

# INTERNATIONAL CIVIL AVIATION ORGANIZATION



## EUROPEAN SECONDARY SURVEILLANCE RADAR (SSR) CODE MANAGEMENT PLAN

*- First Edition -*

**2010**

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**RECORD OF AMENDMENTS**

<b>Amendment</b>	<b>Description</b>	<b>Effective</b>
1	<p>Amendment 1 reflects amendments to the ICAO EUR Air Navigation Plan (Doc 7754), Volume II, Facilities and Services Implementation Document (FASID) – Serial Numbers: EUR/NAT-F 10/34-CNS (06 December 2010) &amp; EUR/NAT-F 12/02-CNS (10 January 2012), the publication of version 3.6 of the Code Allocation List (CAL) for the ICAO EUR Region and the publication of <i>ICAO European Principles and Procedures for SSR Mode S Interrogator Codes (IC) Allocation</i> (EUR Doc 024). Detailed changes are:</p> <ul style="list-style-type: none"> <li>a) Update references to the EUR FASID (1.1.2);</li> <li>b) Include reference to EUR Doc 024 (1.1.4);</li> <li>c) Incorporate the CAL version 3.6 as an Attachment to EUR Doc 023 (2.1, 2.2, 3.1.4, 3.1.5, 7.3.1, 7.4.1, 7.4.2, B.2.4); and</li> <li>d) Editorial corrections and updates</li> </ul>	<i>15 March 2012</i>

## 1 SCOPE

### 1.1 RELATIONSHIP TO EUR AIR NAVIGATION PLAN (DOC 7754)

- 1.1.1 The *European Secondary Surveillance Radar Code Management Plan* (EUR Doc 023) has been produced on behalf of the European Air Navigation Planning Group (EANPG).
- 1.1.2 The purpose of EUR Doc 023 is to detail the requirements to be met by the States of the ICAO European (EUR) Region to comply with the provisions of the *European Basic Air Navigation Plan* (EUR ANP) (Doc 7745, Volume I) and the *European Facilities and Services Implementation Document* (EUR FASID) (Doc 7754, Volume II) as they pertain the management of Secondary Surveillance Radar (SSR) codes in the ICAO EUR Region.
- 1.1.3 The technical requirements and associated procedures may also be adopted by States in adjoining ICAO Regions which elect to participate in the Originating Region Code Assignment Methodology (ORCAM) or enhanced ORCAM (eORCAM) for the management of SSR codes.

All references to SSR Codes in EUR Doc 023 are confined to Mode 3/A. The use and allocation of Mode S Interrogator Codes is covered by *ICAO European Principles and Procedures for SSR Mode S Interrogator Codes (IC) Allocation* (EUR Doc 024).

## 2 DEFINITIONS AND ABBREVIATIONS

### 2.1 DEFINITIONS

Assigned Secondary Surveillance Radar code (ASSR)	The SSR code assigned by the ATSU to a departing aircraft or to an aircraft entering the airspace of the ATSU. <i>Note: In cases where the PSSR can be retained, PSSR and ASSR can be the same code</i>
(SSR) Code	The number assigned to a particular multiple pulse reply signal transmitted by a transponder in Mode A or Mode C.
Code allocation	The distribution of SSR Codes to State, unit or service.
Code assignment	The distribution of SSR codes to aircraft.
Code block	A continuous series of four-digit codes from the same code series.
Code series	A group of 64 four-digit codes having the same first two digits.
Direction of flight	The direction shall be defined as a combination of one or more: a) exit points or receiving AORs; and b) destinations (defined by the first, the first two, the first three or all four letters of an ICAO location indicator).
Directional assignment	Assignment of an SSR code based on the direction of the flight.
Discrete code	A four-digit code with the last two digits not being “00”.
Expectation window	A window of variable size around a 4D position, defined by flight plan information, at which a flight is expected to enter the AOR.
Four-digit code	An SSR identity code containing combinations of A, B, C and D pulses (any reply generated by a 4096-code transponder where the digits fall in the range 0-7).
Geographical correlation	Correlation of a flight with its flight plan using the geographical position of the flight by means of Expectation Windows in cases where the SSR code is already in use by one or more other flights within the same AOR.
Local code	A code allocated to a specific Area of Responsibility (AOR) for use by designated ATC unit(s) within that AOR or, subject to certain conditions, across AOR boundaries.
Mode S Conspicuity Code	In order to maximise SSR code savings through Mode S Elementary Surveillance (ELS), all aircraft identified via the downlinked ACID use the same SSR code, the Mode S Conspicuity Code A1000.
Octal block	A block of 8 four-digit codes from the Same Series and having the first three digits common. They may be identified by indicating their third digit when referring to the Code Series e.g. Codes 0010-0017 may be referred to as Codes 00(1).
Participating area (PA)	An area of specified dimensions comprising the areas of ATS unit responsibility of one or more States.
Previous Secondary Surveillance Radar code (PSSR)	The SSR code transmitted by an aircraft when entering the airspace of an ATSU or when being transferred by the transferring unit. <i>Note: In cases where the PSSR can be retained, PSSR and ASSR can be the same code.</i>

Simultaneous use	code	Assignment of an SSR code, which is already in use within the same AOR, to an aircraft in accordance with procedures which ensure that the two aircraft will be exiting the AOR in opposite or nearly opposite directions.
Retention of an SSR code		Accepting an aircraft from the transferring unit without changing the SSR code. A code can be retained if no other aircraft within the AOR uses the same code and if the retention of the code is in accordance with the CAL (Attachment to EUR Doc 023).
Transit code		A code allocated to a State for a specified ACC for assignment to an aircraft engaged in transit flights within the originating PA or, subject to certain conditions, to specified locations in succeeding PAs.

## 2.2 ABBREVIATIONS

ABI	Advance Boundary Information
ACID	Aircraft Identification
ADEP	Aerodrome of Departure
ADES	Aerodrome of Destination
AOR	Area of Responsibility
ASSR	Assigned Secondary Surveillance Radar code
ATC	Air Traffic Control
ATS	Air Traffic Services
ATSU	Air Traffic Services Unit
CAL	Code Allocation List for the ICAO European Region (Attachment to EUR Doc 023)
COD	SSR Code Assignment Message
EANPG	European Air Navigation Planning Group
ELS	Elementary Surveillance
eORCAM	enhanced Originating Region Code Assignment Method
FDPS	Flight Data Processing System
FIR	Flight Information Region
NM	Nautical Mile
ORCAM	Originating Region Code Assignment Method
PA	Participating Area
PAC	Preliminary Activation Message
PSSR	Previous Secondary Surveillance Radar code
RDPS	Radar Data Processing System
SSR	Secondary Surveillance Radar

### 3 INTRODUCTION

#### 3.1 OBJECTIVES OF THE EUROPEAN SSR CODE MANAGEMENT PLAN

- 3.1.1 The European SSR Code Management Plan has been established to provide States in the ICAO EUR Region with a means to coordinate the use of the SSR codes based on the principles of the Originating Region Code Assignment Method (ORCAM) and enhanced ORCAM (eORCAM), which provide for the most efficient and economical use of codes.
- 3.1.2 The European SSR Code Management Plan will foster the implementation of ORCAM and eORCAM which will ultimately allow for an assigned discrete code which would, whenever possible, be retained throughout the flight.
- 3.1.3 For the development of automated SSR code assignment systems, reference should be made to Chapter 6.
- 3.1.4 On the basis of the above, a detailed Code Allocation List for the ICAO EUR Region (CAL) for defined participating areas (PAs) covering the ICAO EUR region and certain adjacent areas was developed. The CAL is maintained by the SSR Code Secretariat and produced by the EUR/NAT Office of ICAO as an Attachment to EUR Doc 023.
- 3.1.5 The agreed allocation of SSR codes to States and ATS units are documented in the CAL. Also included is a detailed listing of codes serving both transit and local purposes.

#### 3.2 GENERAL PRINCIPLES TO MEET THE OBJECTIVES

- 3.2.1 The detailed principles governing the use of SSR codes in the EUR Region are based on the following general principles which are provided by or are complementary to the worldwide provisions detailed in *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444), Chapter 8:
- a) codes shall be allocated to States in accordance with regional air navigation agreements, taking into account overlapping radar coverage over adjacent airspace;
  - b) codes are allocated to Air Traffic Services Units (ATSU) on the basis of duly justified operational requirements; their number is primarily established by taking into account the number of aircraft to be handled simultaneously and the system capabilities;
  - c) the appropriate ATS authority shall establish a plan and procedures for the allocation of codes to ATSUs;
  - d) the plan and procedures for the allocation of codes to ATSUs shall be compatible with those practised in adjacent States;
  - e) codes shall be assigned to aircraft in accordance with the plan and procedures laid down by the appropriate ATS authority;
  - f) whenever there is a need for individual aircraft identification, each aircraft shall be assigned a discrete code which should, whenever possible, be retained throughout the flight;
  - g) unless eORCAM had been implemented, the assignment of a code should preclude the use of this code for any other function within the area of coverage of the same SSR for a prescribed time period; and
  - h) to reduce pilot/controller workload and the need for communications, the number of code changes required shall be kept to the minimum.
- 3.2.2 SSR codes should be used for ATS purposes only.



- 3.2.3 Code allocations are expressed in terms of complete code series or specified parts thereof. In special cases, such requirements may even cover designated discrete codes.
- 3.2.4 Codes intended to be used for transit purposes are allocated to States for use by specified ATSUs within the PA in which the originating unit is located. Where provided for in the European SSR Code Management Plan and under clearly defined circumstances, such codes may also be designated for use across PA boundaries.
- 3.2.5 Codes intended to be used for local purposes are allocated to States for use by specified ATSUs requiring limited geographical protection for such codes. Where provided for in the European SSR Code Management Plan and under clearly defined circumstances, such codes may also be designated for use across national boundaries.
- 3.2.6 With the exception of codes designated for use for transit purposes in more than one PA and provided that adequate safeguards are observed, transit codes may be used for local purposes by States outside the PAs in which such codes are used in their primary function. However, if conflicts in code use arise because of this, the allocation for transit purposes shall take precedence over that made for local purposes.

### **3.3 MONITORING OF THE PLAN**

- 3.3.1 Provisions regarding the progressive implementation and monitoring of the European SSR Code Management Plan have been agreed by the EANPG. In this connection, the management of the European SSR Code Management Plan is exercised by EUROCONTROL in close coordination with the EUR/NAT Office of ICAO. States expecting to introduce or change SSR facilities are requested to advise the EUR/NAT Office of ICAO at least six months in advance, in order to permit timely accomplishment of any necessary coordination.
- 3.3.2 To be effective, the European SSR Code Management Plan must be kept up to date. While its contents will be reviewed regularly, it is the responsibility of all States to inform the EUR/NAT Office of ICAO and the SSR Code Secretariat promptly of any variations proposed or considered necessary with respect to their code allocations, relevant ATS infrastructure development and/or the guidance material provided in the European SSR Code Management Plan.
- 3.3.3 In order to serve their purposes it is imperative that the European SSR Code Management Plan and the CAL are kept up to date. States are therefore required to inform the EUR/NAT Office of ICAO promptly of any requests for changes, additions or deletions in regard to the use of specific codes, as follows:

#### **EUR/NAT Office of ICAO**

Subject: SSR Code Management

E-mail:

icaoearnat@paris.icao.int

Fax:

+33 1 46 41 85 00

## **4 PERMANENT CODE DISTRIBUTION AND CATEGORIES**

### **4.1 DISTRIBUTION OF CODES**

- 4.1.1 Certain codes are reserved for special purposes on a worldwide scale. The remaining code series for use in the ICAO EUR Region are, in the European SSR Code Management Plan, divided into two distinct types: transit codes and local codes. Both local and transit codes may be used as directionally assigned codes beyond their normal application under clearly defined and published circumstances, and appropriately coordinated through ORCAM and eORCAM working arrangements.
- 4.1.2 For States which elect to manage their SSR codes using ORCAM, the number of codes used for transit purposes has to be relatively high, due to the extended geographical protection required, in order to reduce to a minimum the chances of confusion between the identity of two different aircraft assigned with the same discrete code, particularly where such codes are designated for use across PA boundaries.
- 4.1.3 As the number of available codes does not allow a complete allocation of code series unique to each PA within the EUR region, certain code series have to be shared among two or more PAs. In each of the PAs, such shared codes will be assigned by ATSUs that offer the least probability of code duplications in the border areas.
- 4.1.4 The number of codes used for local purposes can be kept relatively small, as these may be repeated within the same State in some cases, in different States or, by agreement, used across national boundaries. Subject to the general provisions of 18 above and the provisions of the European SSR Code Management Plan, the stock of local codes may be augmented by the use of appropriate transit codes.
- 4.1.5 Furthermore, the allocation possibilities can be increased significantly by dividing specific code series into smaller contiguous codes. When this method is used for transit flights bilateral agreement may be required.

### **4.2 SPECIAL PURPOSE CODES**

- 4.2.1 Specific codes in certain series are reserved for special purposes as follows:

Series 00	Code 0000 is available as a general purpose code for local use by any State.
Series 10	Code 1000 reserved for use as a conspicuity code for Mode S
Series 20	Code 2000 shall be used by flight crews in the absence of any Air Traffic Control (ATC) instructions or regional agreements unless the conditions for the use of codes: 7000,7500, 7600 and 7700 apply.
Series 70	Code 7000 shall be used by flight crews not receiving ATS service in order to improve detection of suitably equipped aircraft in areas specified by States, unless otherwise instructed by ATS.
Series 75	Code 7500 is reserved for use in the event of unlawful interference.
Series 76	Code 7600 is reserved for use in the event of radio communications failure.
Series 77	Code 7700 is reserved for use in the event of emergencies and interception. Code 7776 and Code 7777 are reserved for SSR ground transponder monitoring.

- 4.2.2 Discrete codes in the series 00 are allocated to States for use for local purposes. States in the EUR Region are generally allocated two octal blocks of four-digit codes per State in such a manner that code duplication is avoided at FIR boundaries. The allocation of octal blocks is shown in the CAL.

*Note 1.— Due to its size, allocation in the Russian Federation is made on an FIR basis.*

*Note 2.— The word “interception” in this context does not include intercept and escort service provided, on request, to an aircraft in distress, in accordance with Volumes II and III of the International Aeronautical and Maritime Search and Rescue Manual (Doc 9731).*

### 4.3 TRANSIT CODES

- 4.3.1 Transit codes are allocated for assignment to transit flights. Aircraft will retain the assigned code within the geographical limits of the relevant PA or, in the case of the agreement between States concerned, across PA boundaries.
- 4.3.2 The allocation of transit codes in the EUR Region is based on ten PAs which have been determined on the basis of the flow of air traffic in the region. They are shown on the Charts at Appendix A as follows:

PA EUR-A	Algeria, Portugal (Lisboa and Santa Maria FIRs), Spain (Canarias and Madrid FIR/UIRs), Morocco.
PA EUR-B	Belgium, France, Germany, Ireland, Luxembourg, The Netherlands, Spain (Barcelona FIR/UIR), Switzerland, United Kingdom.
PA EUR-C	Denmark, Estonia, Finland, Latvia, Norway, Sweden.
PA EUR-D	Albania, Austria, Bosnia and Herzegovina, Croatia, Cyprus, Greece, Italy, Malta, Serbia and Montenegro, Slovenia, The former Yugoslav Republic of Macedonia, Tunisia, Turkey.
PA EUR-E	Belarus, Bulgaria, the Czech Republic, Hungary, Lithuania, Poland, Republic of Moldova, Romania, Russian Federation (Kaliningrad only), Slovakia, Ukraine.
PA EUR-F	Armenia, Azerbaijan, Georgia, and the following FIRs of the Russian Federation: Amderma, Arkhangelsk, Astrakhan, Chelyabinsk, Kazan, Kirov, Kotlas, Kurgan, Moskva, Murmansk, Orenburg, Pechora, Penza, Perm, Pertrozavodsk, Rostov-na-Donu, Samara, Sankt Petersburg, Syktyvkar, Ufa, Velikiye Luki, Vologda, Volgograd, Vorkuta and Yekaterinburg.
PA EUR-G	The following FIRs of the Russian Federation: Barnaul, Beryozovo, Dikson, Kamenny Mys, Khatanga, Khanty-Mansyisk, Kolpashevo, Krasnoyarsk, Norilsk, Novosibirsk, Omsk, Salekhard, Surgut, Tarko-Sale, Turukhansk, Tyumen, and Yeniseysk.
PA EUR-H	Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.
PA EUR-I	The following FIRs of the Russian Federation: Batagay, Bratsk, Cherskiy, Chita, Chokurdakh, Chulman, Irkutsk, Kirensk, Magdadachi, Mirny, Tiksi, Yakutsk, Zhigansk, Zyryanka.

PA EUR-J      The following FIRs of the Russian Federation: Anadyr, Blagovetshensk, Chaybukha, Khabarovsk, Magadan, Mys Schmidt, Nicolaevsk-na-Amure, Okha, Okhotsk, Petropavlovsk-Kamchatsky, Pevek, Seymchan, Tilichiki, Vladivostok, Yuzhno-Sakhalinsk.

4.3.3 Transit codes shall be assigned in accordance with the following principles:

- a) when an aircraft enters a PA (either on departure or in flight), it will be assigned a discrete code by the first ATSU concerned in that PA;
- b) each aircraft will keep the original code assigned on entering the PA for the entire flight within that PA at least. Appropriate code protection criteria have to be applied in order to avoid duplication by too early reassignment of the same code. Efforts should be made to reduce the “protection period” while retaining adequate protection; and
- c) a code change is required at the time an aircraft crosses a PA boundary unless special provision has been made for retention beyond the PA boundary.

4.3.4 In establishing the number and series of transit codes for both omni-directional and directional application, account is taken of the following factors:

- a) the air traffic flows and main sources of transit traffic in the EUR Region and likely trends;
- b) the requirement for code series for a given ATC Unit. This requirement is derived from the total number of aircraft requiring assignment of a specific code during the busiest period of activity of that ATC Unit, taking into account a “protection period” after which any specific code assigned to an aircraft by an ATC Unit is normally available for reuse; and
- c) the assignment of a specific code to an aircraft; assignment is made, ideally, as late as possible before take-off, or when an aircraft in flight is imminently due to come under control.

4.3.5 The distribution of the available code series for transit purposes to the different PAs is shown in the CAL.

4.3.6 Specific arrangements are required to ensure that no inordinate conflicting situation will arise in border areas when using codes in such series.

#### **4.4 LOCAL CODES**

4.4.1 Local codes are allocated for use by aircraft remaining within the boundaries of the agreed area of responsibility (AOR) (normally within one State) or, in the case of agreement between States concerned, across agreed AORs. The relevant code series for local purposes are shown in the CAL.

4.4.2 Local codes should be used so that utmost economy in the number of codes required is achieved. In order to facilitate required international coordination of the use of local codes in border areas, the following guidelines are provided:

- a) codes employed for transit purposes in a PA may be used for local purposes in States of other PAs subject to suitable systematic or procedural safeguards to ensure there is no interference with the transit use of those codes in adjacent PAs; based on appropriate agreements between the ATC Units affected, and after coordination through the appropriate body, exceptions to this rule may be made; and

- b) local codes used for terminal purposes or within specified portions of the airspace (sectors) or across national boundaries will be assured protection in these functions from other uses of the same code through suitable systematic or procedural methods.

## 5 ORCAM

### 5.1 OUTLINE OF ORCAM OBJECTIVES

5.1.1 The objectives of ORCAM are:

- a) to ensure safety by uniqueness and continuity;
- b) enhance safety;
- c) reduce workload;
- d) improve system capacity; and
- e) increase efficiency.

5.1.2 Uniqueness and continuity criteria are intended to provide permanent perceptibility and identification of aircraft with a minimum of errors and interruptions.

5.1.3 *Uniqueness.* Depending on system functionality, only one aircraft should respond on a given code in any particular area and at any given time. This provides an unambiguous code/callsign correlation and consequently an easy identification of aircraft.

5.1.4 *Continuity.* A code assigned to an aircraft should, whenever possible, be retained throughout the flight. This secures permanent display of aircraft identification.

5.1.5 The uniqueness and continuity criteria of ORCAM enhance safety by limiting the likelihood of identification errors. They also assist traffic flow since radar identification and all aspects connected with transfers are facilitated. This results in a reduction of workload (radiotelephony, identification monitoring, etc.) and substantially improves the overall system capacity.

5.1.6 In some areas the number of flights greatly exceeds the number of SSR codes available. Some rationalization according to the nature of the flight (short-, medium- or long-haul, domestic, international or transit) and of the capabilities of the system is necessary for the most intensive possible use of the codes.

5.1.7 Permanent code assignments and allocations based on the aircraft callsign, control position or any other systematic distinguishing features cannot be accepted because of the wasteful effects on the efficiency in use of codes required.

## 6 ORCAM SYSTEM REQUIREMENTS

### 6.1 INTRODUCTION

- 6.1.1 European States are relying on the extensive use of SSR in automated ATC ground systems to ensure uninterrupted aircraft identification and maintenance of radar/flight plan correlation.
- 6.1.2 They have recognized the common availability of specified capabilities in automated ATC ground systems as being essential for:
- a) participation of individual automated ATC units in a cooperative environment;
  - b) application of a common SSR Code assignment method in accordance with the ICAO principles;
  - c) efficient utilization of codes in automated ATC ground systems.
- 6.1.3 This “Statement of essential common capabilities for automated ATC ground systems in relation to the use of SSR”, lists the capabilities concerned. It is intended to become a common part of the basis for minimum operational specifications for automated ground systems.

### 6.2 GENERAL SYSTEM CONSIDERATIONS

- 6.2.1 The application of automatic data processing in ATC ground systems allows for great freedom in the definition of system capabilities. This freedom should be exploited to:
- a) provide for all essential capabilities related to the use of SSR in the most simple manner having due regard to operational requirements; and
  - b) enable individual automated ATC ground systems to function as part of a cooperative environment and to comply with agreed conventions facilitating such cooperation (e.g. principles and basic rules for code assignment, code assignment methods etc.).
- 6.2.2 Individual automated ATC ground systems should, as part of a cooperative environment, be capable of making the maximum use of codes previously assigned by other units controlling the aircraft concerned; i.e. they should not introduce any code changes or if this is impossible in some circumstances, require only the minimum of changes.
- 6.2.3 Taking into account a possible cooperation of ATC ground systems within the European Region with others outside that area and the range of codes which may be utilized under such arrangements, automated ATC ground systems should be capable of performing all system functions related to the use of SSR for any 4-digit identity code.
- 6.2.4 Automated ATC ground systems should be designed to allow the use of a minimum number of codes. The application of sophisticated code correlation methods may reduce the number of codes needed in comparison with those required when simpler methods are used.
- 6.2.5 The processing of SSR data in automated ATC ground systems should be aimed at reducing the need for controller intervention.

### 6.3 ESSENTIAL CAPABILITIES FOR AUTOMATED ATC GROUND SYSTEMS

6.3.1 It is essential that automated ATC ground systems be designed to have certain capabilities in common, based on the assumption that:

- a) the maximum use will be made of previously assigned codes;
- b) only where continuing use of previously assigned codes would give rise to ambiguity, new codes will be assigned in accordance with a suitable common SSR code assignment method;
- c) the prime use of codes will be to facilitate automatic identification, automatic tracking and automatic radar/flight plan data correlation; and
- d) the differentiation of aircraft essential for the execution of these functions can be achieved through the use of a single, adequately protected code per aircraft.

6.3.2 In detail, automated ATC ground systems should be capable of automatic:

- a) **Exchange of codes:** in particular of timely transmission to adjacent centres concerned of information on the code previously assigned to flights to be transferred.
- b) **Assignment of codes:** in all instances where no previous code assignment has been made or where previous assignments are found to be unsuitable.
- c) **Processing of SSR code information, including:**
  - i) initiation of automatic tracking of SSR responses;  
*Note.— This does not exclude tracking on the basis of primary radar returns in areas where adequate primary coverage is available;*
  - ii) determination for each code whether it meets the criteria to be established for unambiguous correlation;
  - iii) recognition of any code duplications affecting correlation;
  - iv) proposing action by controllers to resolve code duplications affecting correlation;
  - v) establishment of initial correlation between real-time radar information and current flight plan information on the basis of decoded SSR replies (including Mode C information). Correlation should be achieved sufficiently in advance of the time at which an aircraft enters the area of responsibility of a centre;
  - vi) maintenance of correlation between real-time radar information and current flight plan information on the basis of decoded SSR replies and/or coincidence of flight plan information (route, heading, altitude) or other distinguishing criteria and radar information;
  - vii) storage of code information until a time at which its activation and protection is desired; and
  - viii) activation of stored information for correlation at a given time and/or within a given airspace.



- d) **Display of information including:**
  - i) presentation in a suitable manner of decoded SSR replies and/or correlated flight plan information;
  - ii) filtering of information to be displayed on the basis of SSR-derived data (Mode A/C);
  - iii) indication of code duplications.
- e) **Special codes:** immediate recognition of special codes, as specified on a regional or world-wide basis, as well as maintenance of tracking and correlation of aircraft using these codes.
- f) **Recovery from ground system degradation:** in cases of ground system degradation (excluding display component failure) to the extent that essential SSR-derived information is not displayed, automated ATC ground systems should be capable of restoring all essential information within the shortest possible time. Until full serviceability can be restored, the above aim may necessitate suppression of functions of secondary importance.

## **7 eORCAM FUNCTIONAL REQUIREMENTS FOR FDPS AND RDPS**

### **7.1 APPLICATION**

- 7.1.1 These functional requirements are applicable to States intending to implement eORCAM as a means to improve the efficiency of their SSR code management. eORCAM functional requirements are a supplement to ORCAM functional requirements and have to be implemented in addition to ORCAM functional requirements as described in Chapter 6.

### **7.2 GENERAL**

- 7.2.1 The system shall be capable of classifying available SSR codes into different pools (categories) in order to allow differentiated code assignment.
- 7.2.2 The system shall be capable of defining conflict-free directions of flights for code assignment or code retention.

### **7.3 CODE ASSIGNMENT**

- 7.3.1 The system shall automatically assign an SSR code to each departure within its AOR in compliance with the CAL.
- 7.3.2 The system shall be capable of assigning specific codes (codes from specific categories; paragraph 7.2.1 refers) into specific directions of flights (directional assignment).
- 7.3.3 After a track has been established for a departing flight, the system shall be capable of assigning the same code for the next departure exiting into a conflict free direction (paragraph 7.2.2 refers), maintaining correlation on the established track (simultaneous code use) for the first flight.
- 7.3.4 After a track has been established for a departing flight, the system shall be capable of assigning the same code for the next departure exiting into a conflict free direction (paragraph 7.2.2 refers), maintaining correlation on the established track (simultaneous code use) for the first flight.

### **7.4 CODE RETENTION**

- 7.4.1 The system shall check whether the retention of an SSR code is in compliance with the CAL and whether the code to be retained is not in use by another aircraft. Where this is not the case, the system shall assign a code in accordance with 7.3.
- 7.4.2 If a code change is required due to non-compliance with the CAL, the system should correlate on both the PSSR and the ASSR.
- 7.4.3 If a code change is required due to the code being in use by another aircraft, the system should correlate on both, the PSSR and the ASSR. Correct correlation on the occupied PSSR should be established using the track of the aircraft and a four-dimensional (4D) expectation window for geographical correlation.

### **7.5 INTERACTION WITH NEIGHBOURING UNITS**

- 7.5.1 If no code is available for assignment, the system shall send an ABI or PAC message to the next receiving unit requesting an SSR code.

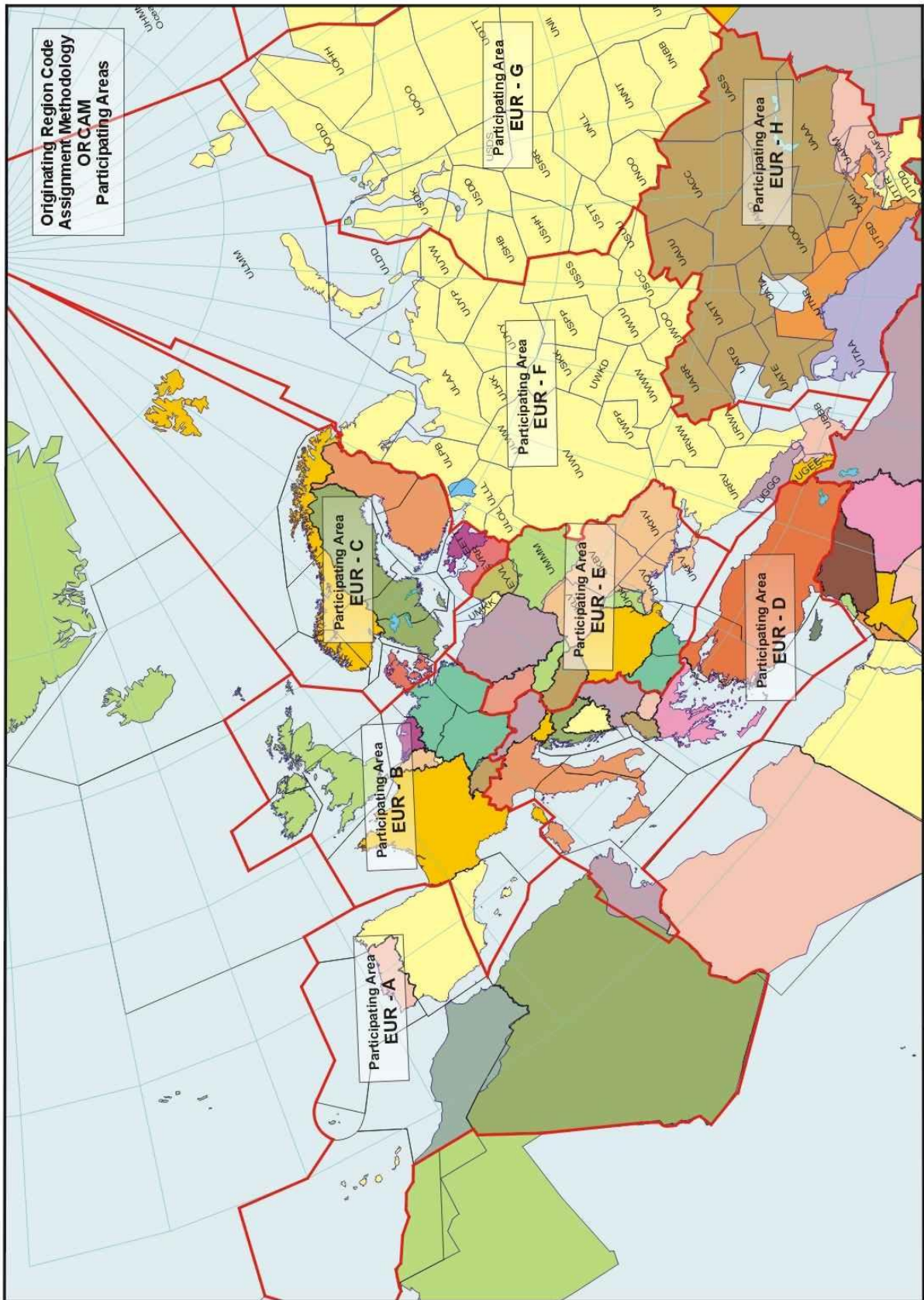
7.5.2 If the system receives an ABI or PAC message from a transferring unit requesting a code, it shall respond with a COD message, including an SSR code from its own respective code pool in accordance with 7.3.

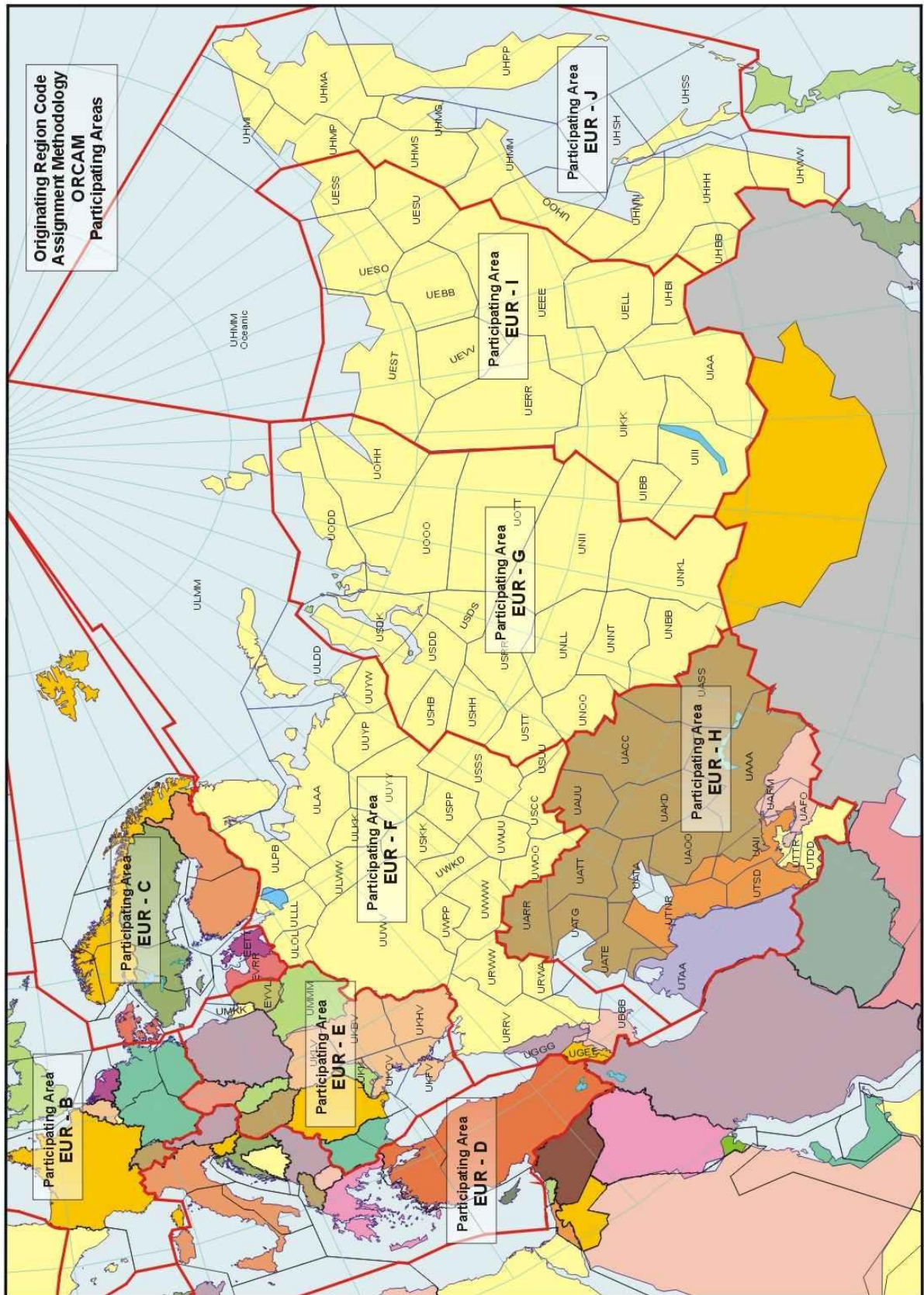
## 7.6 GENERATION OF REPORTS

7.6.1 The system shall record the following data concerning SSR code management:

- date of event
- time of event
- departure or entry (event)
- ACID
- ADEP
- ADES
- entry point or FIR
- exit point or FIR
- PSSR (if applicable)
- ASSR
- reason for code change (code already in use or code not compliant with the CAL (paragraph 7.4.1 refers))
- code pool used for assignment and code change (if applicable)  
*Note: if the ASSR was requested from and provided by the next receiving unit (paragraph 7.5 refers), the entry in "code pool used" should reflect this accordingly.*
- Minimum amount of SSR codes available for assignment per code pool and per day (at peak moment of code assignments)

APPENDIX A - PARTICIPATING AREAS





**APPENDIX B - GENERAL PROCEDURES FOR SSR CODE ASSIGNMENT****B.1 Retention of previous code**

- B.1.1 Every endeavour shall be made to retain the code already assigned to the aircraft. This assumes that the code is known at the time of coordination (either by voice coordination or by transmission of an On-Line Data-Interchange (OLDI) message, or via the pilot) and input into the system if automated. If a code is not already being used by another aircraft flying in an unprotected area and if the code assigned to the aircraft is acceptable for the flight category\*, the code shall be retained.

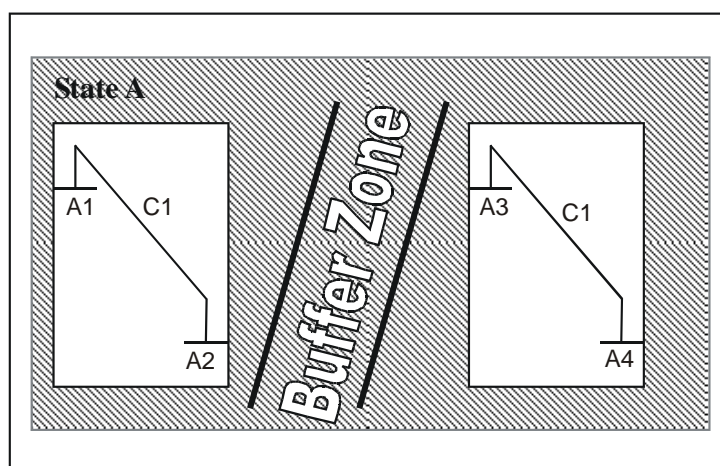
*Note.— This should apply if the aircraft comes from an ATSU belonging to the same PA or a unit in another PA, but it may be retained in an area which has no conflicts with the other units in the area.*

**B.2 Code assignment or re-assignment**

- B.2.1 The following rules will be applied to departing aircraft within the area of the control unit, or to aircraft whose previously assigned code failed to comply with the rules stated in B.1.1 above and consequently could not be retained:

**B.2.2 Where an aircraft remains inside a defined area of the AOR**

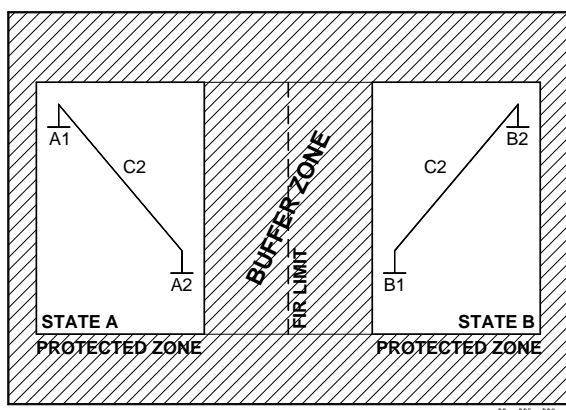
Directional assignment of a local code - Code C1 can be assigned simultaneously to aircraft A1A2 and A3A4. C1 is protected for zone 1 and zone 2:



*Note.— Local code allocation may be protected by buffer zones of at least 60 NM or separated by another unit. This rule is applicable within States, and also by arrangement between adjacent States. In order to make economic use of this type of allocation the same codes should preferably be disseminated (at most every 120 NM) in different small areas instead of having recourse to allocating codes belonging to an excessive number of different series.*

### B.2.3 Where an aircraft remains inside a State

Code C2 can be assigned simultaneously to aircraft A1A2 and B1B2 from different States A and B. C2 is protected for State A and State B:

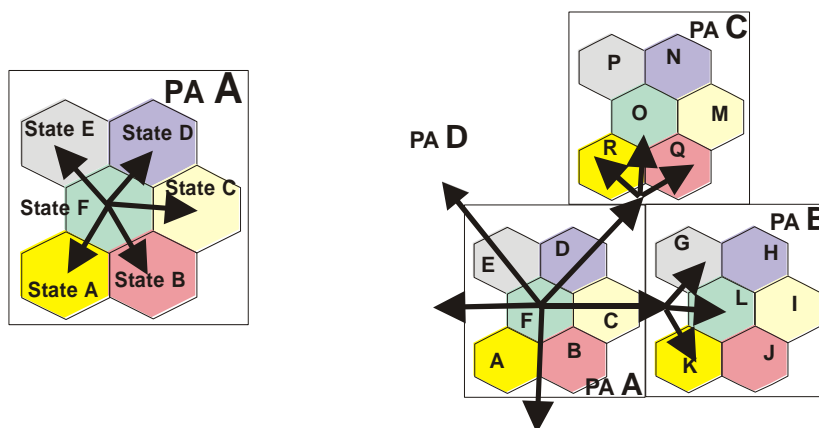


*Note.— Local code allocation must be protected by buffer zones. Even more than in the case of B.2.2 above; consultation between adjacent States will be necessary to ensure such protection and rationalize excessive domestic code utilization as far as possible.*

### B.2.4 For an aircraft leaving a State

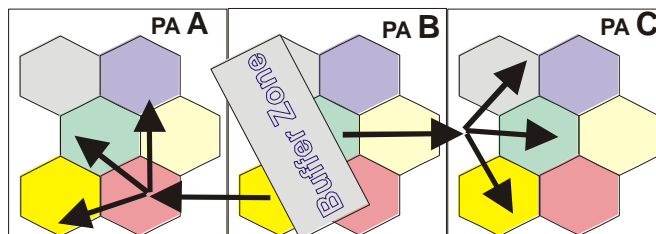
Transit codes are allocated by the European SSR Code Management Plan to the various States for assignment to this flight category. Transit codes should be retained for the remainder of the flight in all States in the same PA and, if possible, other successive PAs, as agreed and reflected in the CAL. Transit codes received from a previous unit are maintained provided that they satisfy the assignment criteria.

#### B.2.4.1 *Omni-directional assignment of a transit code*



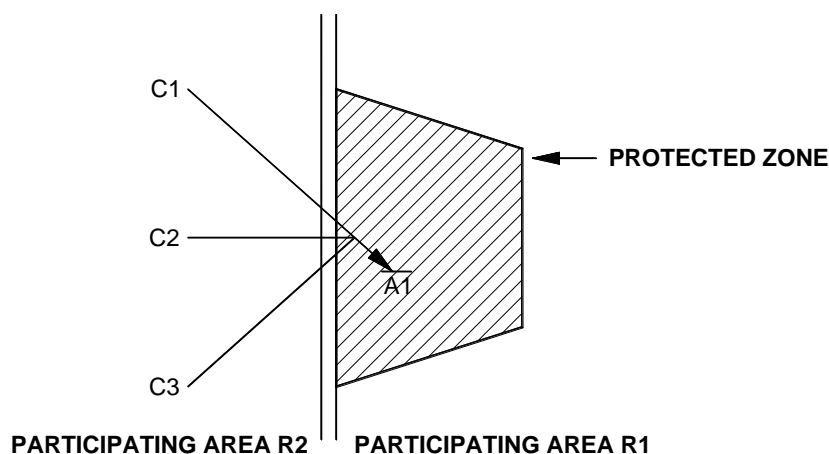
#### B.2.4.2 Directional assignment of a transit code

Allocated by the European SSR Code Management Plan to the various States for assignment to aircraft under specific conditions: to specific destinations in the same PA or in different PAs; to specific directions of aircraft and/or via specific areas. Special attention shall be given in ensuring that when applying directional assignment of a transit code, no code conflict could occur.



#### B.2.4.3 Close to PA border, retention of transit codes of other PA

Codes C1, C2 and C3, which belong to R2 transit series are retained until landing at an airport A1 near the border between the two PAs, which is located in a protection area for the codes in question.



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### B.3 Code occupancy times

B.3.1 In order to ensure uniqueness of the code in the systems concerned by an aircraft, the SSR Code Secretariat based its calculations on a “protection period” of approximately two hours, when establishing the number and series of transit codes (please see paragraph 4.3.4). At the same time, the protection period should be reduced when possible, while providing adequate protection (please see paragraph 4.3. 3. b). Certain suggestions along these lines will be found below.

B.3.2 Point of time for code assignment to aircraft



In order to economize codes as much as possible, it is recommended that codes be assigned to flights which will be performed in the very near future (when ready for departure, or in flight, about to come under control).

*Note.— The ideal moment is the flight activation point in the case of automated systems.*

### B.3.3 Assignment procedures

Codes may be assigned according to the earliest time of release. However, in units assigning codes manually such sophistication may be cumbersome. When sophisticated system are not available, cyclical assignment of the codes released should be preferred instead of a systematic return to the beginning of the category.

### B.3.4 Release of code by an aircraft

When a system records an aircraft landing or passing a distant exit point, the code assigned to the aircraft may be regarded as released and be re-used (after an additional waiting time of approximately thirty minutes has elapsed in the second case). In the event of a flight to which a code has been assigned not taking place, the code assigned should be released for immediate re-use.

### B.3.5 Saturation

When the traffic load is such that no code is available for a given flight category it may be necessary to assign codes in accordance with relaxed rules:

- a) reduced protection times -  
(see B.3.4);
- b) upgrading to a higher-quality code category -  
using an omni-directional assignment if no more codes for directional assignment  
*Note.— The quality of the category shall not be diminished, i.e. a local code assignment to a transit flight.*
- c) use of approved saturation code in category -  
for example, use of the last digit AB77 for an aircraft in a category to which series AB is dedicated

## APPENDIX C - IMPLICATIONS FOR AUTOMATION

C.1 As stated in Appendix B, B.1.1, retention of the code assigned by the previous unit requires foreknowledge, implying capture of the data by the system in the event of automated assignment (direct capture by an OLDI message, or indirect by manual input on coordination).

C.2 Assignment according to flight category implies that the system is capable of analysing the origin and destination of flights. If not, capture of units transferring and accepting, where applicable, may be used. For some cases one may need to process all four data items.

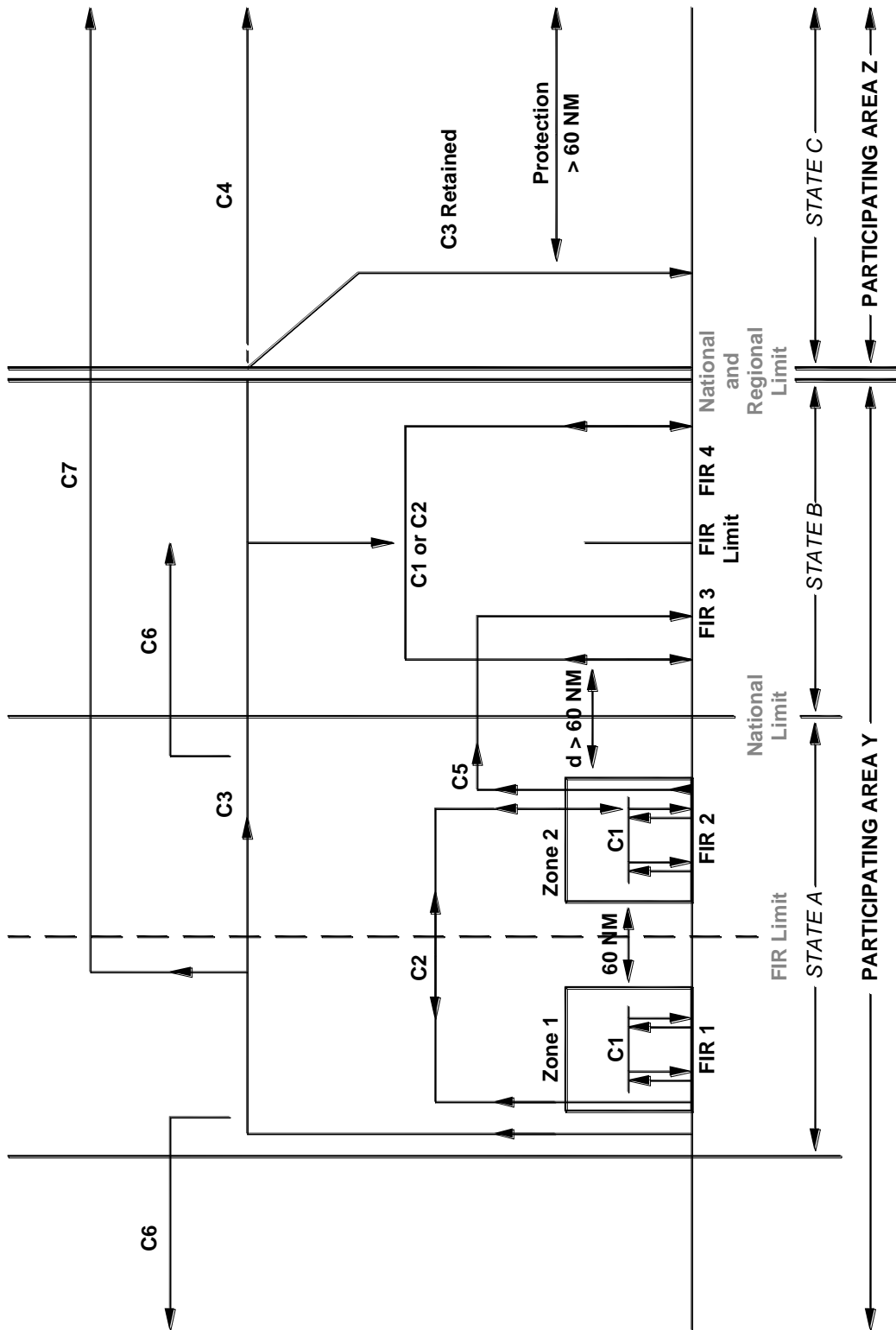
C.3 As in the case of any problem involving the “queuing management”, it is abundantly clear in the light of the previous remarks that the more centralized the allocation-assignment system, the more economical it will be. In other words, the less call there will be for allotment type solutions (provision of sub-banks to decentralized units), and the greater the use made of central assignment in accordance with overall criteria the more economical the system will be.

C.4 Likewise it has been seen that proper management of the assignment system presupposes knowledge of the actual traffic situation (entry into the system, route, exit from the system-landing etc.). Consequently, it is desirable that the assignment machinery should be linked with the real-time system.

C.5 A number of examples given in Appendix B show that despite the uniqueness by zone criterion, two codes may be found to be in use simultaneously in the same system (radar range is greater than the 60 NM buffer zone). Accordingly, the correlation systems should at least be capable of accommodating and unambiguously identifying two aircraft responding on the same code separated at the time of correlation by a designated geographical distance which will be a function of the automated system.

*Note.— A geographical correlation filter should exist such that correlation will not be achieved if the calculated distance between the flight plan derived position based on estimate information and the SSR response corresponding to the SSR code in the flight plan is more than 30 NM.*

C.6 Illustrative diagram for general code allocation and assignment



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**The following notes relate to the diagram:****Code C1:** Local code for PA Y (Local in STATE A Local in STATE B)

These codes can be used inside zone 1, inside zone 2, inside other zones of STATE B, and even inside the whole territory of STATE B if a buffer zone of 60 NM or a FIR separates them.

These codes could be used in PA Z under the same condition of protection against the allocation in STATE B.

**Code C2:** Local code for PA Y (Local in STATE A and STATE B)

Condition: a 60 NM buffer zone should be provided between these two assignments.

**Code C3:** Transit code for PA Y (STATE A)

In general such a code should be assigned to any aircraft originated in STATE A and leaving its boundaries, for overflying STATE B or landing in B.

In general this code may be changed at the entry in PA Z, but it could be retained for an arrival at an aerodrome close to the border and having a protection area of at least 60 NM against any other use in PA Z.

If C3 is planned for transit use from PA Y to PA Z it could be retained inside the whole PA Z.

**Code C4:** Transit code for PA Z (STATE C)

Such a code will be assigned to any flight whose code cannot be retained and overflying STATE C for a further destination in PA Z.

**Code C5:** Directional transit code between STATE A FIR2 and STATE B FIR3

C5 should be simultaneously protected in the two FIRs though domestic for PA Y. Such an allocation has the advantage of avoiding assignment of a transit code for such short middle-range flights.

**Code C6:** Transit code for PA Y

The example given with C6 is a duplication where the directional assignment by STATE A gives a guarantee of no conflicts occurring with the following units.

**Code C7:** Transit code for use for PA Y (STATE A) and PA Z

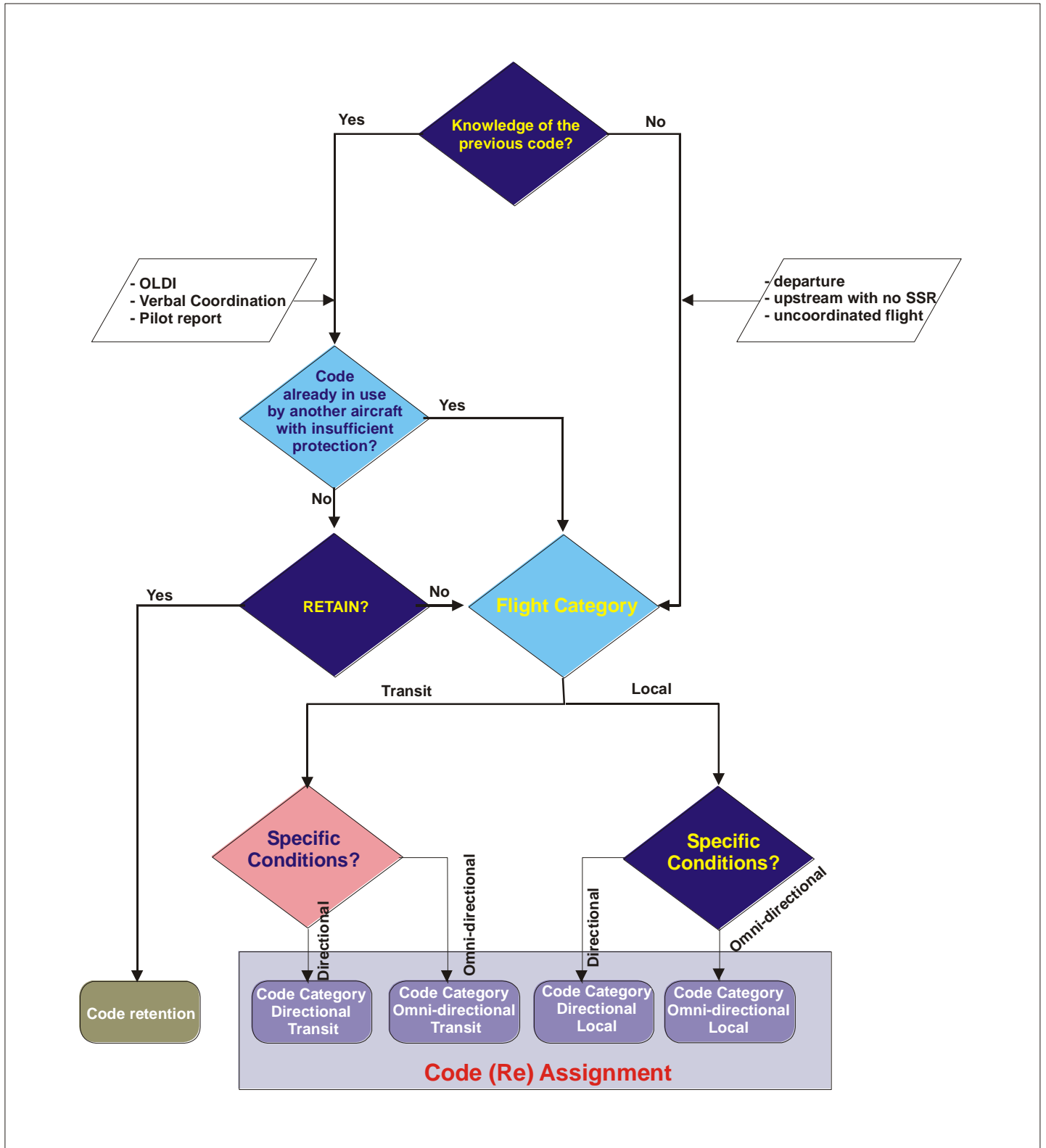
C7 which is at least transit in PA Y and having no domestic use in PA Z will be retained in the two areas.

**Management of the code baskets for STATE A:**

General:	Local basket				: C1, C2
	Transit basket				: C3, C6
Special:	Local State A	FIR 2	—	State B FIR 3	: C5
	Transit State A		—	PA Z	: C7
	Directional assignment	FIR 2	—	State B	
		FIR 1	—	Other State of PA Y	: C6

C.7 Flow Chart

The following chart outlines the retention/assignment procedures described above:



**APPENDIX D - DEVELOPMENT OF AUTOMATED SSR CODE ASSIGNMENT SYSTEMS**

D.1 As computer capabilities could be a limiting factor in code assignment and thus reflect on the code allocation, the following principles for the development of automated SSR code assignment systems should be observed:

- a) automated systems shall be capable of using code blocks (part of a code series) without getting confused if, in a neighbouring system, other blocks of the same code series (with the same first and second digits) are used;
- b) automated equipment shall be capable of coping with a limited number of code conflicts rather than preventing code duplications by means of more complicated and less economical code allocation and assignment methods;

*Note.— It is expected that this feature will become even more important as traffic increases.*

- c) automated systems shall be capable of assigning codes with reference to the category of a flight, i.e. transit codes shall be assigned to an aircraft engaged in transit flights and local codes to an aircraft confined within the smaller area of use reserved for such codes;
- d) automated systems shall permit the addition of a sophisticated capability of assigning codes with reference to the routing or special code protection required for specific aircraft, especially when this will permit economies in the number of codes required;
- e) the code assignment logic of an automated system shall not impose any restriction on the free choice of any specific additional codes if this is required to satisfy new requirements;
- f) automated code assignment systems shall be designed to conform to international cooperative principles and essential capabilities described in this Document.

- END -