

Overall, the implementing rule will harmonise the performance and the interoperability of the surveillance systems and consolidate the current practices for the deployment of these systems and will also support the current and foreseen surveillance technologies allowing new functionalities to be introduced in the area of applicability.

3. INTEROPERABILITY ANALYSIS

The aim of the Interoperability Analysis is to define the extent of the coverage of the implementing rule by identifying the subjects that will have to be included in the rule so as to ensure the desired interoperability. The section provides the justification for the inclusion of these subjects and also identifies the parties that will be impacted by the proposed regulatory coverage. It also addresses the subjects that are proposed not to be addressed by the implementing rule, as resulted from the responses to the questionnaire distributed to the SPI focal points.

3.1 Subjects covered by regulatory provisions

The objective of this section is to scope the regulatory coverage of the rule by identifying the subjects that need to be covered by regulatory provisions so as to achieve the interoperability of the EATMN with regard the surveillance performance and interoperability. These subjects will form the skeleton of the implementing rule and will be further developed in the section identifying the possible options that could be followed for the development of the rule. The regulatory subjects proposed for inclusion in the implementing rule are as follows:

- The objective and scope of the implementing rule will address the surveillance systems and procedures and the surveillance data processing systems as a subsystem of systems and procedures for air traffic services, serving ATC units providing services to GAT flights within the EATMN (this may include relevant aspects related to ground surveillance at airport level) as identified in Annex I of 552/2004. As it is proposed that the implementing rule will address the surveillance systems as a “black box” making mandatory requirements addressing the end-to-end performance of the surveillance system it is likely that no specific constituents of the ground systems will be identified in the rule. However it is proposed to develop Community Specifications addressing the components/constituents of surveillance systems as well as the specific technologies. The inclusion of these subjects within the regulatory coverage will ensure their clear identification as well as the traceability to the relevant essential requirements (seamless operations, etc) applicable to them.
- The airspace of applicability (by default, it is the airspace within the ICAO EUR and AFI where Member States are responsible for the provision of air traffic services or only certain airspaces in the case of a phased deployment) as well as the “type” of flights (e.g. GAT/IFR) aiming to identify the aircraft population to which the regulatory provisions applies. These provisions will refer to mandatory carriage of onboard equipment and to the appropriate functionality of such equipment, in order to address the interoperability between the ground and the airborne components of the surveillance systems. These requirements will ensure a homogenous level of airborne equipment within the airspace of applicability of the rule as well as a harmonized deployment and will ensure seamless operations as well as support for new concepts of operation.

Note: By default the SES interoperability Regulation applies to all systems, constituents and associated procedures within the EATMN. However, the scope of application can be fine tuned in each implementing rule, which can take into account that there are particular areas or types of traffic for which the equipage would not be justifiable (e.g. low levels of traffic or certain areas in the lower airspace in which deployment of surveillance infrastructure is not required or economically justified). Therefore a phased approach (e.g. starting with the core area) and/or transitional arrangements may be considered with regard to the airspace of applicability as well as the implementation conditions.

- The interoperability requirements to be defined in the implementing rule will address the following issues:
 - The use of minimum common functionalities for the exchanges of surveillance data between surveillance systems. However it should be noted that these requirements will be applicable only when this data is exchanged between surveillance systems of individual ANSPs. Whenever the data is used within the system of an ANSP (e.g. the data is sent by a surveillance sensor to a display within the “boundary” of the same system) there will be no mandatory requirements on the features of this data. The possible ways to make mandatory the use of common functionalities are addressed and further developed in the proposed options, without intending to explicitly make mandatory the use of specific solutions (such as ASTERIX), but referring to principles that have to be respected by the data exchanges either at a high level or associated to specific types of data and sources of such data.

- The performance requirements to be defined in the implementing rule will address the following issues:
 - The requirements on ANSPs to ensure that the surveillance systems allow the use of consistent separation standards across boundaries leading to safe and seamless operations. The rule would not prescribe specific values for separation minima. This is justified by the fact that these minima (supported by the performance of the surveillance systems) are dependent on the ATM environments as well as the traffic characteristics. However the implementing rule, in its performance section, will identify performance requirements applicable to the surveillance systems whenever the service providers **choose** to apply 3 NM and/or 5 NM separations (but without being obliged to use 3 NM or 5 NM). It should be noted that once performance requirements relative to other surveillance applications/separations are available, the implementing rule might be updated in order to take them into account. If found appropriate, the rule might also include provisions related to surveillance on the ground, based on relevant essential requirements of the interoperability Regulation.
 - The minimum end-to-end performance requirements of the surveillance systems will be extracted from the “ATM Surveillance system standard requirements” (currently under development). These performance requirements will only apply to surveillance systems used in environments where 5 NM and 3 NM separation minima are in place (see also the bullet above). The requirements may address (but not be limited to) parameters as accuracy, integrity, availability of the surveillance data (e.g. position, identity, etc).

Note: it may be needed to address specifically the end-to-end performance of ADS-B applications as they are dependent on the aircraft derived position.
 - The requirement to establish Service Level Agreements (addressing the quality of service) in the cases when surveillance data is exchanged between a provider and a user of such data.

- The associated procedures requirements will address the following issues:
 - The performance assessment procedures to be used to evaluate the overall performance of the surveillance systems in order to increase the confidence of the users in the quality of the surveillance information therefore in the applied

separation standards, supported as required by the appropriate Community Specifications.

The inclusion of the interoperability, performance and associated performance assessment procedures requirements identified above within the implementing rule will ensure the seamless operation within EATMN by allowing the exchange of data of consistent quality between the surveillance systems, coherent and harmonized level of end-to-end performance of the surveillance systems as well as by increasing the confidence in the capability of the surveillance systems to support the applied separation standards.

- The implementation dates requirements will identify the dates when the parties within the scope of the implementing rule will have to comply with the regulatory requirements applicable to them. This will address all the parties that are subject to the regulatory provisions, including the air navigation service providers as well as the aircraft operators. The regulatory provisions will provide a consistent approach towards the dates of implementation and are critical to the achievement of interoperability and of seamless operations. Transitional arrangements will be defined as appropriate, taking notably into account the impact of the rule on legacy systems.
- The safety requirements will (at least) identify the high level obligation of the Member States to ensure that the design and deployment of surveillance systems as well as any changes to the surveillance systems derived from implementation of the implementing rule are subject to a safety assessment. Subject to the results of the safety assessment done during the development of the implementing rule specific safety requirements may also be identified in the rule. The safety requirements within the rule will ensure the compliance and traceability to the essential requirement on safety as well as a harmonized approach with regard to the carrying out of the safety assessment. During the development of the implementing rule some high level security requirements may also be identified.
- The conformity assessment requirements will address the obligation of the manufacturers and air navigation service providers to issue the appropriate declarations as identified in the interoperability Regulation. They will further detail and supplement the requirements already defined in the interoperability Regulation. The conformity assessment requirements will be developed in line with the conclusions of the Conformity Assessment Task Force (see also section 5 of this document).
- The requirements associated with the surveillance spectrum protection as well as with the rationalization of the surveillance infrastructure in order to help manage the spectrum more efficiently and prevent inadvertent interference. They may address high level principles related to the spectrum protection in a technology independent way, as well as high level requirements aimed to explore surveillance data sharing and exchange opportunities before deploying the surveillance infrastructure, without entering into the technical details that should be left, if needed, at the level of Community Specifications.

3.2 Subjects outside the scope of the implementing rule

This section identifies the subjects that, even if related to the surveillance systems, are outside the regulatory coverage of the surveillance performance and interoperability requirements implementing rule. The proposal not to include these topics in the implementing rule is based on the responses to the questionnaire distributed to the SPI focal points and these subjects are as follows:

- The operational procedures related to the use of the surveillance data (e.g. by the controller) and the operating procedures supporting the surveillance infrastructure (e.g. the procedures related to the Mode A code allocation).
- The air-to-air surveillance requirements and procedures.
- The identification of specific performance requirements applicable to the sub-systems components of the surveillance systems (e.g. surveillance sensors or surveillance data processing and distribution systems). The rule will only address the end-to-end performance aspects of the surveillance systems.
- Wind turbines. The issue is considered to have an influence on the performance of surveillance systems, even potentially on those located in adjacent States. Even if this matter is sufficiently mature, as it impacts a broader scope than surveillance for ATM (e.g. maritime radars) it is proposed to address it and other obstacles in a wider context than the one of the SPI requirements implementing rule.

4. OPTIONS FOR THE REGULATORY APPROACH

4.1 Introduction

There may be multiple ways to achieve the high level objective of efficiency and interoperability of surveillance systems within the EATMN; therefore as required by the European Commission's mandate, the Regulatory Approach identifies various options that may be followed for the development of the draft implementing rule. This section identifies the proposed options and builds upon the subjects identified in the Interoperability Analysis chapter.

Three possible options are described for the regulatory approach of the implementing rule. Subjects in the regulatory coverage vary in each of the options, and the level and extent to which the nature of prescriptions would be drafted also vary. However, there would also be common prescriptions across the three options.

4.2 Option 1

4.2.1 General description

Option 1 would apply minimum regulatory provisions in the areas of performance and interoperability. Moreover, requirements would apply only to the ground elements (surveillance sensors and SDPDS), with no specific airborne equipage obligations placed on aircraft operators. This option will mostly harmonize and consolidate the current practices by putting them in a clear regulatory framework. The table below sets out the subjects and nature of provisions that would be addressed under Option 1. The implementation of these regulatory requirements would be supported by the development of relevant Community Specifications providing the details required for implementation.

4.2.2 Regulatory coverage of option 1

Subjects	Nature of Provisions
Separation minima and System deployment as well as the Performance requirements	<p>High level requirements placed on ANSPs to set up separation minima that ensure seamless operations within the airspace of the Single European Sky and to deploy suitable surveillance systems</p> <p>High level performance requirements for surveillance systems that are deployed to meet 5NM and 3NM separation minima, whenever the service providers choose to apply 3 NM and/or 5 NM separation (but without being obliged to use 3NM and/or 5 NM) (these performance requirements to be defined as a result of the review of the former Surveillance Standard). Progressively, once performance requirements relative to other surveillance applications/separations are available, the implementing rule might be updated in order to address them.</p>

<p>Interoperability requirements in terms of:</p> <ul style="list-style-type: none"> • Functional characteristics of Data Exchange • Formal Arrangements Between Providers • Spectrum Protection and rationalisation of surveillance infrastructure 	<p>High level generic interoperability requirements to be applied whenever surveillance data is required to be exchanged. (This would not apply to the exchange of data within the systems of an ANSP).</p> <p>High level requirements for the establishment of Service Level Agreements for the exchange of data between providers and users of surveillance data.</p> <p>High level principles relative to the spectrum protection, as well as high level requirements on the suppliers and users of surveillance data, aimed to explore surveillance data sharing and exchange opportunities before deploying the surveillance infrastructure, without entering into the technical details, which should be left, if needed, at the level of Community Specifications.</p>
<p>Safety</p>	<p>High level safety requirements addressing the design, deployment and operations of the surveillance systems.</p>
<p>Assessment of Performance and Conformity Assessment</p>	<p>High level requirements for the procedures to be employed for the overall assessment of the performance of surveillance systems.</p> <p>High level requirements addressing the obligation of manufacturers as well as of air navigation service providers to issue the appropriate declarations as defined by the interoperability Regulation.</p>

4.3 Option 2

4.3.1 General description

Option 2 would include the provisions identified in Option 1 with the addition of several specific issues:

With regard to the interoperability requirements related to the exchange of surveillance data, this option could propose the identification of mandatory types of data depending on the source. Therefore the implementing rule would identify requirements applicable to specific types and sources of data, which would be supported by detailed Community Specifications based on ASTERIX. The introduction of such categorisation would serve multiple purposes:

- easier to identify the application within the surveillance domain;
- facilitation of the dispatching of the data to the appropriate task within the receiving system;
- only the category for applications implemented in the user system would have to be implemented.

The second specific issue of this option is the introduction of regulatory requirements relative to the mandatory carriage and operation of specific airborne equipment. This carriage requirement would address the Mode S transponders compliant with ICAO Annex 10 Vol. IV A77 Level 2s (SI code capable) with the aircraft configuration certified as compliant to Mode S ELS functionality (in accordance with EASA/JAA TGL13 revision 1 or later issue) on all the IFR/GAT flights within the SES airspace.

The SI code capability would in particular support the Regulatory Approach which has been retained for the Mode S Interrogator Code Allocation (MSI) implementing rule, allowing to increase considerably the available number of ICs by prescribing the support to the use of "SI codes". The benefit of SI codes support is the long term sustainability of the Mode S deployment as the lack of such capability would result in greatly reduced radar coverage, difficult allocation coordination and frequent need for arbitration between operators whose operational requirements cannot be satisfied. This could jeopardise the deployment of Mode S surveillance and seamless operation. The use of SI codes requires radar and transponder support as the ability to use SI codes depends not only on radar capabilities but on the compliance of aircraft SSR transponders with ICAO SARPs. Before SI codes can be allocated to (capable) radars, all Mode S transponders flying in the airspace covered would normally need to be SI compliant.

During the discussions on the Regulatory Approach for MSI, it was agreed that it would not include provisions for transponder carriage requirements. This second SPI option would address these provisions.

Therefore this option will not only consolidate and formalize the current practices (as option 1) but will also support the MSI implementing rule and will also facilitate the introduction of Mode S elementary surveillance in the SES airspace, maximising its benefits. In addition, mandatory carriage of Mode S transponders will facilitate the extraction of Mode S elementary surveillance DAP's, like Aircraft ID and 24 bit address, by WAM systems.

4.3.2 Regulatory coverage of option 2

Based on the principles described above, the regulatory coverage of this option would include option 1 supplemented with:

- Possible more detailed functional prescriptions derived from the ASTERIX categories, depending of the sources and the types of surveillance data.
- Mandatory carriage by IFR/GAT flights within the SES airspace of Mode S transponders compliant with ICAO Annex 10 Vol. IV A77 Level 2s (SI code capable) with the aircraft configuration certified as compliant to Mode S ELS functionality.

4.4 Option 3

4.4.1 General description

Option 3 is an extension of Option 2 in terms of airborne equipment. It proposes the mandatory carriage by IFR/GAT traffic within the SES airspace of Mode S transponders compliant with ICAO Annex 10 Vol. IV A77 Level 2es (1090 ES and SI code capable) with the appropriate aircraft configuration certified. Within this option it will be possible to define specific equipage requirements based on common criteria (e.g. Mode S EHS compliant with EASA AMC 20-13 or ADS-B out based on 1090ES technology and the associated functionalities).

The possibility for the definition of common principles/criteria and performance requirements for the higher levels of equipage mentioned above will be addressed during the development of the implementing rule, leading to harmonised requirements across the area of application of the implementing rule.

This approach would not only support the MSI implementing rule but would also allow the interoperability of the airborne equipment with the current and foreseen surveillance technologies, taking also into consideration that a large amount of aircraft are already fitted with 1090 ES capabilities. It would establish the mandatory carriage of Mode S ELS with SI and 1090 ES capabilities as the baseline for IFR/GAT traffic within the SES airspace. It will further support the deployment of WAM and open the way to the deployment of new technologies (e.g. ADS-B out) or new functionalities (e.g. EHS) based on common needs/criteria.

Note: it should be noted that the requirements related to the carriage of ADS-B out equipment and the associated timeframes will take into account the availability of certification material, the costs for equipage of different categories of airspace users, the availability of surveillance services based on ADS-B as well as specificities of such technologies (e.g. security issues).

4.4.2 Regulatory coverage of option 3

Based on the principles described above, the regulatory coverage of this option would include option 2 supplemented with:

- Mandatory carriage by IFR/GAT flights within the SES airspace of Mode S transponders compliant with ICAO Annex 10 Vol. IV A77 Level 2es (SI code capable and 1090ES) with the appropriate aircraft configuration certified. Within this option it will be possible to allow more demanding requirements on the airborne capabilities in view of the deployment of new technologies/functionalities (e.g. EHS, ADS-B out). Common criteria for imposition of such requirements would be addressed during the development of the implementing rule.

4.5 Summary

The objective of this section is to identify several possible options that might be followed during the development of the implementing rule. The first Option is based on high level regulatory requirements applicable to the ground systems, with no prescriptions applicable to the airborne segment of the surveillance systems. The following two options are built on the principles identified in Option 1, by progressively extending the regulatory coverage of the implementing rule.

Option 2 adds to the coverage of Option 1 more detailed provisions related to the interoperability of surveillance data depending on the type and source of data (high level functional requirements extracted from the ASTERIX categories) as well as the mandatory carriage by IFR/GAT flights within the SES airspace of Mode S transponders compliant with ICAO Annex 10 Vol. IV A77 Level 2s (SI code capable) having the Mode S ELS functionality.

Option 3 builds on the prescriptions of Option 2 but supplements the requirements applicable to the airborne carriage by extending them to the mandatory carriage by IFR/GAT flights within the SES airspace of Mode S transponders compliant with ICAO Annex 10 Vol. IV A77 Level 2es (SI code capable and 1090ES) and providing the Mode S ELS functionality as a baseline. Within this option it would be possible to allow more demanding requirements on the airborne capabilities in view of the deployment of new technologies/functionalities (e.g. EHS, ADS-B out) depending on certain criteria. The possible identification for common criteria for imposition of such requirements would be addressed during the development of the implementing rule.

Section 7 of the present document identifies a preliminary impact assessment based on currently available material and/or on early assumptions. It provides information at a level suitable to support decision-making on the best regulatory approach to take based on the analysis of the several proposed options.

5. CONFORMITY ASSESSMENT ANALYSIS

5.1 General issues

According with Article 3.2 of the SES interoperability Regulation, the systems, constituents and associated procedures of the European Air Traffic Management Network shall comply with the relevant implementing rules for interoperability throughout their lifecycle. This compliance is ensured through specific conformity assessment requirements described in the implementing rules.

The SES framework Regulation (EC) 549/2004 defines “system” as “*the aggregation of airborne and ground-based constituents, as well as space-based equipment, that provides support for air navigation services for all phases of flight*”, while “constituents” means “*tangible objects such as hardware and intangible objects such as software upon which the interoperability of the EATMN depends*”.

With regard to the verification of compliance, the SES interoperability Regulation defines two specific declarations, one relative to constituents and one to systems. Concerning the constituents, they shall be accompanied by an “EC declaration of conformity or suitability for use of constituents” issued by the manufacturer, covering either the assessment of the intrinsic conformity of a constituent, considered in isolation, with the Community specifications to be met or the assessment/judgement of the suitability for use of a constituent, considered within its air traffic management environment.

With regard to the systems, before they are put into service the relevant Air Navigation Service Provider shall establish an “EC declaration of verification of systems” (“*putting into service*” meaning “*the first operational use after the initial installation or an upgrade of a system*”).

It should be noted that the EC declaration of verification of systems shall be without prejudice to any assessments that the National Supervisory Authority may need to carry out on grounds other than interoperability. With regard to constituents and the assessment of conformity or suitability for use thereof, the manufacturer’s declaration of conformity or suitability for use is sufficient as it would be excessive to affix the CE mark to constituents in order to show compliance with the SES interoperability requirements. However this does not affect the obligation on manufacturers to affix the CE mark to certain constituents in order to certify their compliance with **other** Community legislation relating to them. This confirms the complementarities between the interoperability Regulation and other relevant Community legislation outside the Single European Sky context.

5.2 Determination of conformity assessment requirements for EATMN systems

The basic principle is to specify conformity assessment requirements for each EATMN system within the scope of the implementing rule. These systems are the surveillance systems and procedures as well as the surveillance data processing systems within the systems and procedures for air traffic services. However it should be noted that the proposed approach is to address the surveillance system as a “black box” and to define the performance and the interoperability requirements relative to the end-to-end characteristics of the systems. Therefore the scope of the conformity assessment requirements will have to be adapted accordingly.

Annex IV (2) of the interoperability Regulation requires that the systems are checked for each of the following aspects:

- Overall design;

- Development and integration of the system;
- Operational system integration;
- Specific system maintenance provisions.

These verification aspects are important in the context of the implementing rule on surveillance performance and interoperability, as the end-to-end performance of the surveillance systems is strongly dependent on the design of the system, the integration of its elements and their distribution as well as the geographical environment in which the system is deployed.

In the context of the conformity assessment requirements applicable to systems, the implementing rule will also identify requirements addressing the procedures relative to the assessment of the overall performance of the surveillance systems, in order to provide appropriate assurance on the quality of the surveillance information provided by the system and the possibility to use intended separation standards.

It is important to note that the verification of compliance with the requirements addressing procedures doesn't lead to the issuance of a certificate. However, as in the Initial Flight Plan implementing rule, the procedures are subject to several additional requirements supporting compliance as part of the conformity assessment activities.

5.3 Determination of conformity assessment requirements for EATMN constituents

The implementing rule specifies the requirements to be respected by the applicable manufacturers of constituents, before issuing an EC declaration of conformity or suitability for use, based on the adapted modules of the Council Decision 93/465 as required by the European Commission's mandate.

However it should be noted that as the proposed approach is to address the surveillance system as a "black box", it is likely that no specific ground constituents will be identified in the implementing rule (the particular case of the airborne constituents of the surveillance systems is addressed in section 5.4).

5.4 Airborne constituents

The requirements relative to the mandatory carriage of specific equipment will be applicable to all aircraft flying IFR/GAT within the airspace of application. Therefore these requirements will apply irrespective of the country of registration of the aircraft (to all EU and non-EU aircraft that will enter the airspace of application).

It should be noted that there is a difference between the obligation to issue an EC certificate, applicable before putting a constituent on the EU market, (requirement coming from 552/2004) and the obligation to apply the requirements of the IR in terms of equipment/performance, applicable to all aircraft flying in the airspace of applicability of the rule. Therefore the non-EU aircraft will have to comply with the interoperability and performance requirements of the draft implementing rule, without having to show an EC declaration of conformity for the airborne equipment.

For the EU aircraft it is proposed (as it was done for the VCS implementing rule recently approved by the Single Sky Committee) to consider that the airworthiness processes performed by EASA constitute acceptable procedures for satisfying SES conformity assessment requirements, provided they include the demonstration of compliance with the Regulation . This principle has the objective to avoid the duplication of showing compliance in front of two different bodies (EASA and a "SES" one). However, by definition this approach can only apply to aircraft certified by EASA (within the scope of article 4 of 1592/2002).

5.5 Development process

Following their development in the broader context of the development of the implementing rule based on the option selected from the Regulatory Approach, the conformity assessments requirements will be discussed with the Conformity Assessment Task Force (CATF). The CATF is managed by EUROCONTROL (Regulatory Unit – RU and Safety Regulation Unit – SRU), with the participation of Air Navigation Service Providers, National Supervisory Authorities, Industry and the European Commission.

The CATF has developed guidelines that might be followed by ANSPs and NSAs in the conformity assessment process. These guidelines will be further developed in the months to come and their evolution will be reflected as appropriate in the development of the conformity assessment requirements included in the draft implementing rule on surveillance performance and interoperability requirements.

It should be noted that the performance of the end-to-end surveillance systems may depend (considering the type of surveillance) on the level of aircraft equipage. Therefore the impact of the airborne component and of the possible carriage exemptions on the performance of ground systems and the associated verification procedures will be specifically addressed in the context of the development of the conformity assessment requirements.

6. ANALYSIS OF IMPLEMENTATION CONDITIONS

This section describes the issues which will have to be addressed in the following areas: dates of implementation for the regulated parties, possible transitional arrangements and the specific criteria allowing the stakeholders not to comply with the regulatory requirements, if it will be the case. It should be noted that at this early stage only a high level statement of the likely conditions is possible.

6.1 Dates of implementation

The dates of implementation will address the obligations of all the implementing rule's addressees with regard to the dates when they will have to comply with the regulatory requirements identified in the implementing rule. These dates may be different depending on the scenario selected for the development of the rule as well as depending on the parties impacted by the implementing rule (e.g. ANSP, aircraft operators, etc) and the different requirements. The implementation dates will take into account the current and the planned activities related to the deployment of surveillance applications within the area of applicability of the rule. It is expected that some "types" of requirements (e.g. those related to the conformity assessment activities or to the procedures related to the assessment of the overall performance of the surveillance systems) to be applicable from an earlier date than those related to the achievement of specific performances of the surveillance systems.

With regard to the mandatory carriage of specific onboard equipment, the implementation dates will also take into account the current plans as well as the specific constraints related to the equipage of aircraft. It is expected that the mandatory equipage will apply only to aircraft fulfilling specific characteristics and aircraft operators must be informed throughout the development process of the implementing rule so that they may anticipate the required equipage in due time. The implementation dates will differentiate between the need to retrofit the aircraft already in service and to forward fit the new aircraft. Retrofit of "in service" aircraft with specific equipment that can be completed during routine maintenance periods will significantly minimise the costs for aircraft operators. The period of time for retrofit should be specified in the implementing rule. New aircraft that are due for delivery before the equipage deadline specified in the implementing rule can normally be fitted with the required equipment in a cost effective manner prior to delivery. A shorter notice period can also be given to aircraft operators for the equipage of new aircraft than that provided for retrofits. The period of time for this 'forward fit' of new aircraft should be specified in the implementing rule. Specific dates will also take into account the particular constraints applicable to the State aircraft as appropriate.

6.2 Transitional arrangements

The transitional arrangements will address the flexibility which must be left to implementing rule's addressees for implementing specific requirements in the case of systems being ordered before the entry into force of the Regulation. They will have the main objective to avoid putting unnecessary financial burden on the stakeholders in order to comply with the implementing rule by proposing in the same time a reasonable path in terms of dates, for the achievement of the objectives of the rule.

6.3 Applicability Criteria

By default, the implementing rule will be applicable to the surveillance systems and constituents within the EATMN, in the airspace of the EUR and AFI ICAO regions where the Member States have the responsibility to provide air navigation services. However, the scope can be fine tuned in each implementing rule, which can take into account that there are particular areas or types of traffic for which the equipage would not be justifiable as revealed by CBA studies (e.g. low levels of traffic or in certain areas in the lower airspace in which deployment of surveillance infrastructure is not required or economically justified). Therefore

a phased approach (e.g. starting with the core area) and/or transitional arrangements may be considered with regard the implementation conditions. This approach will also address the dates relative to the mandatory carriage of airborne equipment, with different dates for the forward fit of new aircraft and for retrofit, allowing sufficient time to equip the new aircraft as well as those already in service.

With regard to the requirements addressing the ground systems, various applicability criteria may be considered. They could address several requirements (but not be limited to) as follows:

- The interoperability requirement relative to the use of a common data format applies when the surveillance data is required to be exchanged between (surveillance) systems of individual ANSPs. However, surveillance data exchange between or within systems of the same ANSP could use different data formats.
- The performance requirements (extracted from the “ATM Surveillance system standard requirements”, currently under development) are applicable only when 5 or 3 NM separations are in place.

With regard to the mandatory carriage of airborne equipment, the rule will identify the criteria based on which the aircraft will have to comply or not with the equipage requirements. These criteria may address:

- The class of flight to which the rule will apply (e.g. only those aircraft operating as GAT under instrument flight rules)
- The class of aircraft to which the rule will apply (e.g. only those aircraft above a certain maximum take-off mass)
- The types of airspace in which the flights will take place (e.g. en-route, above a certain flight level or in certain FIRs)

6.4 Exemption procedures

In principle, the implementing rule should seek to minimize the number of exemptions. However it is recognised that exemption procedures may apply to those aircraft that fall within the applicability criteria but which have a genuine need to be temporarily or permanently exempted from compliance with the implementing rule (e.g. aircraft approaching the end of their lifecycle, test, delivery and maintenance flights). In addition, there may be necessary to allow some specific exemptions to the State aircraft that fall within the applicability criteria.

6.5 Conclusions

Following the selection of one of the proposed options as a result of the written consultation on the Regulatory Approach, the principles identified above will be further refined and detailed for the inclusion in the implementing rule. The resulting requirements will aim to ensure a homogenous implementation of the rule by providing realistic and achievable timeframes and recognising the practical constraints that may be encountered by the different stakeholders impacted by the rule.

7. IMPACT ASSESSMENT

7.1 Introduction

This section records the preliminary assessment of the impact that the three options for regulatory approach could have on the implementing rule's addressees. The impact analysis uses readily available information to compare the advantages, disadvantages, benefits and costs of the options in several areas. At this stage in the development of the proposals, the available information is of a qualitative nature and, once an option has been agreed, a cost-benefit study will need to be conducted. Therefore during the development of the implementing rule the selected option will be subject to a more detailed impact analysis covering the areas of safety, civil/military organisation, and efficiency and economic aspects, including a cost benefit analysis. This impact assessment will be part of the Justification Material included in the Final Report, as required by the Mandate.

The aim of the impact analysis is to predict the likely consequences, both direct and indirect, of each regulatory approach option on stakeholders and to provide sufficient information to be able to compare the options and identify a preferred solution.

The major part of the impact analysis is concerned with the economic and efficiency impact that the potential regulatory approach options would have on stakeholders. Consequently, qualitative economic advantages and disadvantages are identified and described for each option. At this early stage in the proposals, it has not been possible to apply meaningful quantification to the likely impacts and there is no readily available cost benefit analysis data to support the impact assessment.

The options are then assessed in terms of the qualitative advantages and disadvantages that they may have on general safety issues in the EATMN. Notwithstanding this, a specific safety analysis and safety summary will be required when the draft rule is more mature. The section also analyse the impact of the regulatory approach options on civil/military organisation.

In order to compare the results of the assessment of each of the options easily, the impact analysis is then summarised and recommendations made for the preferred regulatory approach.

7.2 Stakeholders affected

7.2.1 Air Navigation Service Providers (ANSPs)

ANSPs are those public or private entities providing air navigation services for GAT in the SES airspace, which include surveillance services supported by surveillance systems and procedures.

7.2.2 Commercial Aircraft operators

Commercial aircraft operators are those organisations or individuals who operate aircraft as IFR/GAT for scheduled and charter operations in the SES airspace for commercial purposes, including executive charter companies. These airspace users will comprise airlines, freight carriers, and aircraft leasing and charter companies from inside and outside of the EU. This category may also include some commercial pilot training schools.

7.2.3 Private Aircraft Operators

Private aircraft operators that require access to SES airspace as IFR/GAT could be affected by this implementing rule.

7.2.4 Military Authorities and 'State' Aircraft Operators

Military and 'state' aircraft that require access to SES airspace as IFR/GAT could be affected by this implementing rule. This will particularly be the case for the larger transport type aircraft engaged in routine deployment and training missions that require access to the civil en route system under IFR. Military authorities that receive or exchange surveillance data with civil ANSPs could also be affected by this implementing rule.

7.2.5 Supervisory Authorities

Regulatory, supervisory and certification authorities operating within the EU will have responsibilities arising from ensuring compliance with this implementing rule. These organisations could include the European Aviation Safety Agency (EASA), national supervisory authorities (NSAs) and EUROCONTROL.

7.2.6 Equipment Manufacturers

Manufacturers, suppliers and vendors of aircraft, avionics and ATC systems and constituents, are those organisations that will be responsible for manufacturing, supplying, installing and integrating the appropriate surveillance equipment in aircraft and ATS units.

7.3 Economic and Efficiency Impact

7.3.1 Common Provisions

Tables below set out qualitative economic impact assessment issues for the proposed regulatory approach options.

Provisions	Requirements	Impact
<p>High level requirements placed on ANSPs to set up separation standards that ensure seamless operations across boundaries with neighbouring States.</p>	<p>Negotiation required between neighbouring ANSPs to ensure that the same separation standards are applied for flights transiting across an international FIR boundary.</p>	<p>This would potentially support increased capacity, ATM productivity and/or reduction in delays from the removal of this potential cause of 'bottlenecks' across international boundaries where different separation standards currently exist. However, no major 'bottlenecks' have been reported and these prescriptions may only provide benefit where there is a transition between en route and TMA airspace across an international boundary.</p> <p>ANSPs will still be able to determine the criteria for when to apply specific separation standards, and these criteria may not be standardised across the SES airspace by this rule. For example, the use of the different separation standards may not to be linked to user or operational requirements. However, it is assessed as unlikely that there will need to be any significant changes in the current separation standards applied in the SES airspace.</p> <p>In order for neighbouring ANSPs to agree separation standards at mutual boundaries, there could be some administrative cost impact from having to first negotiate and set up any new</p>

Provisions	Requirements	Impact
		<p>arrangements.</p> <p>The prescriptions promote efficient use of controller resources through sector optimisation at international boundaries and support the concept of Functional Airspace Blocks across national boundaries.</p> <p>These prescriptions would not necessarily provide a legal basis for resolving bottlenecks on the outer boundaries of SES airspace, which is where 'bottlenecks' are currently considered more likely to occur.</p> <p>MINOR IMPACT.</p>
<p>High level requirements on ANSPs to deploy suitable surveillance systems that are validated as meeting the requirements of the separation standards that are set up.</p>	<p>The numbers, types and performance capability of sensors and SDPDS deployed by EU States would need to be in accordance with a suitable harmonised standard.</p>	<p>It is not thought that the requirements defined as a result of the review of the Surveillance Standard, which could be used as a means of compliance to support the rule, will require any major differences in the currently deployed surveillance systems in the EATMN. A study has been initiated to quantify this issue.</p> <p>Deploying suitable surveillance systems is in accordance with current practice in most States anyway, and so the incremental costs to meet these requirements should be minimal.</p> <p>There could be additional costs associated with compliance monitoring to ensure ANSPs are deploying appropriate systems. However, national supervisory authorities already have oversight of surveillance system safety and functionality, and the rule is unlikely to introduce any new requirements over and above what is already conducted in many States.</p> <p>Where current data sharing arrangements are not adequate to meet the performance requirements, it may result in need for an increase of interrogator installations.</p> <p>MINOR IMPACT.</p>
<p>High level performance requirements for surveillance systems that are deployed to meet 5NM and 3NM</p>	<p>Systems and constituents deployed by EU States would need to perform in accordance with common harmonised</p>	<p>This provides a legal basis to ensure harmonised criteria is applied across the SES airspace to optimise the surveillance function. It ensures that agreed separation standards can be applied and it may facilitate greater industry standardisation.</p>

Provisions	Requirements	Impact
separation standards.	standards.	<p>It is not thought that the new requirements following the review of the Surveillance Standard, which could be used as a means of compliance to support the rule, will require any major differences in the currently deployed surveillance systems in the EATMN. A study has been initiated to quantify this issue.</p> <p>This may result in cost savings from the rationalisation of deployed surveillance systems in some States, and particularly interrogator installations, across the EATMN.</p> <p>This requirement will most likely be in accordance with current practices in most States anyway, and so the incremental costs to meet these requirements should be minimal. Most States already comply or exceed the requirements of the current EUROCONTROL Surveillance Standard, and the new requirements are not expected to require any major changes in the currently deployed infrastructure.</p> <p>The means of compliance may result in a requirement for a consistent method of surveillance system analysis across the EATMN. This may result in additional costs for ANSPs in terms of the analysis and monitoring tools that have to be used, but compliance monitoring requirements of national supervisory authorities should not change significantly.</p> <p>MINOR IMPACT.</p>
High level requirements for the establishment of Service Level Agreements for the exchange of data between surveillance providers and users.	<p>Negotiation required between parties to set up formal arrangements.</p> <p>Arrangements for periodic monitoring and updating the agreements would need to be put in place.</p> <p>Specific quantified performance, availability and integrity requirements may need to be negotiated and documented.</p>	<p>There would be no formal requirement for stakeholders to exchange surveillance data. These prescriptions would only apply to those that voluntarily wish to exchange the data, and agreements of some description are already used in these circumstances.</p> <p>This should provide greater consistency, data quality and awareness between ANSPs where data is exchanged. It may also improve the coordination process. It provides clarity of the service to be provided, a mutually agreed standard, and is business focussed. It facilitates improved communication and provides a process for gauging service effectiveness.</p> <p>It will harmonise data exchange across the</p>

Provisions	Requirements	Impact
		<p>EATMN and may encourage greater use of data sharing. This could encourage opportunities for cost savings from greater efficiency in the use of surveillance systems through a rationalisation of the deployed infrastructure and an increase in the sharing of data.</p> <p>There could also be potential revenue streams to ANSPs from greater data exchange opportunities with other States/ANSPs.</p> <p>There would be manpower costs associated with negotiating, setting up and monitoring SLAs. It could take an estimated 24 man-days effort to set up each SLA and a further 6 days per year to maintain one; but the availability of harmonized SLA requirements may reduce this required effort. (Set up cost is based on 4 people preparing for and then attending a 3 day drafting meeting and 2 one-day review meetings. The maintenance cost is based on 1 person collating and reporting comments, and four people spending 1/2 a day preparing and 1/2 day attending an annual review meeting.) Where an ANSP has many agreements, specific posts may need to be established to manage and administer the agreements and process.</p> <p>MINOR IMPACT.</p>
<p>High level requirements for the procedures to be employed for the overall assessment of the performance of surveillance systems.</p>	<p>Appropriate manpower resources and tools will need to be put in place by ANSPs/States.</p> <p>Consistent methods of surveillance systems analysis would need to be employed.</p>	<p>There could be potential for greater efficiency in fault finding, error reporting and maintenance procedures, and hence reduced costs from outages and downtime.</p> <p>Improved confidence in the quality of surveillance data would be provided for data sharing if the assessment is standardised between providers. This could encourage greater use of data sharing.</p> <p>There would be costs of procuring and deploying suitable tools, and also manpower costs associated with their deployment in some States.</p> <p>It could facilitate easier identification of inadequate or inefficient systems and improved prevention of equipment operating out of specification.</p>

Provisions	Requirements	Impact
		<p>It would harmonise measurement processes across the EATMN to ensure confidence that separation standards can be applied safely.</p> <p>SIGNIFICANT IMPACT.</p>

Economic and Efficiency Impact of Common Provisions

7.3.2 Specific Option 1 Provisions

Provisions	Requirements	Impact
<p>High level functional requirements for the interoperability of data exchange to be used by surveillance providers. (This would not apply to the exchange of data within the systems of an ANSP).</p>	<p>Systems will need to be procured or modified to provide data that meets the requirements.</p>	<p>There would be a cost to some States/ANSPs for modifying systems not compatible with the interoperability requirements. However, it is believed that 98% of ANSPs that exchange data already use a common format and these high level requirements would provide sufficient scope for States to determine an appropriate solution and minimise any cost impact.</p> <p>This may result in cost savings from the rationalisation of deployed surveillance systems, and particularly interrogator installations, in the EATMN through increased opportunities and ease of data sharing. There is potential for increased revenue streams to ANSPs from greater data exchange opportunities. However, high level performance requirements only are unlikely to cause significant changes to the current situation in most States.</p> <p>This could improve surveillance data quality and promote industry standardisation. This also does not over-regulate local systems that have minimal impact on the overall interoperability of the EATMN.</p> <p>The prescriptions may not be sufficiently detailed to guarantee interoperability of systems and constituents between ANSPs. The means of compliance would need to be chosen carefully.</p> <p>MINOR IMPACT.</p>

Economic Impact of Provisions Specific to Option 1

7.3.3 Specific Option 2 Provisions

Provisions	Requirements	Impact
<p>More detailed</p>	<p>Systems will need to</p>	<p>This would improve on the Option I</p>

Provisions	Requirements	Impact
functional requirements for the interoperability of data exchange to be used by surveillance providers.	be procured or modified to provide data that meets the requirements.	<p>advantages considerably in that it is more likely that technical interoperability can be achieved. The means of compliance will be much narrower for ANSPs than for Option I but there could be greater cost impact for procuring or modifying systems to meet the requirements.</p> <p>Interoperability may still not be fully guaranteed if ANSPs do not use ASTERIX as the means of compliance. However, it is considered highly likely that ASTERIX will be used as the common means by industry and ANSPs, as around 98% of ANSPs are believed to already currently employ the format within some or all of their existing systems.</p> <p>MINOR IMPACT.</p>
Carriage and operation of SSR Mode S ELS 'Level 2s' transponders on all IFR/GAT flights.	All IFR/GAT aircraft will require equipage with compliant transponders even if they do not currently need to operate in declared Mode S airspace.	<p>This would maximise the economic benefits of the current and planned Mode S ELS introduction in ground systems. It maximises the benefits of the deployment of Mode S radars in terms of spectrum efficiency and helps to overcome Mode A code shortages. It improves the efficiency of the Mode S IC Allocation process.</p> <p>Facilitates an easier introduction of SSR Mode S in a wider area of the EATMN by creating a suitable airborne environment. It provides a harmonised legal basis for the current European Mode S programme and provides clear and standardised requirements for aircraft operators. The equipment is also compatible with 'Classical' SSR, ASMGCS and WAM (Moreover, the deployment of WAM is easier on the basis of Mode S replies than on Mode A/C replies.</p> <p>There would be significant equipage costs to those operators that do not currently operate flights in Mode S airspace without any immediate benefits. This is because there would be no realistic return on investment for aircraft operators with aircraft that do not routinely operate in declared Mode S airspace.</p> <p>Many aircraft operated internationally in SES airspace will be already appropriately equipped by 31 Mar 07 to meet the coordinated implementation of Mode S within the 'core' States through which</p>

Provisions	Requirements	Impact
		<p>around 78% of IFR/GAT flights in Europe operate.</p> <p>This may require the extension of the need to provide the EUROCONTROL coordinated exemption arrangements and the associated administrative running costs that accrue from this activity.</p> <p>There would, however, still be a difference between the rule and the current requirements for the carriage and operation of Mode S EHS transponders in some major TMA and en-route airspace by aircraft in excess of 5,700kg maximum take-off mass and 250 kt maximum cruising true airspeed.</p> <p>Full benefits of these prescriptions for the EATMN would not be maximised unless there is an associated requirement for compatible ground systems to be deployed across the SES airspace; however, the provisions would provide no regulatory basis for this to occur. Nevertheless it should be noted that there is a growing number of Mode S stations being deployed as they will become the baseline in the process of replacing the aging MSSR infrastructure.</p> <p>MAJOR IMPACT.</p>

Economic and Efficiency Impact of Provisions Specific to Option 2

7.3.4 Specific Option 3 Provisions

Provisions	Requirements	Impact
<p>Carriage and operation of SSR Mode S ELS 'Level 2es' transponders on all IFR/GAT flights</p> <p>Specific additional requirements would be allowed in order to permit the deployment of new functionalities/technologies.</p>	<p>These requirements included the 1090ES capability for the transponder.</p> <p>The option allows additional requirements allowing new functionalities or technologies (e.g. the need to provide Mode S EHS DAPs according with EASA AMC 20-13 or ADS-B 'Out'). Common criteria</p>	<p>This is likely to just formalise existing coordinated arrangements in some States and the many aircraft affected by this will already be appropriately equipped, or will be by 31 Mar 07. However it should be noted that the 1090ES capability is not available on all the aircraft impacted by the 31 Mar 07 date in the context of ELS/EHS airborne requirements.</p> <p>It would allow for new deployments of Mode S, WAM and ADS-B in the EATMN and, therefore, minimise future costs of deployment.</p> <p>This would maximise the investment made in the deployment of the ground infrastructure in some States to use</p>

Provisions	Requirements	Impact
	for such requirements would be addressed during the development of the implementing rule.	DAPs. MAJOR IMPACT.

Economic and Efficiency Impact of Provisions Specific to Option 3

7.4 Safety Impact

A safety analysis on the impact of the implementing rule will need to be conducted once the regulatory coverage has been finalised, and a safety summary will need to be drafted accordingly. However, at this stage it is considered that there will be safety benefits to the interoperability of the EATMN from the following aspects of the proposed regulatory approach options:

- The necessary levels of performance, availability and integrity of surveillance data and deployed systems will be harmonised, monitored and clearly understood across the EATMN;
- Harmonised separation standards within the SES airspace will reduce the workload associated with the use of inconsistent separations and the associated risks;
- The rule may result in a rationalisation of surveillance interrogators, thereby reducing the risks of interference, frequency pollution and inadequate detection of aircraft;
- Harmonised measurement and assessment of surveillance systems across the EATMN will be assured, which will ensure that systems and constituents do not operate outside of the required performance criteria set by the rule;
- The rule should avoid the interference incidents between the surveillance systems within the EATMN;
- The quality of exchanged surveillance data should be harmonised;
- Equipage with SSR Mode S transponders within the SES airspace under Options 2 and 3 will help to ensure that the safety benefits of Mode S, such as eradication of Mode A code conflicts and reduction in RF pollution on 1090 MHz, can be realised;
- The requirement for SI code capability on aircraft transponders under Options 2 and 3 will ensure that SI codes can be operated by SSR Mode S interrogators to help minimise the need for RF-inefficient IC optimisation measures to be deployed;
- The requirements for airborne equipment under Option 3 mean that specific safety risks could be targeted within portions of EATMN airspace, such as the reduction of 'Level Busts' within busy TMAs or the introduction of surveillance systems based on ADS-B.

7.5 Impact on Civil/Military Organisation

The following tables set out the qualitative impact of the proposed regulatory approach options on civil/military surveillance interface.

7.5.1 Common Provisions

Provisions	Impact
High level requirements placed on ANSPs to set up separation standards that ensure seamless operations across boundaries with neighbouring ANSPs.	Provides clear criteria to support the flexible use of airspace concept and the joint civil/military use of surveillance facilities. Provides useful guidance for services applied to OAT. Military ATC authorities that handover aircraft as IFR/GAT to civil centres in neighbouring States will

Provisions	Impact
	need to comply with agreed separation standards.
High level requirements on ANSPs to deploy suitable surveillance systems that are validated as meeting the requirements of the separation standards that are set up.	Where military ATC authorities provide services to IFR/GAT, appropriate surveillance systems will need to be deployed.
High level performance requirements for surveillance systems that are deployed to meet 5NM and 3NM separation standards.	Where military ATC authorities provide services to IFR/GAT, suitable surveillance systems will need to be deployed.
High level requirements for the establishment and content of Service Level Agreements for the exchange of data between surveillance providers and users.	Promotes improved consistency, quality and awareness between civil and military ANSPs where data is exchanged. It improves coordination, it harmonises data exchange across the EATMN, and it could encourage increased data exchange between civil and military agencies.
High level requirements for the procedures to be employed for the overall assessment of the performance of surveillance systems.	There would be a need for the Member States to set-up the appropriate mechanisms to ensure that the verification of surveillance systems demonstrate the conformity of these systems with the requirements of this Regulation and to take the necessary measures to ensure compliance with the implementing rule.
Requirements for the registration of active surveillance interrogators with State authorities, together with details of the key operating parameters.	There would be security considerations to overcome from any requirement for military authorities to provide details of interrogators to civil agencies. However, a joint civil/military register would improve the speed and efficiency of interference investigations.
Generic performance requirements for the assignment and coordination of Interrogator Repetition Frequencies for radars in overlapping coverage.	<p>There will be potential for reduced interference and improved performance of military IFF systems and ATC interrogators.</p> <p>There would be a need for military authorities to participate in the coordinated allocation processes. However, security concerns from having to coordinate with civil agencies could mean that military authorities will not be able to cooperate. Also, military radars can be frequency agile or mobile, and so they could be difficult to coordinate.</p>

Impact of the Common Provisions on Civil/Military Coordination

7.5.2 Specific Option 1 Provisions

Provisions	Impact
High level generic interoperability requirements for the data	This may improve access to civil surveillance data by military forces if the format is standardised across

Provisions	Impact
exchange format to be used whenever surveillance data is required to be exchanged between the surveillance systems of different ANSPs. (This would not apply to the exchange of data within the systems of an ANSP).	<p>Europe, particularly for forces on deployment/exercise in other States. There would also be benefits to national security and counter terrorist activity with potentially easier access to civil surveillance data.</p> <p>There could be potential revenue streams to military authorities from greater data exchange opportunities. However, military authorities would need to ensure that systems could send and receive surveillance data in the correct exchange format for any of these benefits to accrue.</p>

Impact of Specific Option I Provisions on Civil/Military Coordination

7.5.3 Specific Option 2 Provisions

Provisions	Impact
Detailed interoperability requirements for the data exchange format to be used whenever surveillance data is required to be exchanged between the surveillance systems of different ANSPs.	Military systems would need to follow the civil ASTERIX requirements more closely in order to guarantee interoperability.
Carriage and operation of SSR Mode S ELS 'Level 2s' transponders on all IFR/GAT flights.	There would be costs and timescales issues to be addressed in order to achieve compliancy for those military aircraft requiring to operate as IFR/GAT. Due to the ongoing work in the European Mode S Programme the impact of this should be minor as military equipage with Mode S ELS is already being addressed. However, the particular constraints specific to the State aircraft (see 7.5.5) will be considered in the draft implementing rule.

Impact of Specific Option II Provisions on Civil/Military Coordination

7.5.4 Specific Option 3 Provisions

Provisions	Impact
<p>Carriage and operation of SSR Mode S ELS 'Level 2es' transponders on all IFR/GAT flights</p> <p>Additional requirements for airborne equipage would be allowed for the introduction of new functionalities/technologies, based on common criteria</p>	<p>There would be costs and timescales issues to be addressed in order to achieve compliancy for those military aircraft requiring to operate as IFR/GAT. Moreover, it is not technically feasible to equip some military aircraft with specific technology or to provide specific functionality such as Mode S EHS and ADS-B and exemptions would need to be applied accordingly in these cases.</p> <p>There are potential security considerations to be addressed for military authorities for the use of ADS-B 'Out' on military aircraft.</p>

Impact of Specific Option 3 Provisions on Civil/Military Coordination

7.5.5 Short to Medium Term Aircraft Equipage Requirements

Options 2 and 3 in the proposed regulatory approach would affect only State aircraft that will require access to the applicable SES airspace. More specifically, they affect those aircraft requiring an ATS when operating as IFR/GAT under the control of an ANSP. As with all CNS/ATM equipage programmes for the civil aviation community, there are unique difficulties for military authorities in meeting the required levels of compliancy in State aircraft. This is mainly due to the long lead-times required for the procurement of new equipment, existence of large fleets, the expensive retrofits, the many competing demands on national defence budgets, and also with the technical challenges of integrating the CNS/ATM equipment into aircraft designed and equipped primarily to conduct and support warfare.

Overall, the average daily number of flights made by military and other State aircraft operating as IFR/GAT is negligible compared to the levels of civil air traffic. In general, therefore, these flights do not have a significant impact on controller workload or Air Traffic Flow and Capacity Management (ATFCM) measures. Consequently, it is reasonable to assume that exemptions for 'state' aircraft could be accommodated within any of the options for regulatory approach without any adverse impact on civil/military organisation and co-ordination.

Therefore, the draft implementing rule will identify specific transitional arrangements and exemption policies applicable to the different categories of State aircraft (e.g. transport type, non-transport type). Similarly to the Air-Ground Voice Channel Spacing implementing rule, the air navigation service providers will have to accept the non-equipped State aircraft, provided that they can be safely handled within the capacity limits of the ATM system. The air navigation service providers will have to set-up procedures for the handling of non-equipped State aircraft and will also have to communicate to the Member State that have designated them, the plans for the handling of these non-equipped aircraft.

7.6 Summary and Recommendations

The economic and efficiency impact of most of the proposed common provisions across all three options has an overall net beneficial nature to interoperability of surveillance in the EATMN. Some of the subjects will either just formalise existing practices in many of the individual States or they will just require harmonised administrative and coordination arrangements to be put in place. A major indirect benefit that may be facilitated by the provisions could be an overall rationalisation of the interrogator infrastructure in the EATMN through improvements to and ease of surveillance data sharing and coordination. Nevertheless, such a rationalisation will not be specifically made mandatory by the implementing rule.

The regulatory coverage should help to prevent the negative economic and efficiency impact of capacity 'bottlenecks' at international boundaries, although these are not generally thought to be a serious problem at the current time. ANSPs will still be free to choose what separation standards to use, as long as they are coordinated with neighbours to ensure a seamless flow of air traffic across the interfaces. Potential capacity 'bottlenecks' at the outer edges of SES airspace may, however, not be resolved by the prescriptions if agreements on separation standards with non-EU member States cannot be set up. Confidence in the separation standards that are applied by EU States will be assured by the harmonised requirements on ANSPs to deploy suitable, validated surveillance systems with appropriate levels of performance.

Some States may be significantly impacted by the potential new monitoring and assessment requirements from the need to procure and deploy new tools or employ the associated engineering manpower resources to conduct the required tasks. However, this could be offset by benefits such as improved detection of inadequate performance of systems and interference, or by improved fault finding, reliability of systems, and data integrity.

In some States, there should be no impact of potentially having to administer a centralised registration and coordination process for interrogators but, in other States, it could be significant because new processes may have to be initiated. Coordination of IRF and frequency allocations for interrogators could also create new administrative burdens for some stakeholders. If a centralised EATMN IRF plan is deemed necessary, this will also present additional administrative costs, and existing allocations may have to be audited and changed in order to make a new initial centralised plan work. Once again, these costs may be offset from benefits in more efficient interference investigation, a rationalisation of the interrogator infrastructure, or a general improvement in the performance of interrogators.

Overall, it is considered likely that the costs and benefits for ANSPs and national supervisory authorities would be broadly similar under each of the three options, especially if ASTERIX is chosen as the means of compliance for the data exchange format. Notwithstanding this, the cost impact for ANSPs and national supervisory authorities across the EU States could be asymmetrical.

Aircraft operators would not be directly affected by Option 1. Under Option 2, all operators of IFR/GAT flights in SES airspace would be affected, but it is considered that the majority will already be suitably equipped by the time the rule comes into force because of the European Mode S programme requirements. However, there would be an asymmetrical impact on those operators that do not currently need to gain access to declared or future planned Mode S airspace in Europe, as they would not realise tangible benefits from the required equipage unless the corresponding Mode S related services were implemented by all ANSPs.

Option 2 is likely to accrue more ATM productivity benefits than Option 1. Option 3 is likely to accrue more ATM productivity benefits than Option 2, but these would not necessarily be accrued by all EU States. Option 3 would not only support the MSI implementing rule but it would also allow the interoperability of the airborne equipment with the current and foreseen surveillance technologies, taking also in consideration that a large amount of aircraft flying in the core area are already fitted with 1090 ES capabilities. It establishes the mandatory carriage of Mode S ELS with SI and 1090 ES capabilities as the baseline for IFR/GAT traffic across the EATMN supporting and facilitating the introduction of new technologies (e.g. ADS-B based on 1090ES, Wide Area Multilateration) and of new functionalities (e.g. EHS according with EASA AMC 20-13) based on common needs/criteria.

Therefore Option 3 should bring the greatest overall net benefit to the EATMN and is considered to be the preferred option to take forward for more detailed development in the draft implementing rule.

8. OBJECTIVES AND SCOPE OF THE DRAFT IMPLEMENTING RULE

8.1 Objectives

The main objective of the implementing rule on surveillance performance and interoperability requirements is to ensure a harmonised level of performance and interoperability of surveillance systems in a given environment within the EATMN. This environment should take into account the geographic as well as the traffic characteristics of the airspace as applicability so as to ensure seamless operations. Another objective of similar importance is to formalise the procedures specific to the assessment of the overall performance of surveillance systems, in order to increase the confidence in the applied separation standards.

8.2 Scope

Based on the principles described in the previous sections of this document, the scope of the implementing rule on surveillance performance and interoperability requirements will address:

- The end-to-end performance requirements applicable to the surveillance systems deployed within the EATMN (when 3 and 5 NM separations are applied)
- The interoperability requirements relative to the use of a common data format used when surveillance information is exchanged between surveillance systems of different ANSPs as well as the obligations to deploy surveillance systems supporting harmonized separation standards and seamless operations
- The mandatory carriage of specific equipment and the airspace where this obligation is applicable
- The acceptable exemptions as well as the transitional arrangements allowing the stakeholders not to comply with the regulatory requirements in certain, specified cases
- The procedures put in place by the ANSPs in order to assess the performance of the surveillance systems and to the conformity assessment in general
- The timescales for the above.

8.3 Refinement of the Essential Requirements

The interoperability Regulation specifies that the implementing rules are to be developed where necessary in order to refine and complement the essential requirements. As such, the SPI implementing rule has to ensure the traceability to the essential requirements it refines and complements. The complete set of essential requirements applicable to the European Air Traffic Management network is described in the Annex II of the SES interoperability Regulation (552/2004) but not all of these requirements are to be reflected in the SPI implementing rule.

Based on the analysis presented in the sections above it is considered that the essential requirements complemented and refined by the proposed rule will be as follows:

- Seamless operation – complemented by addressing the end-to-end performance requirements of the surveillance systems within EATMN as well as the interoperability requirements related to the exchange of surveillance data.
- Support for new concepts of operation – refined through the identification of requirements supporting the current as well as the foreseen surveillance technologies and allowing the deployment of new functionalities.

- Safety – complemented by ensuring the availability of surveillance information of better and consistent quality and by the formalization of the overall assessment of the performance of surveillance systems.
- Civil-military co-ordination – refined by addressing the interoperability of the surveillance data when this is exchanged by different stakeholders (including civil and military).

The SPI implementing rule is not expected to have a direct impact on the other Essential Requirements set out in the Annex II of the SES interoperability Regulation (552/2004).

9. ARTICULATION OF DRAFT IMPLEMENTING RULE WITH COMMUNITY SPECIFICATIONS

In accordance with the basic principles of the New Approach, the implementing rule should not unduly prescribe detailed technical requirements. The detailed solutions for implementation should be left at the level of Community specifications to be nominated as means of compliance with the implementing rule. The Community specifications are voluntary standards developed by EUROCONTROL in the case of operational standards or by the European Standardisation Bodies in cooperation with EUROCAE, in the case of technical standards. The incentive for the stakeholders to use the Community specifications whose reference numbers have been published in the OJEU as the technical solution for implementation is that they provide presumption of conformity with the implementing rule to which they are associated.

As with regard the ground systems, the proposed options identify high level functional requirements without prescribing a specific technology, the implementing rule will have to be supported by detailed Community Specifications detailing how the regulatory requirements could be achieved by using different technical solutions. Therefore the CS will address (but will not be limited to):

- detailed description of the ASTERIX message structure, allowing compliance with the interoperability requirements
- detailed description for each of the surveillance technologies (primary radar, SSR, Mode S, ADS-B, WAM, etc) allowing compliance with the performance requirements as well as for the components of surveillance systems (e.g. surveillance sensors, trackers, etc)
- detailed description of test tools and procedures, allowing compliance with the requirements relative to and the overall assessment of the surveillance systems.

Concerning the aspects related to the carriage and operation of specific equipment onboard, in order to ensure interoperability, it is intended to provide references to the relevant ICAO standards (e.g. ICAO Annex 10 Vol. IV Amendment 77) in the implementing rule. Based on this, Community Specifications will have to be developed in order to provide the detailed implementation solutions.

It should be noted that it may be desirable to have certain Community Specifications available before the dates when the stakeholders are supposed to comply with the regulatory requirements in order to facilitate this compliance. Therefore the dates of implementation identified in the implementing rule will take into account the need to have some of the means of compliance available before these dates.

With regard the practical development of specifications, as required by the EC mandate, the final report to be delivered by EUROCONTROL will include a document identifying the proposed means of compliance with the draft implementing rule. Assuming current practices are maintained, the SES standardisation work programme will be discussed in the framework of the Industry Consultation Body (ICB) before being recommended to the Commission. The proposals included in the SPI final report will be used to trigger discussions within ICB. Once the Commission has agreed on the work programme, they will issue mandates as required. The development process will take place according with Article 4 of the SES framework Regulation (549/2004) through the European Standardisation Organisations with support from EUROCAE (on technical issues) as European Standards or through EUROCONTROL (mainly on operational matters) as EUROCONTROL Specification, before their recognition as Community specifications.

10. OVERALL STRUCTURE OF THE DRAFT IMPLEMENTING RULE

On the basis of the proposed approach described above, this section describes the overall structure of the proposed rule in terms of preamble, enacting terms and annexes. The preamble will contain the citations and recitals providing the legal basis and statement of reasons for the draft implementing rule.

The enacting terms, structured on articles, will address the subjects identified in section 3 “Interoperability analysis” to be covered by regulatory requirements.

The articles will address:

- The objective and scope of the implementing rule including the systems impacted by the implementing rule as well as the airspace of applicability (if applicable, depending on the selected option)
- The definitions associated with the implementing rule
- The interoperability requirements applicable to surveillance systems in the form of obligations applicable to the air navigation service providers, addressing data formats and the set-up of separation standards supported by surveillance systems
- The performance requirements to be complied with by the surveillance systems
- The requirements on the aircraft operators with regard the carriage and operation of specific airborne equipment
- The requirements related to the overall assessment of surveillance systems
- The requirements related to the spectrum protection and rationalization of surveillance infrastructure
- Safety requirements
- Conformity assessment requirements for constituents and systems
- The transitional arrangements
- The implementation dates including the entry into force of the Regulation.

The annexes will contain further details that are referenced in the articles. The annexes might contain the references to the external documents (e.g. ICAO), specific safety requirements or detailed conformity assessment requirements, as applicable.

ANNEX I

RESULTS OF THE CONSULTATION ON THE SPI QUESTIONNAIRE

INTRODUCTION

During the months of July and August 2006 a questionnaire was circulated to the focal points nominated by stakeholders as contact points for the SES mandate on surveillance performance and interoperability requirements (SPI). The scope of the questionnaire was to help focus the activities being undertaken to produce the Regulatory Approach document as well as to provide initial guidelines in the identification of the possible options that may be followed for the development of the implementing rule.

12 responses to the questionnaire were received, from: NATS (United Kingdom), DIRCAM (Mil France), HungaroControl (Hungary), ENAV (Italy), LGS (Latvia), DHMI (Turkey), LVNL (Netherlands), DFS (Germany), Bundeswehr (Mil Germany), Skyguide (Switzerland), CAA (United Kingdom), Belgian Army (Mil Belgium).

This document summarizes the received responses and presents the issues that will be further developed in the Regulatory Approach document itself. It should be noted that before its submission to the European Commission, the Regulatory Approach, including the possible options that may be followed for the development of the implementing rule will be subject to a written consultation allowing the stakeholders to present their views and opinions.

ANALYSIS OF THE RESPONSES

ASSOCIATED PROCEDURES

Question 1.1 raised the issue of the procedures associated to the Surveillance systems to be considered in the Regulatory Approach.

The received responses showed unanimous support for the EUROCONTROL proposal to exclude from the scope of the Regulatory Approach (therefore from the implementing rule) the procedures related to the use of surveillance data or the procedures supporting the Surveillance infrastructure (e.g. Mode A code allocation, licensing of transmitters, etc). The procedural aspects will be limited to these procedures required to ensure that the necessary level of performance of surveillance data is available to the end user.

PERFORMANCE REQUIREMENTS

The objective of question 2.1 was to identify the existence of capacity “bottlenecks” generated by the usage of different separation minima in neighboring states. The responses showed that within the airspace of applicability of the implementing rule (EU Member States) there are no significant capacity problems generated by the use of different separation minima.

It is considered that the reported cases of “bottlenecks” caused by different separation minima could not be addressed/solved by the implementing rule as being outside its geographic scope.

Question 2.2 raised the issue of defining in the implementing rule harmonized separation standards based on specific criteria. This proposal was widely supported by the stakeholders that responded to the questionnaire; therefore it will be retained for the development of the Regulatory Approach. However, the way to impose the separation standards (e.g. standards defined in the implementing rule or an obligation on the Member States to define them) will

be further refined and might be subject to possible options identified in the Regulatory Approach.

IDENTIFICATION OF THE BOUNDARY OF THE SURVEILLANCE SYSTEM

The objective of question 3.1 was to consult stakeholders with regard to the possibility to address in the implementing rule the mandatory carriage of airborne equipment, taking into account that among the specific issues to be addressed by the implementing rule, the SES mandate identifies the “airborne interoperability requirements”.

The received responses showed a slight preference, notably from civil stakeholders, for the inclusion in the implementing rule of requirements addressing mandatory equipage. As the responses did not indicate a clear view about this topic and taking into account the diversity of the responses concerning what equipment to be considered for mandatory carriage, it will be further analyzed in the Regulatory Approach and several options might be considered for the written consultation.

Question 3.2 addressed the inclusion in the implementing rule of provisions making mandatory the deployment of specific airport surveillance facilities/systems, based on specific criteria. The responses showed a divergence of views with regard this subject, with a slight preference for not including these provisions in the implementing rule. This subject will be further developed in the Regulatory Approach and may be subject to possible options.

Questions 3.3, 3.4 and 3.5 were related and addressing the way to consider the surveillance system within the implementing rule. The options were to consider the system as a black box, considering the end-to-end systems design in the implementing rule, supported by Community Specifications providing the technical solutions specific to the systems components, or to identify and define the performance of the system components in the implementing rule itself. The received responses showed a clear preference for the definition of the end-to-end performance of the surveillance systems in the implementing rule in a technology independent way, supported by Community Specifications providing the appropriate technical requirements specific to the components of the system.

INTEROPERABILITY REQUIREMENTS

Taking into account that the main objective of the implementing rule is to ensure the interoperability and efficiency of the surveillance systems within the EATMN, questions 4.1 to 4.4 had the scope to identify what types of interoperability requirements could be defined in the implementing rule and with what levels of details.

The analysis of the responses showed a wide support for the inclusion in the implementing rule of requirements addressing the format and the performance of surveillance data. Therefore the proposed way forward that will be further developed in the Regulatory Approach will be to prescribe in the implementing rule the use of the ASTERIX format as well as the identification of minimum performance to be included in the Service Level Agreements between the providers and the users of surveillance data, in order to supplement the ASTERIX requirements. This approach is supported by the fact that the proposal to prescribe in the rule the use of ASTERIX data format was supported by 11 of the 12 respondents, while leaving it **only** at the level of Community Specifications was not considered a viable option by 9 respondents.

The level of ASTERIX details to be made mandatory as well as the associated issues (e.g. configuration management, etc) will be addressed during the development of the Regulatory Approach and may be subject to several options presented in the document.

RATIONALIZATION OF SURVEILLANCE INFRASTRUCTURE

The objective of question 5.1 was to evaluate the option of mandating requirements addressing the global rationalization of surveillance infrastructure, in order to reduce the number of active sensors. As there was not possible to draw a clear conclusion following the responses, the subject will be further explored in the Regulatory Approach for a possible inclusion in one of the proposed options.

RF SPECTRUM EFFICIENCY

The questions 6.1 and 6.2 were addressing the RF interference generated by surveillance systems located in neighboring countries and at a higher level, the possible inclusion in the implementing rule of measures dealing with the improved management of RF spectrum. While the responses to the questionnaire acknowledged the potential benefits of frequency planning and protection, it was considered that the issue is much broader than the surveillance spectrum therefore it would exceed the scope of this implementing rule. It should also be noted that the issue of Mode S interrogator code allocation raised by some of the respondents is the subject of another SES interoperability mandate for which the Regulatory Approach is currently under development.

ASSESSMENT OF THE SYSTEM PERFORMANCE

All the responses supported the proposal to define in the implementing rule a set of minimum requirements relative to the methods used to assess the overall performance of the surveillance system. Therefore this proposal will be retained for further development and inclusion as an option in the regulatory approach. The intention is to provide the high level principles in the implementing rule, leaving the details of the processes/tools at the level of Community Specifications.

WIND TURBINES

The objective of question 8.1 was to consult the stakeholders about the opportunity to address the deployment of wind turbines in the implementing rule, through a set of high level requirements, supported by Community Specifications. The responses showed that while the issue of wind turbines is acknowledged as a real problem, it impacts a wider scope than surveillance for aviation (e.g. maritime radars). The matter will be addressed in the Regulatory Approach with the recommendation for further action, probably in a wider context than the one of the SPI implementing rule.