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CAR/SAM REGIONAL PLANNING AND IMPLEMENTATION GROUP (GREPECAS)

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Agenda Item 3: Development of surveillance systems

3.3 Surveillance system considerations for the integration of automated ATM systems and ATFM requirements

INTERCONNECTION OF AUTOMATED SYSTEMS IN THE CAR/SAM REGIONS

(Result of Project RLA/98/003 on Automation)

(Presented by the Secretariat)

SUMMARY

This working paper presents the results of the automation activities carried out by the RLA/98/003 project, consisting of an initial automated ACC interconnection plan and a system interface control document for review by the Meeting and use by States as reference material for drawing up action plans to implement the interconnection of automated ACC systems.

References:

- Report of GREPECAS/12 (Havana, Cuba, 7-11 June 2004);
- Report of GREPECAS/14 (San José, Costa Rica, 16-20 April 2007);
- Preliminary version of the SICD document (RLA/98/003 project); and
- Initial plan for interconnection of CAR/SAM automated systems (project RLA/98/003) document.

Strategic Objectives:

This working paper is related to Strategic Objective D

1. Introduction

1.1 CAR/SAM air traffic control centres have encountered difficulties in carrying out appropriate air traffic coordination procedures, factor that has been defined as the main cause for air traffic incidents, which would be reduced significantly through the use of automated systems in air traffic control centres to implement automatic data transfer, to minimise the execution of manual procedures for the required ATC coordination.

1.2 Several CAR/SAM States/Territories/International Organisations and ATM providers have already implemented or are in the process of implementing automated systems in air traffic control centres. To guide the CAR/SAM Regions in their integration of automated systems in order to further automatic data transfer, the GREPECAS/12 meeting agreed to recommend a strategy by formulating Conclusion 12/31 - *Regional strategy for the integration of automated systems*, which urges CAR/SAM States, in coordination with the ICAO Regional Offices, to define action plans for integration.

1.3 With a view to helping States/Territories/International Organisations draw up action plans for integrating automated systems, the Automation Task Force of the ATM/CNS Subgroup developed an “*Interface Control Document (ICD) for data communications between ATS units in the Caribbean and South American Regions (CAR/SAM ICD)*,” together with a Table of “*ATS Operational Requirements for Automated Systems*”. In this regard, the GREPECAS/14 meeting formulated Conclusion 14/43 – *Agreements for automated system interface* and Conclusion 14/44 – *Establishment of an action plan for the interface of ATM automated systems*.

1.4 ICAO technical cooperation project RLA 98/003 – *Transition to CNS/ATM systems in the CAR/SAM Regions*, in order to assist States/Territories/International Organisations with the integration of automated systems and taking into account the GREPECAS conclusions formulated in this regard, undertook the drafting of an interconnection plan for automated systems in CAR/SAM air traffic control facilities. The purpose of this plan was to establish the automated transmission of flight plan and surveillance information for flights in transition from one FIR to the adjacent one, as a means for improving air traffic control coordination between the air traffic control centres involved.

1.5 In order to prepare the system interface control document (SICD) and a regional interconnection plan, the project carried out the following activities:

- a) Development of a questionnaire on automated systems installed in ATS units and their interfaces;
- b) Testing the interconnection between the automated systems of the Manaus ACC (Amazonía FIR) in Brazil and the Maiquetía ACC (Maiquetía FIR) in Venezuela;
- c) Data collection missions to States. This activity was carried out in 2007 by a group of experts and ICAO to assess the status of automated air traffic control systems installed in the control centres in the following CAR/SAM States: Argentina, Brazil, Chile, Colombia, Ecuador, Honduras, Panama, Peru, Uruguay and Venezuela;
- d) Development of the Interface Control Document (SICD). Based on information collected during the visits, the team prepared an interface document containing all of the associated data, together with a description of the interfaces existing in many available ACC systems in CAR/SAM States. As a result, they subsidise the adoption of the necessary measures for the interconnection of such systems; and
- e) Drafting of the Interconnection Plan based on the information consolidated in the SICD, which takes into account the unique features of each ACC in the States.

2. **Analysis**

2.1 Based on the answers given by States/Territories/International Organisation to the questionnaire and on State visits, the project drafted a preliminary system interface control document (SICD), which provides technical details about the external interfaces connecting to ATC automated systems (ATCS) (flight plan and radar data processors). Internal ATCS messages will be covered in detail in another document (IDD) to be prepared. Much of the information to be used in the IDD document should be provided by ATCS manufacturers.

2.2 The SICD document contains detailed information about the interface between the radar sensor (primary/secondary radar) and the ATCS, the interface between ATCSs, the interface between the automated message switching centre (AFTN) and the ATCS, the OLDI interface between ATCSs, the AIDC interface between ATCSs, the interface between flight plan processors, the interface between the

radar sensor monitoring and control system and the monitoring and control centre unit, and the interface between the clock synchronisation server and the ATCS.

2.3 For each of the aforementioned interfaces, the SICD document specifies the type (synchronous serial, etc.), description (duplex, simple HDLCs, etc.), data type (radar, flight plan, OLDI, etc.), format (Asterix, TVT2, etc.), message definition (Asterix 001, 002, etc. message types), speed (9.6Kbits/sec, 2.4Kbits/sec, etc.), electrical characteristics (RS 232, V24/V28, etc.), physical connection (type of connector), and reference (manufacturer's manual).

2.4 The SICD is a reference document that will facilitate the interconnection between radar sensors, flight plans, and the corresponding ATCSs, as well as between ATCS systems. Although the document only describes automated system interfaces in the States visited by the project, it can also serve as reference material for other States with automated ATC systems that wish to interconnect with other automated systems or radar sensors in other States, for it describes the technical information to be provided. **Appendix A** to this working paper contains a copy of the preliminary SICD.

2.5 This preliminary SICD, together with the Interface Control Document (ICD) for data communications between ATS units prepared by the Automation Task Force of the ATM/CNS Subgroup, will help States implement action plans for the interconnection of automated systems.

2.6 Implementation of the interconnection of ATC automated systems is envisaged on a bilateral or multilateral basis, as specified in GREPECAS Conclusion 14/43 – *Agreements for automated system interface*.

2.7 In this connection, and taking into account the data collected through the automation questionnaire, the visits by project RLA/98/003 to member States that have ATC automation systems, and the preliminary SICD, project RLA/98/003 drafted the initial plan for the interconnection of automated systems, which appears in **Appendix B** to this working paper.

2.8 This document shows that different levels of automated systems interconnection have been observed in the States visited and that interconnection levels are to be used as planning elements for defining implementation strategies, inasmuch as they reflect the current status and availability of each ATC centre for such interconnection.

2.9 Interconnection levels are classified from a lower level, representing non-automatic functionality, to a higher one, representing automatic functionality. The initial plan for interconnection of automated ACC systems contains a table showing solutions for the implementation of these levels of interconnection.

2.10 Basically, the project proposes two solutions for attaining the level of interconnection implementation, one involving bilateral interconnection and the other, multilateral. It also offers a solution for providing radar information to countries that border on Brazil through the Brazilian radars installed on those borders, using a system (SISTRASAG) that makes it possible to distribute selective radar information from the overall domestic coverage to customers needing that information for operational purposes.

2.11 Bilateral interconnection takes place when a common protocol is established for the exchange of flight plan information and radar data between two neighbouring countries, with the necessary adjustments to integrate this information within each system. This form of interconnection has the advantage of being able to establish actions for short periods of time and to use common technologies that exist in each neighbouring State. This makes it possible to use existing expertise and resources to save money and means.

2.12 Multilateral interconnection would be implemented as a radar information network that would facilitate an extensive sharing of surveillance data. All of the information (radar and future ADS-B) would be collected in this network from different sites/locations of the various States through the specific interface of each sensor, converted to ASTERIX format and shared in accordance with the geographic filters of interest to each State. The basic equipment would be of the RMCDE (radar message conversion and distribution equipment) type that, in principle, is usually applied to support national modernisation programmes. The equipment would subsequently offer the possibility of interconnection with the facilities of adjacent States for the exchange of surveillance data of common interest and, in advanced stages, the same physical equipment would permit integration with a flexible, wide-range radar information network. This system, called RADNET, is currently installed in Europe.

2.13 Upon analysing the different automation solutions, it should be noted that bilateral solutions for sharing flight plan information and surveillance data might not be implemented in time and, under certain conditions, would not be the most convenient for the interconnection. They are, however, the solution that the Region can implement in the short and medium terms.

2.14 The multilateral solution for sharing flight plan information and surveillance data may be difficult to implement without a project centralising the coordination. The support that may be required from system providers for configuring the systems or implementing minor changes or updates would be more effective if negotiated collectively and not individually by air navigation service providers (ANSPs). Experience gained with multinational implementations--e.g., REDDIG, under the provisions of specific projects coordinated by ICAO Regional Offices--has been positive. Therefore, it is highly recommended that the interconnection of ATC automated centres in the CAR/SAM Regions be done through a specific project, in a way similar to the REDDIG project.

3. Conclusion

3.1 Automation activities carried out by project RLA/98/003--the preliminary SICD, as well as the Initial Interconnection Plan for Automated ACCs--were designed to provide project members and the other CAR/SAM States with reference information to support the development of action plans when the time comes to implement the integration of automated systems.

3.2 Consequently, the Meeting should study the material presented so that it may be sent to the Automation Task Force for consideration as a reference for the integration of automated systems, together with the material previously prepared by the Automation Task Force on the Interface Control Document (ICD) for data communication between ATS units in the Caribbean and South American Regions (CAR/SAM ICD) and the Operational Requirements for Automated ATS Systems.

3.3 In this respect, the following draft decision is formulated:

DRAFT DECISION CNS/6/XX -

REVIEW OF THE PRELIMINARY SYSTEM INTERFACE CONTROL DOCUMENT (SICD) AND OF THE INITIAL PLAN FOR INTERCONNECTION OF AUTOMATED ACC SYSTEMS

That the CNS Committee of the ATM/CNS Subgroup send to the Automation Task Force the preliminary system interface control document (SICD) and the initial plan for the interconnection of CAR/SAM automated systems contained in Appendices A and B to this working paper, for consideration as reference documents for the interconnection of automated systems.

4. **Suggested action**

4.1 The Meeting is invited to:

- a) take note of the information presented;
- b) review the results of the automation activities carried out by project RLA/98/003 and presented in section 2 and in Appendices A and B to this working paper;
- c) analyse draft decision CNS/6/X of this working paper with a view to its approval; and
- d) analyse other considerations deemed necessary in this regard.

APPENDIX A

Preliminary System Interface Control Document

for the

Interconnection of ACC Centers of the CARSAM Region

Prepared by:

ICAO Group

Preface

This document defines the external interfaces and messages of the ATC Systems in the countries from the CARSAM Region. It includes those interfaces that are external to the ATC Automation System. It is based on source material obtained from a Survey coordinated by ICAO Office in Lima. This document was prepared for the purpose of registering the current interfaces between the ATC Automation Systems and the external sensors and Centers. This document is subject to change based on continuing review by ICAO Office and the countries members.

Revision History

Revision/Date	Description of Change	Change Pages

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1.0 Scope

The purpose of this document is to provide details of the external interfaces existing in each ATC System installed on countries of the CARSAM Region. The Air Traffic Control Automation System (ATCS) is part of the ACC that is responsible for the FIR control.

1.1 Identification

This document is identified as the System Interface Control Document (SICD) for the ATC Systems in the CAR/SAM region. The following diagram shows the hierarchical structure of the documents and identifies the relative position of this document.

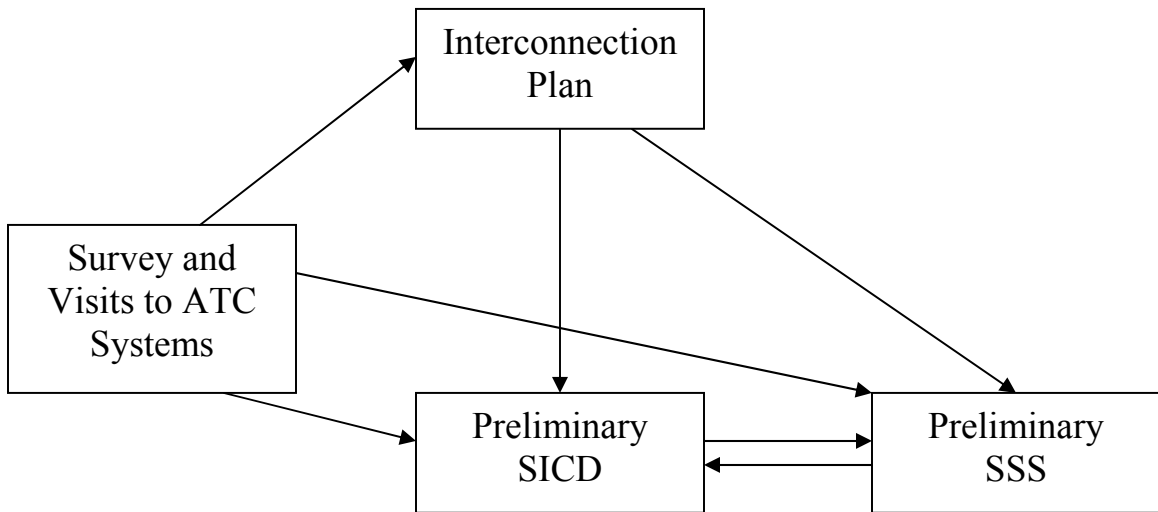


Figure 1.1-1 Document hierarchy

1.2 System Overview

The Interconnection Plan is a strategy to interconnect the ATC System in the CAR/SAM Region involving analysis of the infrastructure to provide the better flight coordination and flow control between adjacent control centers, promoting improvements in safety as well.

ATC Systems are composed of a great quantity of sensors and flight plan interfaces connected to Data Processing Servers by a telecommunications network (REDDIG). These data-processing centers are known variously as Data Treatment and Visualization centers (STVs) which include necessary local telecommunications equipments .

Various sensors provide the data concerned to the Air Traffic and meteorological information. The supporting subsystems include:

- Primary and secondary air traffic control radars,
- Weather radars,
- Air navigation aids,
- Radio and telephone communications.

These sensors collect data that are transmitted through one integrated telecommunications network to the STVs. A local network of computer workstations provides the necessary ambient for the processing, exploitation and analysis of collected data; the development and use of application software and program development tools; the management and use of databases from varied sources and for the training of system users.

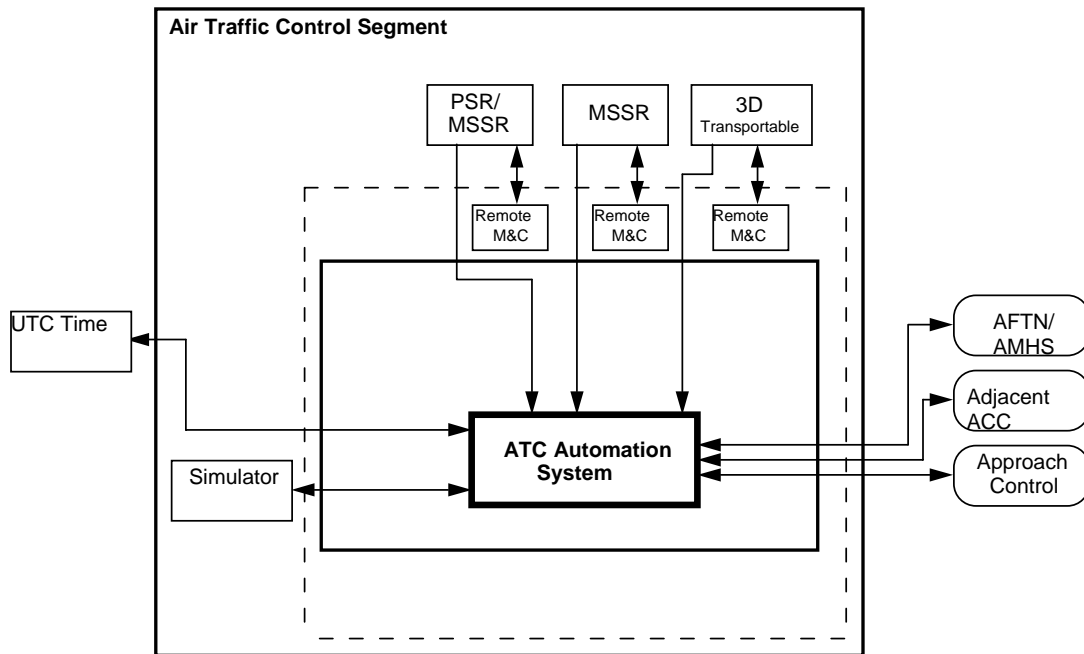


Figure 1.2-1 System Architecture

<u>SEGMENT</u>	<u>DESIGNATOR</u>	<u>SUBSYSTEM NAME</u>
Air Traffic Control	ATC System	
	RDP System	Radar Data Processor
	FDP	Flight Data Processor
	AIS	Aeronautical Information System
	AFTN	Aeronautical Fixed Telecommunication Network
	AMHS	Aeronautical Message Handling System

Table 1.2-1 ATC Systems

1.3 Document Overview

This document defines the external interfaces that connect to the Air Traffic Control Automation System. Messages that are internal to the ATCS should be detailed in the Interface Design Document (IDD) from each System Supplier.

The method of describing each of the external interfaces follows the same pattern. Each subsection addresses one interface. The objective is to identify all the parameters of the interface including the point of connection. This is defined as a point between two areas of responsibility. Each side of the interface will agree on this line of demarcation and the interface definition presented.

2.0 Referenced Documents

The documents listed below form a part of this System Interface Document (SICD) to the extent specified herein.

2.1 ICAO Documents

- | | |
|------------------|--|
| ICAO Annex 10 | Aeronautical Communications |
| Doc 4444-RAC/501 | Air Traffic Management - Procedures for Air Navigation Services ICAO 14th Edition 01/ 11/ 2001 |

2.2 EUROCONTROL Documents

- | | |
|---------------|--|
| Ref. 005-1-93 | Eurocontrol Standard Document for Radar Data Exchange – All Purpose Structured Eurocontrol Radar Information Exchange (ASTERIX), 31 January 1995 |
|---------------|--|

- DPS.ET1.ST06-STD-01-01 Eurocontrol Standard Document for On-Line Data Interchange (OLDI) Edition 2.3 December 2001

SUR.ET1.ST05.2000-STD-09-01 Eurocontrol Standard Document For Surveillance Data
Exchange Part 9 : Category 062 SDPS Track Messages Edition : 1.3
Edition Date : April 2005

SUR.ET1.ST05.2000-STD-10-01 Eurocontrol Standard Document For Surveillance Data
Exchange Part 10: Category 63 Sensor Status Messages

2.3 Other Documents

- ISO 3309 Data Communications High-Level Data Link Control (HDLC) Procedures, Frame Structure
- WMO Manual on Codes
- Publication #306 World Meteorological Organization Manual on Codes
- Vol. I International Codes
- Vol. II National and Regional Codes
- G630621 INTERFACE CONTROL DOCUMENT BETWEEN THE SIVAM 3-D TRANSPORTABLE RADAR AND THE AUTOMATION SYSTEM
- G535530 INTERFACE CONTROL DOCUMENT BETWEEN THE ASR23SS AND THE AUTOMATION SYSTEM INTERFACE CONTROL DOCUMENT
- IC808466/801 FOR THE CONDOR MK2D ASTERIX RADAR DATA OUTPUT SIVAM - FREE-STANDING INSTALLATIONS
- E-277-01-2132 SSDD - USER APPLICATION PROFILE (UAP) FOR TRANSMISSION OF MONORADAR TARGET REPORT (ASTERIX CATEGORY 34 & 48) FROM ALENIA
- CD2 FPS-117 Specification
- TVT2 Inter-facility Radar Message Formats. "Procedure De Transmission TVT2"
- C.A.006.13.D.TV.710.AT.T02.DK.001.03 - ESPECIFICAÇÃO DAS INTERFACES EXTERNAS (SICD) – ACC CINDACTA I
- Formato de Mensajes Radar ASTERIX con UAPs de Alenia. COCESNA
- ESPECIFICACIÓN DEL INTERFACE DE SALIDA DE DATOS EN FORMATO DDE DEL RADAR IRS-20MP/L Ceselsa 15/11/95
- ESPECIFICACIÓN DEL INTERFACE DE SALIDA DE DATOS EN FORMATO ASTERIX DEL RADAR IRS-20MP/L Ceselsa 15/11/95
- ESPECIFICACIÓN DEL INTERFAZ SDC-2000/AIRCON2000 INDRA 25/10/01
- TymServeTM 2100L Network Time Server User's Guide Datum Inc Rev B May 1999

3.0 External Interfaces

Each external interface is identified and listed in Table 3.0-1 below. Where multiple instances of the same interface type occurs, they are indicated in the list by the letter 'M'. Interfaces used with ATC Automation Systems are usually duplicated to provide increased availability, especially, where telecommunications channels used are maintained by a third party. Dual data links provide identical information simultaneously, when fully operational. These links are indicated in the list by the letter 'D'.

Number	Name of External Interface	Dual Links/Multiple Occurrence
R001,R005 ,R011	3D PSR/MSSR	D, M
R002-R004 R006-R010 R012-R016	2D PSR/MSSR	D, M
R017-R024	MSSR	D, M
R025-R027	ATCS to ATCS (for Radar Track Updates)	M
F028-F032	ATCS to ATCS (for Flight Plan Data)	
F034	AFTN Server (to/from AIS)	
033	RCMS	M
032	AFTN Server (to/from FDPS)	
T035	Time Server to ATCS (for Time Synchronization)	

Table 3.0-1 List of External Interfaces

The following tables indicate the allocation of the various interfaces to the ATC Operational Centers. All ATCs have direct access to the international AFTN network via the AFTN Server, and hence links to all other AFTN Subscribers.

Radar Type	Radar	Interface ID	Argentina	Brazil	Chile	COCESNA	Colombia	Ecuador	Panamá	Peru	Uruguay	Venezuela
3D PSR + MSSR	TPS-B-4 Lockheed Martin	R001		✓								
2D PSR + MSSR	LP-23 + RSM 870 THALES	R002	✓				✓				✓	
2D PSR + MSSR	ASR9 + MMSSR	R003							✓			
2D PSR + SSR	LP-23 + RSM 970 THALES	R004		✓	✓							
3D PSR + MSSR	TRS2230 + RSM 970 THALES	R005		✓								
2D PSR + MSSR	Tracker 2000 + RSM 970 THALES	R006			✓							
2D PSR + MSSR	ATCR33M/S + SIR-M (7) ALENIA	R007	✓				✓					
2D PSR + MSSR	ATCR33DPC + SIR-S ALENIA	R008					✓	✓				
2D PSR + MSSR	ATCR22M + SIR-M ALENIA	R009					✓					
2D PSR + MSSR	SKYTRACKER + IRS20MPL	R010					✓					
3D PSR + MSSR	TPS70	R011					✓					
2D PSR + MSSR	STAR2000 + RSM 970 THALES	R012		✓	✓			✓				
2D PSR + MSSR	TA-10 + RSM 970 THALES	R013		✓							✓	
2D PSR + SSR	TA-10 + RSM770 THALES	R014					✓					
2D PSR + MSSR	ASR 23 SS/16 + MSSR Condor MK2 RAYTHEON	R015		✓								✓
2D PSR+ MSSR	ASR12SS + MSSR (CD-2)	R016								✓		

Radar Type	Radar	Interface ID	Argentina	Brazil	Chile	COCESNA	Colombia	Ecuador	Panamá	Peru	Uruguay	Venezuela
MSSR	RSMA INVAP	R017	√									
MSSR	CARDION	R018			√							
MSSR	SIR-7 Alenia	R019		√								
MSSR	SIR-S SELEX	R020										√
MSSR	CONDOR	R021		√								
MSSR	ISIR-M ALENIA	R022				√						
MSSR	IRS-20MP/L INDRA	R023				√		*				
MSSR	RSM 970 THALES	R024					√					

√* - Not installed yet

Table 3.0-2 Radar Types Allocation Table

Surveillance Interface to Adjacent Centers	Interface ID	Argentina	Brazil	Chile	COCESNA	Colombia	Ecuador	Panamá	Peru	Uruguay	Venezuela
AMS Interface	IR025					√	√				
Inter-CINDACTA	IR026		√								√*
INDRA Interface	IR027	√**								√**	

√* - With minor software changes used in the Essay Brazil-Venezuela

√**- As verified in the SSS, but this requirement was not tested yet

Table 3.0-3 Radar Interface to Adjacent Centers Allocation Table

Flight Plan Interface	Interface ID	Argentina	Brazil	Chile	COCESNA	Colombia	Ecuador	Panamá	Peru	Uruguay	Venezuela
ICAO 4444 & Hand-off Coordination	IF028 IF032		√								√*
ICAO 4444 without Hand-off Coordination	IF029			√	√	√	√	√	√	√	
OLDI	IF030	√*		√**	√*	√*	√*	√*		√*	
AIDC	IF031	√***									

√* - Not configured

√** - Only for APP and ACC interconnection

√*** - To be implemented

Table 3.0-4 Flight Plan interface with Adjacent Centers

ATCS Automation System Supplier	Version	Argentina	Brazil	Chile	COCESNA	Colombia	Ecuador	Panamá	Peru	Uruguay	Venezuela
ATECH	X-4000		√								√
ATECH/ RAYTHEON	SCO		√								
THOMSON	MITRA		√*								
THALES	EUROCAT1000			√							
INDRA	AIRCON2000				√	√		√			
INDRA	AIRCON2010									√	
INDRA	AIRCON2100	√									
ALENIA/ MARCONI	CMS					√	√				
NORTHROP GRUMMAN	AMS2000								√		

√* - To be changed to ATECH X-4000 this year

Table 3.0-5 ACC ATCS Automation Systems

3.1 3D-PSR/MSSR TPS-B34 3D Transportable Radar Interface

3.1.1 General

The 3D-PSR/MSSR sensor is a transportable primary radar (TPS-B34) system with a co-mounted secondary radar. Each system contains plot extraction facilities and remote control and monitoring capability. Each radar site provides radar plot and track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site and does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communication between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.1.2 Interface Definition

Type:	Serial - synchronous
Description	HDLC, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX
Message Definition:	ASTERIX messages types 001 Radar target report 002 Radar service message 008 Mono-radar derived weather information
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	D' type 25 pin at input to Radar Distribution Unit (RDU)
Reference	G630621 - INTERFACE CONTROL DOCUMENT BETWEEN THE SIVAM 3-D TRANSPORTABLE RADAR AND THE AUTOMATION SYSTEM

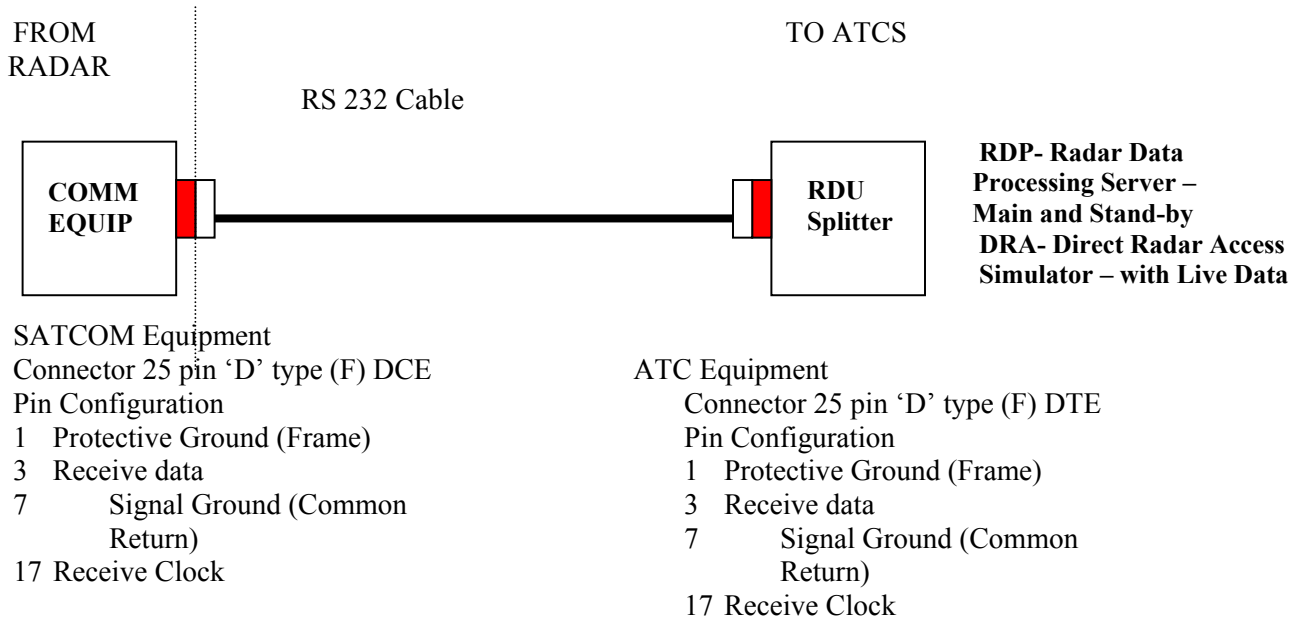
3.1.3 Special Features

Radar data links are organized as Simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

These radar systems are transportable and may be relocated to meet the needs for required radar coverage. In addition, the host radar (PSR) can operate in either of two turning modes (rpm of antenna) which needs a separate re-configuration for each radar (PSR and MSSR).

3.1.4 Typical Interface Connection for HDLC

The following diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.



3.1.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.1.5-1 HDLC Frame Structure

3.2 PSR/SSR LP23M + RSM870 Thomson Interface

3.2.1 General

The PSR/SSR sensor is a co-mounted primary (LP 23M) and secondary radar system with plot extraction facilities and remote control and monitoring capability. These radar sites are existing radar facilities. Each site provides radar track data in a standard format to the ATCS. Information provided by the radar supports ATC Operations. Communications is provided between the ATCS and the radar site by telephone channels, using landline and microwave links.

3.2.2 Interface Definition

Type: Serial – binary-synchronous
 Description: Simplex (TVT2)

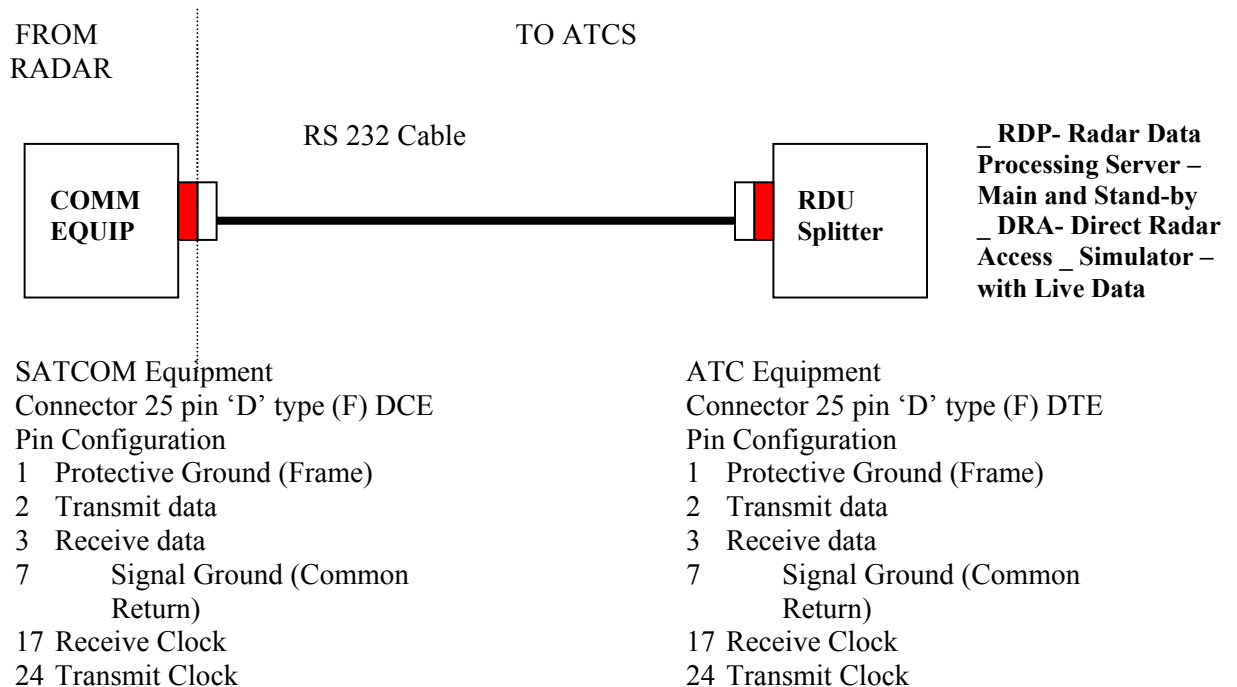
Data Type:	Radar data
Format:	PR 800
Message Definition:	TVT2 messages types – Ref. ‘Procedure de Transmission TVT2’ Message ‘Status’ (Sector Message) Message ‘Piste’ (Track Report) Message ‘Correspondance Horloge’ (North Mark) Message ‘Suppression Piste’ (Track Drop)
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232
Physical Connection:	‘D’ type 25 pin at input to Radar Distribution Units
Reference	SICD ACC-BS

3.2.3 Special Features

These radars use a common format (TVT2) for data transmission between the radar site and the existing ATC centers.

3.2.4 Typical Interface Connection for BI-SYNC Protocol

The following diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.



3.2.5 Interface Connection

The data provided by the radar site is formatted into a BISYNC data block as shown below. Order of transmission is LSB sent first.

SYN	SYN	SOH	HEADER	STX	TEXT	ETX/ETB	BCC
-----	-----	-----	--------	-----	------	---------	-----

Table 3.2.5-1 Binary Synchronous Frame Structure

3.3 PSR/MSSR ASR-9 Interface

3.3.1 General

The PSR/MSSR sensor is a co-mounted dual primary (ASR 9) and dual secondary MMSSR radar system with plot extraction facilities and remote control and monitoring capability. Each site provides radar plot, track and weather data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site but does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communications between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.3.2 Interface Definition

Type:	Serial - synchronous
Description	HDLC, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX
Message Definition:	ASTERIX message types 001 Radar target report 002 Radar service message 008 Mono-radar derived weather information
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	'D' type 25 pin at input to Radar Distribution Unit (RDU)
Reference	TBD

3.3.3 Special Features

Radar data links are organized as simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.3.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.3.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown in below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.3.5-1 HDLC Frame Structure

3.4 PSR/SSR LP23M + RSM 970 Thomson Interface

3.4.1 General

The 3D-PSR/MSSR sensor is a primary radar system with a co-mounted secondary radar. Each system contains plot extraction facilities and remote control and monitoring capability. Each radar site provides radar plot and track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site and does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communication between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.4.2 Interface Definition

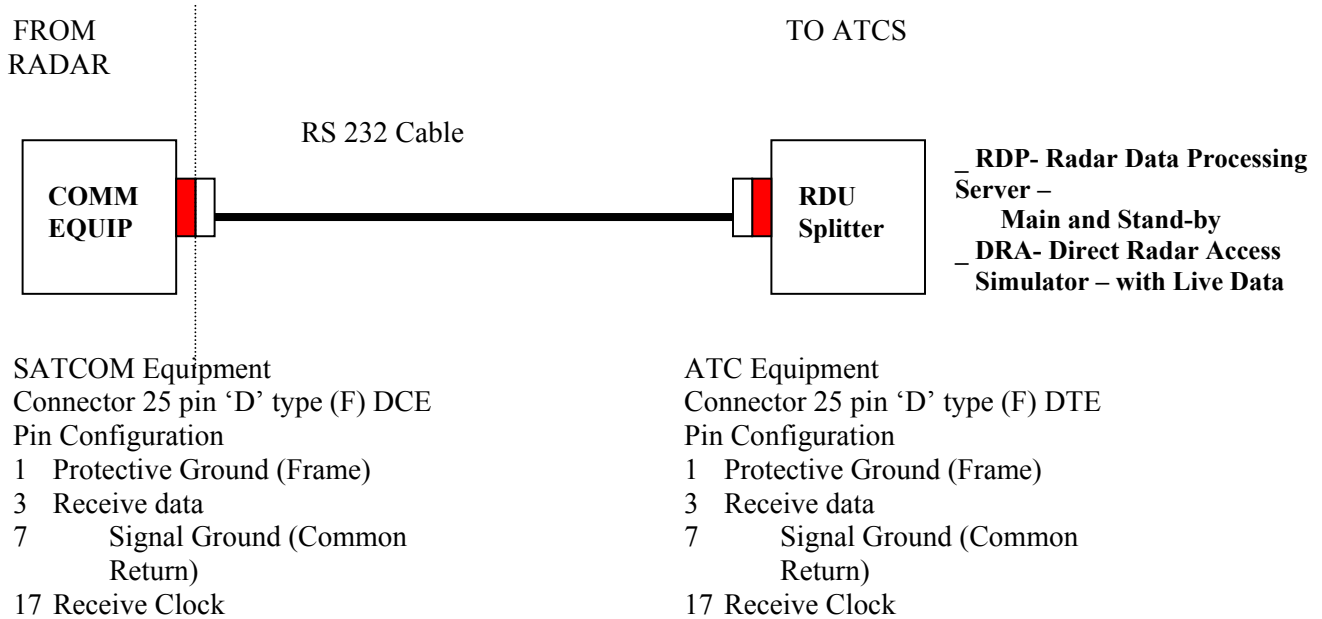
Type:	Serial - synchronous
Description	HDLC, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX
Message Definition:	ASTERIX messages types 034 Radar target report 048 Radar service message 008 Mono-radar derived weather information
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	D' type 25 pin at input to Radar Distribution Unit (RDU)
Reference	THALES SICD

3.4.3 Special Features

Radar data links are organized as Simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.4.4 Typical Interface Connection for HDLC

The following diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.



3.4.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.4.5-1 HDLC Frame Structure

3.5 3D-PSR/MSSR TRS2230 + RSM 970 Interface

3.5.1 General

The 3D TRS2230 sensor is a primary radar system with a co-mounted secondary radar. Each system contains plot extraction facilities and remote control and monitoring capability. Each radar site provides radar plot and track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site and does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communication between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.5.2 Interface Definition

Type:	Serial - synchronous
Description	HDLC, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX
Message Definition:	ASTERIX messages types 048 Radar target report 034 Radar service message 008 Mono-radar derived weather information
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	'D' type 25 pin at input to Radar Distribution Unit (RDU)
Reference	SICD TRS2230 from THALES

3.5.3 Special Features

Radar data links are organized as Simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.5.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.5.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.5.5-1 HDLC Frame Structure

3.6 2D-PSR/MSSR TRACKER 2000 + RSM 970 Interface

3.6.1 General

The 2D PSR sensor is a co-mounted primary (TRACKER 2000) and secondary radar system with plot extraction facilities and remote control and monitoring capability. These radar sites are existing radar facilities. Each site provides radar track data in a standard format to the ATCS. Information provided by the radar supports ATC Operations. Communications is provided between the ATCS and the radar site by telephone channels, using landline and microwave links.

3.6.2 Interface Definition

Type:	Serial – binary-synchronous
Description	Simplex (AIRCAT500)
Data Type:	Radar data
Format:	PR 800
Message Definition:	AIRCAT 500 messages types Message ‘Status’ (Sector Message) Message ‘Piste’ (Track Report) Message ‘Correspondance Horloge’ (North Mark) Message ‘Suppression Piste’ (Track Drop)
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232
Physical Connection:	‘D’ type 25 pin at input to Radar Distribution Units
Reference	AIRCAT 500 Specification

3.6.3 Special Features

These radars use a common format (AIRCAT500) for data transmission between the radar site and the existing ATC centers.

3.6.4 Interface Connection

The 3.2.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.6.5 Interface Protocol

The data provided by the radar site is formatted into a BISYNC data block as shown below. Order of transmission is LSB sent first.

SYN	SYN	SOH	HEADER	STX	TEXT	ETX/ETB	BCC
-----	-----	-----	--------	-----	------	---------	-----

Table 3.6.5-1 Binary Synchronous Frame Structure

3.7 2D-PSR/MSSR ATCR33M/S + SIR-M(S) Interface

3.7.1 General

The 2D PSR/MSSR sensor is a primary radar system with a co-mounted secondary radar. Each system contains plot extraction facilities and remote control and monitoring capability. Each radar site provides radar plot and track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site and does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communication between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.7.2 Interface Definition

Type:	Serial - synchronous
Description	HDLC, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX
Message Definition:	ASTERIX messages types 001 Radar target report 002 Radar service message 008 Mono-radar derived weather information
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	'D' type 25 pin at input to Radar Distribution Unit (RDU)
Reference:	TBD

3.7.3 Special Features

Radar data links are organized as Simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.7.4 Interface Connection

The 3.1.4 defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.7.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.7.5-1 HDLC Frame Structure

3.8 ATCR33DPC + SIR-S ALENIA

3.8.1 General

The 2D PSR/MSSR sensor is a primary radar system with a co-mounted secondary radar. Each system contains plot extraction facilities and remote control and monitoring capability. Each radar site provides radar plot and track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site and does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communication between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.8.2 Interface Definition

Type:	Serial - synchronous
Description	HDLC, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX
Message Definition:	ASTERIX messages types 048 Radar target report 034 Radar service message 008 Mono-radar derived weather information
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	‘D’ type 25 pin at input to Radar Distribution Unit (RDU)
Reference	E-277-01-2132SSDD - USER APPLICATION PROFILE (UAP) FOR TRANSMISSION OF MONORADAR TARGET REPORT (ASTERIX CATEGORY 34 & 48)

3.8.3 Special Features

Radar data links are organized as Simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.8.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.8.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.8.5-1 HDLC Frame Structure

3.9 2D PSR + MSSR ATCR22M+ SIR-M

3.9.1 General

The 2D PSR/MSSR sensor is a primary radar system with a co-mounted secondary radar. Each system contains plot extraction facilities and remote control and monitoring capability. Each radar site provides radar plot and track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site and does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communication between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.9.2 Interface Definition

Type:	Serial - synchronous
Description	HDLC, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX
Message Definition:	ASTERIX messages types 001 Radar target report 002 Radar service message 008 Mono-radar derived weather information
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	'D' type 25 pin at input to Radar Distribution Unit (RDU)
Reference	TBD

3.9.3 Special Features

Radar data links are organized as Simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.9.4 Interface Connection

The following diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.9.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.9.5-1 HDLC Frame Structure

3.10 2D PSR SKYTRACKER + IRS20MPL

3.10.1 General

The 2D PSR/MSSR sensor is a primary radar system with a co-mounted secondary radar. Each system contains plot extraction facilities and remote control and monitoring capability. Each radar site provides radar plot and track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site and does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communication between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.10.2 Interface Definition

Type:	Serial - synchronous
Description	HDLC, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX
Message Definition:	ASTERIX messages types 001 Radar target report 002 Radar service message 008 Mono-radar derived weather information
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	‘D’ type 25 pin at input to Radar Distribution Unit (RDU)
Reference:	TBD

3.10.3 Special Features

Radar data links are organized as Simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.10.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.10.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.10.5-1 HDLC Frame Structure

3.11 3D PSR/MSSR TPS-70

3.11.1 General

The 3D PSR sensor is a co-mounted primary (TPS-70) and secondary radar system with plot extraction facilities and remote control and monitoring capability. These radar sites are existing radar facilities. Each site provides radar track data in a standard format to the ATCS. Information provided by the radar supports ATC Operations. Communications is provided between the ATCS and the radar site by telephone channels, using landline and microwave links.

3.11.2 Interface Definition

Type:	Serial – binary-synchronous
Description	Simplex
Data Type:	Radar data
Format:	BiSYNC
Message Definition:	CD-2 messages types
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232
Physical Connection:	'D' type 25 pin at input to Radar Distribution Units
Reference	CD2 (FPS-117) Specification

3.11.3 Special Features

These radars use a common format (CD2) for data transmission between the radar site and the existing ATC centers. CD2 stands for Common Digitizer Protocol - enables the transmission and reception of synchronous radar data.

3.11.4 Interface Connection

The following diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.11.5 Interface Protocol

The data provided by the radar site is formatted into a BISYNC data block as shown below. Order of transmission is LSB sent first.

SYN	SYN	SOH	HEADER	STX	TEXT	ETX/ETB	BCC
-----	-----	-----	--------	-----	------	---------	-----

Table 3.11.5-1 Binary Synchronous Frame Structure

3.12 2D SSR STAR2000 + RSM 970

3.12.1 General

The 2D PSR STAR2000 sensor is a primary radar system with a co-mounted secondary radar. Each system contains plot extraction facilities and remote control and monitoring capability. Each radar site provides radar plot and track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site and does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communication between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.12.2 Interface Definition

Type:	Serial - synchronous
Description	HDLC, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX
Message Definition:	ASTERIX messages types 001 Radar target report 002 Radar service message 008 Mono-radar derived weather information
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	‘D’ type 25 pin at input to Radar Distribution Unit (RDU)
Reference	SICD STAR2000 from THALES

3.12.3 Special Features

Radar data links are organized as Simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.12.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.12.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.12.5-1 HDLC Frame Structure

3.13 2D TA-10 + RSM 970

3.13.1 General

The 2D PSR TA-10 sensor is a primary radar system with a co-mounted secondary radar. Each system contains plot extraction facilities and remote control and monitoring capability. Each radar site provides radar plot and track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site and does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communication between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.13.2 Interface Definition

Type:	Serial - synchronous
Description	HDLC, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX

Message Definition: ASTERIX messages types
 001 Radar target report
 002 Radar service message
 008 Mono-radar derived weather information

Data Rate: 9.6 kbps

Electrical Characteristics: RS 232c V24/V28

Physical Connection: 'D' type 25 pin at input to Radar Distribution Unit (RDU)

Reference: SICD TA-10 from THALES

3.13.3 Special Features

Radar data links are organized as Simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.13.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.13.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.13.5-1 HDLC Frame Structure

3.14 2D TA-10 + RSM 770

3.14.1 General

The 2D PSR TA-10 sensor is a primary radar system with a co-mounted secondary radar. Each system contains plot extraction facilities and remote control and monitoring capability. Each radar site provides radar plot and track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site and does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communication between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.14.2 Interface Definition

Type:	Serial - synchronous
Description	HDLC, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX
Message Definition:	ASTERIX messages types 001 Radar target report 002 Radar service message 008 Mono-radar derived weather information
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	‘D’ type 25 pin at input to Radar Distribution Unit (RDU)
Reference	SICD TA-10 from THALES

3.14.3 Special Features

Radar data links are organized as Simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.14.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.14.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.14.5-1 HDLC Frame Structure

3.15 2D PSR ASR23SS + MSSR

3.15.1 General

The PSR/MSSR sensor is a co-mounted dual primary (ASR 23 SS/16) and dual secondary (Condor Mk 2) radar system with plot extraction facilities and remote control and monitoring capability. Each site provides radar plot, track and weather data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site but does not directly connect to the ATCS. Information provided by the radar supports ATC Operations.

Communications between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.15.2 Interface Definition

Type: Serial - synchronous
Description: HDLC, Simplex – one way transmission
Data Type: Radar data
Format: ASTERIX
Message Definition: ASTERIX message types
001 Radar target report
002 Radar service message
008 Mono-radar derived weather information
Data Rate: 9.6 kbps
Electrical Characteristics: RS 232c V24/V28
Physical Connection: ‘D’ type 25 pin at input to Radar Distribution Unit (RDU)
Reference: G535530 - INTERFACE CONTROL DOCUMENT
BETWEEN THE ASR23SS AND THE AUTOMATION
SYSTEM

3.15.3 Special Features

Radar data links are organized as simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.15.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.15.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown in below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.15.5-1 HDLC Frame Structure

3.16 ASR12SS + MSSR

3.16.1 General

The 2D PSR sensor is a co-mounted primary and secondary radar system with plot extraction facilities and remote control and monitoring capability. These radar sites are existing radar facilities. Each site provides radar track data in a standard format to the ATCS. Information provided by the radar supports ATC Operations. Communications is provided between the ATCS and the radar site by telephone channels, using landline and microwave links.

3.16.2 Interface Definition

Type:	Serial – binary-synchronous
Description	Simplex
Data Type:	Radar data
Format:	BiSYNC
Message Definition:	CD-2 messages types
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232
Physical Connection:	‘D’ type 25 pin at input to Radar Distribution Units
Reference	CD2 (FPS-117) Specification

3.16.3 Special Features

These radars use a common format (CD2) for data transmission between the radar site and the existing ATC centers. CD2 stands for Common Digitizer Protocol - enables the transmission and reception of synchronous radar data.

3.16.4 Interface Connection

The 3.2.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.16.5 Interface Protocol

The data provided by the radar site is formatted into a BISYNC data block as shown below. Order of transmission is LSB sent first.

SYN	SYN	SOH	HEADER	STX	TEXT	ETX/ETB	BCC
-----	-----	-----	--------	-----	------	---------	-----

Table 3.16.5-1 Binary Synchronous Frame Structure

3.17 MSSR RSMA INVAP

3.17.1 General

The MSSR INVAP sensor is dual secondary radar system with plot extraction facilities and remote control and monitoring capability. Each site provides radar plot, track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site but does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communications between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.17.2 Interface Definition

Type:	Serial - synchronous
Description	ASTERIX over TCP/IP, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX
Message Definition:	ASTERIX message types 001 Radar target report 002 Radar service message
Data Rate:	128 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	'D' type 25 pin at input to Radar Distribution Unit (RDU)
Reference	TBD

3.17.3 Special Features

Radar data links are organized as simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames. The data is sent to the Center using a TCP/IP Wrapper.

3.17.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.17.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown in below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.17.5-1 HDLC Frame Structure

3.18 MSSR CARDION

3.18.1 General

The MSSR CARDION sensor is a dual secondary radar system with plot extraction facilities and remote control and monitoring capability. Each site provides radar plot, track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site but does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communications between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.18.2 Interface Definition

Type:	Serial - synchronous
Description	HDLC, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX
Message Definition:	ASTERIX message types 001 Radar target report 002 Radar service message
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	'D' type 25 pin at input to Radar Distribution Unit (RDU)
Reference	TBD

3.18.3 Special Features

Radar data links are organized as simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.18.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.18.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown in below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.18.5-1 HDLC Frame Structure

3.19 MSSR SIR-7 ALENIA

3.19.1 General

The MSSR sensor is dual secondary radar system with plot extraction facilities and remote control and monitoring capability. Each site provides radar plot, track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site but does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communications between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.19.2 Interface Definition

Type:	Serial - synchronous
Description	HDLC, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX
Message Definition:	ASTERIX message types 001 Radar target report 002 Radar service message
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	‘D’ type 25 pin at input to Radar Distribution Unit (RDU)
Reference	TBD

3.19.3 Special Features

Radar data links are organized as simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.19.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.19.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown in below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.19.5-1 HDLC Frame Structure

3.20 MSSR SIR-S SELEX

3.20.1 General

The MSSR sensor is dual secondary radar system with plot extraction facilities and remote control and monitoring capability. Each site provides radar plot, track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site but does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communications between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.20.2 Interface Definition

Type:	Serial - synchronous
Description	HDLC, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX
Message Definition:	ASTERIX message types 001 Radar target report 002 Radar service message
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	D' type 25 pin at input to Radar Distribution Unit (RDU)
Reference	TBD

3.20.3 Special Features

Radar data links are organized as simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.20.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.20.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown in below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.20.5-1 HDLC Frame Structure

3.21 MSSR CONDOR MK2D

3.21.1 General

The MSSR sensor is a dual secondary radar system with plot extraction facilities and remote control and monitoring capability. Each site provides radar plot, track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site but does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communications between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.21.2 Interface Definition

Type:	Serial - synchronous
Description	HDLC, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX
Message Definition:	ASTERIX message types 001 Radar target report 002 Radar service message
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	‘D’ type 25 pin at input to Radar Distribution Unit (RDU)

Reference IC808466/801 FOR THE CONDOR MK2D
 ASTERIX RADAR DATA OUTPUT SIVAM - FREE-
 STANDING INSTALLATIONS

3.21.3 Special Features

Radar data links are organized as simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.21.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.21.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown in below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.21.5-1 HDLC Frame Structure

3.22 MSSR ISIR-M ALENIA

3.22.1 General

The MSSR sensor is a dual secondary radar system with plot extraction facilities and remote control and monitoring capability. Each site provides radar plot, track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site but does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communications between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.22.2 Interface Definition

Type: Serial - synchronous
 Description: HDLC, Simplex – one way transmission
 Data Type: Radar data

Format:	ASTERIX
Message Definition:	ASTERIX message types 001 Radar target report 002 Radar service message
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	'D' type 25 pin at input to Radar Distribution Unit (RDU)
Reference	Mensajes Radar ASTERIX con UAPs de Alenia. COCESNA

3.22.3 Special Features

Radar data links are organized as simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.22.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.22.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown in below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.22.5-1 HDLC Frame Structure

3.23 MSSR IRS-20MP/L INDRA

3.23.1 General

The MSSR sensor is a dual secondary radar system with plot extraction facilities and remote control and monitoring capability. Each site provides radar plot, track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site but does not directly connect to the ATCS. Information provided by the radar supports ATC Operations. Communications between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.23.2 Interface Definition

Type:	Serial - synchronous
Description:	HDLC, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX
Message Definition:	ASTERIX message types 001 Radar target report 002 Radar service message
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	'D' type 25 pin at input to Radar Distribution Unit (RDU)
Reference:	Specification IRS-20MP/L INDRA COCESNA

3.23.3 Special Features

Radar data links are organized as simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.23.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.23.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown in below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.23.5-1 HDLC Frame Structure

3.24 MSSR RSM 970 THALES

3.24.1 General

The MSSR sensor is a dual secondary radar system with plot extraction facilities and remote control and monitoring capability. Each site provides radar plot, track data in a standard format to the ATCS. A remote monitoring and control (M&C) terminal is located at the ATCS site but does not directly connect to the ATCS. Information provided by the radar supports ATC

Operations. Communications between the ATCS and the radar site is provided by telephone channels, using satellite links and land-lines.

3.24.2 Interface Definition

Type:	Serial - synchronous
Description	HDLC, Simplex – one way transmission
Data Type:	Radar data
Format:	ASTERIX
Message Definition:	ASTERIX message types 001 Radar target report 002 Radar service message
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	‘D’ type 25 pin at input to Radar Distribution Unit (RDU)
Reference	TBD

3.24.3 Special Features

Radar data links are organized as simplex transmission from Radar to ATCS. The serial data stream is synchronous with the clock provided by the source (radar site). Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.24.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.24.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown in below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.24.5-1 HDLC Frame Structure

3.25 AMS (Alenia Marconi Systems) Interface (Intercenter System Radar Track)

3.25.1 General

This interface allows to send and receive system track data, resulting of the fusion of the information from several PSR/MSSR and MSSR sensors, the coordinate are sent in latitude, longitude. The track is sent with the flight Plan information associated to the track. The cycle update is generated by the center, usually 4, 5 or 10 sec. Communications is provided between the ATCS and the radar site by telephone channels, using landline and microwave links.

3.25.2 Interface Definition

Type:	Serial - synchronous
Description	HDLC, Full-duplex
Data Type:	System Track data
Format:	ASTERIX
Message Definition:	ASTERIX message types 062 Radar target report 063 Sensor status service message
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	'D' type 25 pin at input to Radar Distribution Unit (RDU)
Reference	EUROCONTROL Surveillance Data Exchange

3.25.3 Special Features

System Track Radar data links are organized as full-duplex transmission from ATCS to an adjacent ATCS. The serial data stream is synchronous with the clock provided by the source ATCS. Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.25.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.25.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown in below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.25.5-1 HDLC Frame Structure

3.26 Inter-CINDACTA (Intercenter System Radar Track)

3.26.1 General

This interface allows to send and receive system track data, resulting of the fusion of the information from several PSR/MSSR and MSSR sensors, the coordinate are sent in stereographical projection referenced to the Center. The track is sent with the CALLSIGN associated to the track. The cycle update is generated by the center, usually 4, 5 or 10 sec. Communications is provided between the ATCS and the radar site by telephone channels, using landline and microwave links.

3.26.2 Interface Definition

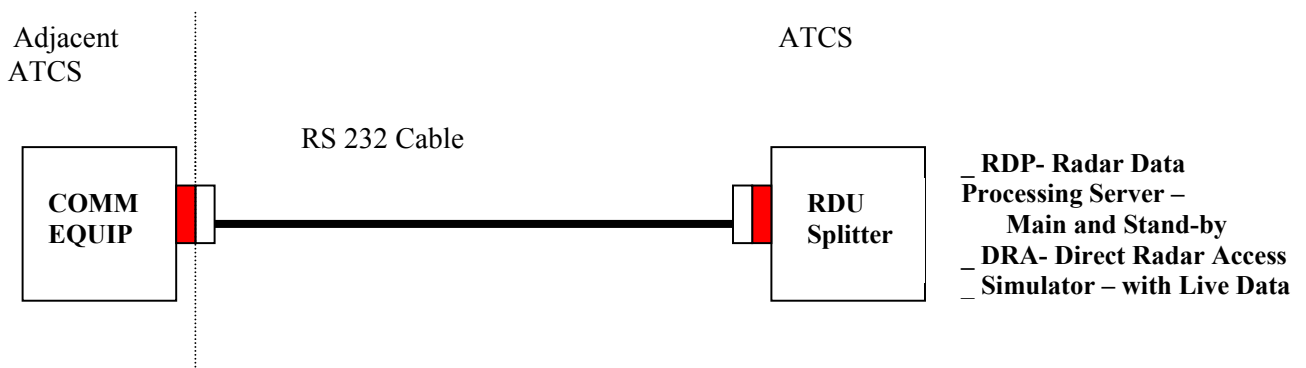
Type:	Serial – binary-synchronous
Description	Full-duplex (TVT2)
Data Type:	Radar data
Format:	System Radar Data
Message Definition:	TVT2 messages types – Ref. ‘Procedure de Transmission TVT2’
	Message ‘Status’ (Sector Message)
	Message ‘Piste’ (Track Report)
	Message ‘Correspondance Horloge’ (North Mark)
	Message ‘Suppression Piste’ (Track Drop)
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232
Physical Connection:	‘D’ type 25 pin at input to Radar Distribution Units
Reference	SICD ACC-BS

3.26.3 Special Features

These interface use a common format (TVT2) for data transmission between the ATCS Site from/to an adjacent ATCS center.

3.26.4 Typical Interface Connection for BI-SYNC Protocol

The following diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.



SATCOM Equipment
Connector 25 pin 'D' type (F) DCE
Pin Configuration
1 Protective Ground (Frame)
2 Transmit data
3 Receive data
7 Signal Ground (Common
Return)
17 Receive Clock
24 Transmit Clock

ATC Equipment
Connector 25 pin 'D' type (F) DTE
Pin Configuration
1 Protective Ground (Frame)
2 Transmit data
3 Receive data
7 Signal Ground (Common
Return)
17 Receive Clock
24 Transmit Cloc

3.26.5 Interface Protocol

The data provided by the radar site is formatted into a BISYNC data block as shown below. Order of transmission is LSB sent first.

SYN	SYN	SOH	HEADER	STX	TEXT	ETX/ETB	BCC
-----	-----	-----	--------	-----	------	---------	-----

Table 3.26.5-1 Binary Synchronous Frame Structure

3.27 INDRA Interface (Intercenter System Radar Track)

3.27.1 General

This interface allows to send and receive system track data, resulting of the fusion of the information from several PSR/MSSR and MSSR sensors, the coordinate are sent in latitude, longitude. The track is sent with the flight Plan information associated to the track. The cycle update is generated by the center, usually 4, 5 or 10 sec. Communications is provided between the ATCS and the radar site by telephone channels, using landline and microwave links.

3.27.2 Interface Definition

Type:	Serial - synchronous
Description	HDLC, Full-duplex
Data Type:	System Track data
Format:	ASTERIX
Message Definition:	ASTERIX message types 062 Radar target report 063 Sensor status service message
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	'D' type 25 pin at input to Radar Distribution Unit (RDU)
Reference	EUROCONTROL Surveillance Data Exchange

3.27.3 Special Features

System Track Radar data links are organized as full-duplex transmission from ATCS to ATCS. The serial data stream is synchronous with the clock provided by the source ATCS. Each physical communications link consists of two signals, data and clock, from the radar site. The HDLC procedure is defined in accordance with ISO 3309 for one way transmission with no acknowledgement of received frames.

3.27.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the radar serial interface. See also Figure 3.1-1 for details of the Radar Distribution Unit.

3.27.5 Interface Protocol

The data provided by the radar site is formatted into an HDLC frame structure as shown in below. Order of transmission is LSB sent first.

FLAG	ADDRESS	CONTROL	ASTERIX MESSAGE BLOCK	FCS	FLAG
01111110	8 bits	8 bits	Variable length (bytes)	16 bits	01111110

Table 3.27.5-1 HDLC Frame Structure

3.28 Flight Plan interface with Hand-off Coordination ICAO

3.28.1 General

The Aeronautical Fixed Telecommunications Network (AFTN) is a Worldwide network specifically for the transmission of Flight Plans and related information (aeronautical and meteorological) between Airports, ATC Centers, Meteorological centers and Air Traffic Services. The network is essentially a low speed data network designed for use over low-grade telephone lines. Data rates can be as low as 75 baud (telex rates) or may be as high as 9.6 kbps as output from modern Automatic Message Switch System (AMSS). These AMSS usually form a hub at many centers to provide local distribution and also allow direct access to the network. Communications between the ATCS and the AMSS is provided by point-to-point serial digital links. The AMSS is also referred to as a AFTN Server in this document.

3.28.2 Interface Definition

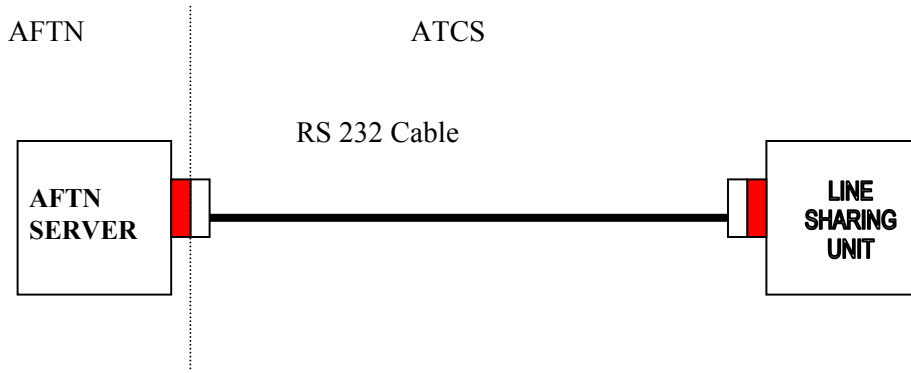
Type:	Serial - asynchronous
Description	FULL DUPLEX
Data Type:	AFTN messages
Format:	ICAO
Message Identity:	FPL, CHG, CNL, DLA, DEP, CPL, EST, ARR, including also CDN, LAM and ACP for Hand-off
Message Definition:	Refer to ICAO Annex 10 and Doc 4444
Data Rate:	2.4 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	'D' type 25 pin at input to Flight Data Processors
Reference	ICAO Doc 4444

3.28.3 Special Features

A line-sharing unit is employed at the input to the FDPs to allow for un-interrupted connection should one of the FDPs fail and a switch over occurs.

3.28.4 Interface Connection

The following diagram defines the interface connection point for the AFTN serial interface. See also Figure 3.1-4 for details of the connection to the FDP processors.



Connector 25 pin 'D' type (F) DCE
Pin Configuration

1	Protective Ground (Frame)
2	Transmit data
3	Receive data
4	Request to Send
5	Clear to Send
7	Signal Ground (Common Return)

ATC Equipment
Connector 25 pin 'D' type (F) DTE
Pin Configuration

1	Protective Ground (Frame)
2	Transmit data
3	Receive data
4	Request to Send
5	Clear to Send
7	Signal Ground (Common Return)

3.29 Flight Plan interface without Hand-off Coordination ICAO

3.29.1 General

The Aeronautical Fixed Telecommunications Network (AFTN) is a Worldwide network specifically for the transmission of Flight Plans and related information (aeronautical and meteorological) between Airports, ATC Centers, Meteorological centers and Air Traffic Services. The network is essentially a low speed data network designed for use over low-grade telephone lines. Data rates can be as low as 75 baud (telex rates) or may be as high as 9.6 kbps as output from modern Automatic Message Switch System (AMSS). These AMSS usually form a hub at many centers to provide local distribution and also allow direct access to the network. Communications between the ATCS and the AMSS is provided by point-to-point serial digital links. The AMSS is also referred to as a AFTN Server in this document.

3.29.2 Interface Definition

Type:	Serial - asynchronous
Description	FULL DUPLEX
Data Type:	AFTN messages
Format:	ICAO
Message Identity:	FPL, CHG, CNL, DLA, DEP, CPL, EST, ARR
Message Definition:	Refer to ICAO Annex 10 and Doc 4444
Data Rate:	2.4 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	'D' type 25 pin at input to Flight Data Processors
Reference:	ICAO Doc 4444

3.29.3 Special Features

A line-sharing unit is employed at the input to the FDPs to allow for un-interrupted connection should one of the FDPs fail and a switch over occurs.

3.29.4 Interface Connection

The 3.26.4 diagram defines the interface connection point for the AFTN serial interface. See also Figure 3.1-4 for details of the connection to the FDP processors.

3.30 OLDI Interface

3.30.1 General

This interface is used to coordinate Flight Plans (Hand-Off) between Adjacent ATC Centers. This protocol is used for Entry Coordination and Exit Coordination, using a specific set of messages to transfer a flight Plan from/to a Adjacent Center, with specific signalization on the Human-Machine Interface to the Controller.

3.30.2 Interface Definition

Type:	Serial - synchronous
Description:	X.25, HDLC, FULL DUPLEX
Data Type:	Flight Plan Coordination
Format:	OLDI
Message Identity:	ABI, ACT, REV, PAC, MAC e LAM
Message Definition:	Refer to OLDI EUROCONTROL doc
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	'D' type 25 pin at input to Flight Data Processors
Reference:	Estándar de Eurocontrol de intercambio de datos en línea (OLDI, On-Line Interchange) Eurocontrol Edición 2.3 diciembre de 2001

3.30.3 Special Features

A line-sharing unit is employed at the input to the FDPs to allow for un-interrupted connection should one of the FDPs fail and a switch over occurs.

3.30.4 Interface Connection

The 3.1.4 diagram defines the interface connection point for the OLDI serial interface.

3.30.5 Interface Protocol

The data provided by the radar site is formatted into a BISYNC data block as shown below. Order of transmission is LSB sent first.

SYN	SYN	SOH	HEADER	STX	TEXT	ETX/ETB	BCC
-----	-----	-----	--------	-----	------	---------	-----

Table 3.30.5-1 Binary Synchronous Frame Structure

3.31 AIDC interface

3.31.1 General

This interface is used to coordinate Flight Plans (Hand-Off) between Adjacent ATC Centers. This protocol is used for Entry Coordination and Exit Coordination, using a specific set of messages to transfer a flight Plan from/to a Adjacent Center, with specific signalization on the Human-Machine Interface to the Controller.

3.31.2 Interface Definition

Type:	Serial - synchronous
Description:	X.25, HDLC, FULL DUPLEX (and future ATN)
Data Type:	AIDC messages
Format:	ICAO
Message Identity:	ABI, CPL, EST, PAC, ACP, MAC, LAM, LRM, TOC, AOC
Message Definition:	Refer to ICAO Doc
Data Rate:	2.4 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	'D' type 25 pin at input to Flight Data Processors
Reference:	APANPIRG ICD

3.31.3 Special Features

A line-sharing unit is employed at the input to the FDPs to allow for un-interrupted connection should one of the FDPs fail and a switch over occurs.

3.31.4 Interface Connection

The 3.26.4 diagram defines the interface connection point for the HDLC (X.25) serial interface. See also Figure 3.1-4 for details of the connection to the FDP processors.

3.31.5 Interface Protocol

The data provided by the radar site is formatted into a BISYNC data block as shown below. Order of transmission is LSB sent first.

SYN	SYN	SOH	HEADER	STX	TEXT	ETX/ETB	BCC
-----	-----	-----	--------	-----	------	---------	-----

Table 3.31.5-1 Binary Synchronous Frame Structure

3.32 ATCS to ATCS (CINDACTA) Interface Flight Plan Data Message

3.32.1 General

Flight plan data will be exchanged between the ATCS and adjacent ATCS (CINDACTA). The primary communication path for this exchange is via the digital comms infrastructure. Digital comms nodes are available at the major sites and are interconnected using digital data links. The links are supported by landline, microwave or satellite links. The information that is provided by these links supports ATC Operations. The communication path between the SCO and a CINDACTA is a point to point data circuit.

3.32.2 Interface Definition

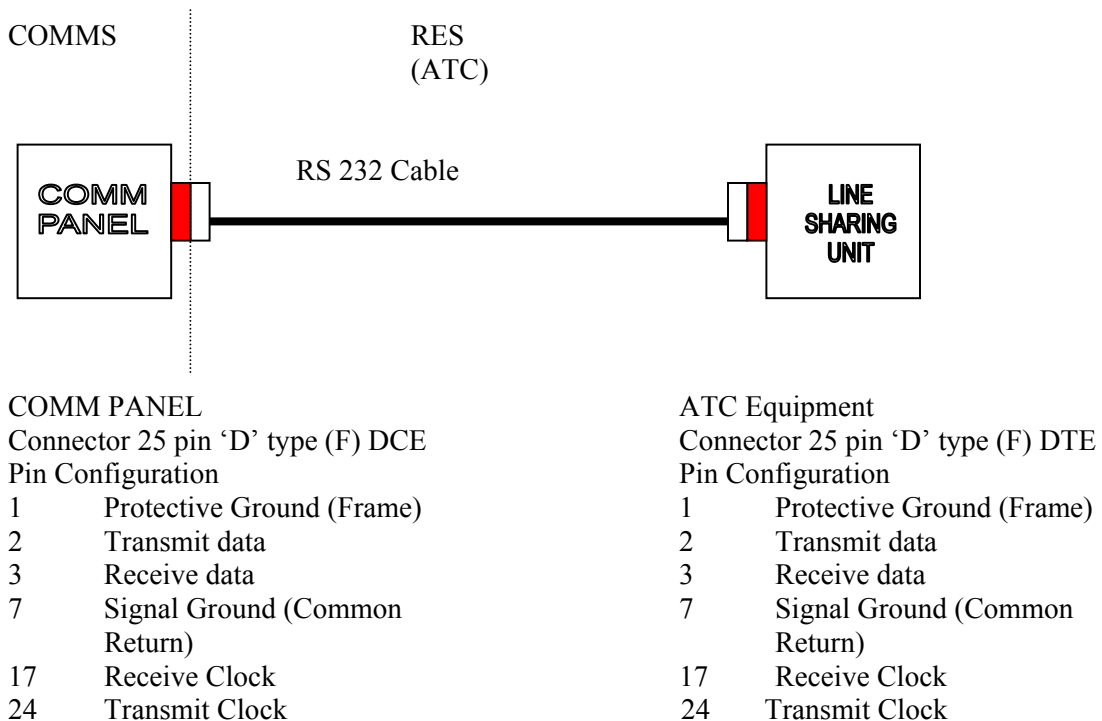
Type:	Serial – binary-synchronous
Description	FULL DUPLEX (TVT2)
Data Type:	Flight Plan Data
Format:	ICAO in TVT2 wrapper
Message Identity:	CDN, LAM, ACP
Message Definition:	Refer to Doc 4444
Data Rate:	9.6 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	'D' type 25 pin at input to FDPS
Reference	SICD ACC-BS

3.32.3 Special Features

The Line Sharing Units allow connection between the active Flight Plan Data Processor of the ATCS and the equivalent units in the adjacent CINDACTA. The active FDP will exchange messages for flights in a defined region on each side of the FIR boundary, controlled by the respective ATC centers. Messages will be received and transmitted using NOS to implement the network communications function.

3.32.4 Interface Connections

The following diagram defines the interface connection point for the SCO to CINDACTA serial interface. See also Figure 3.1-4 for details of the connection to the FDP processors.



3.32.5 Interface Protocol

The data provided by the SCO is formatted into a BISYNC data block as shown in below. Order of transmission is LSB sent first.

SYN	SYN	SOH	HEADER	STX	TEXT	ETX/ETB	BCC
-----	-----	-----	--------	-----	------	---------	-----

Table 3.32.5-1 Binary Synchronous Frame Structure

3.33 RCMS (Radar Sensors) Interface

3.33.1 General

For each of the PSR/MSSR sensors, MSSR sensors and the 3-D radars, Remote Control and Monitoring facilities are provided. The Remote monitoring and control (M&C) terminals which can be situated both at the radar head (site) and in the ATCS are used to control (configure) and monitor the status of the radars. The data links used with the remote monitoring and control (M&C) terminals are the same type as used for the radar data except the links are full-duplex in operation. These remote monitoring and control (M&C) terminals which are situated in the ATCS do not directly connect to the ATCS. Communications between the ATCS and the radar site is provided by telephone channels, satellite links and land-lines.

3.33.2 Interface Definition

Part of the Radar system. Refer to the specific Radar ICD such as: G630621, G628715 and IC808136/802

3.33.3 Special Features

One remote terminal will be provided for each radar site.

3.34 AFTN AMSS (to/from AIS) Interface

3.34.1 General

The Aeronautical Fixed Telecommunications Network (AFTN) is a Worldwide network specifically for the transmission of Flight Plans and related information (aeronautical and meteorological) between Airports, ATC Centers, Meteorological centers and Air Traffic Services. The network is essentially a low speed data network designed for use over low-grade telephone lines. Data rates can be as low as 75 baud (telex rates) or may be as high as 9.6 kbps as output from modern Automatic Message Switch System (AMSS). These AMSS usually form a hub at many centers to provide local distribution and also allow direct access to the network. Communications between the ATCS and the AMSS is provided by point-to-point serial digital links. The AMSS is also referred to as a Text Server in this document.

3.34.2 Interface Definition

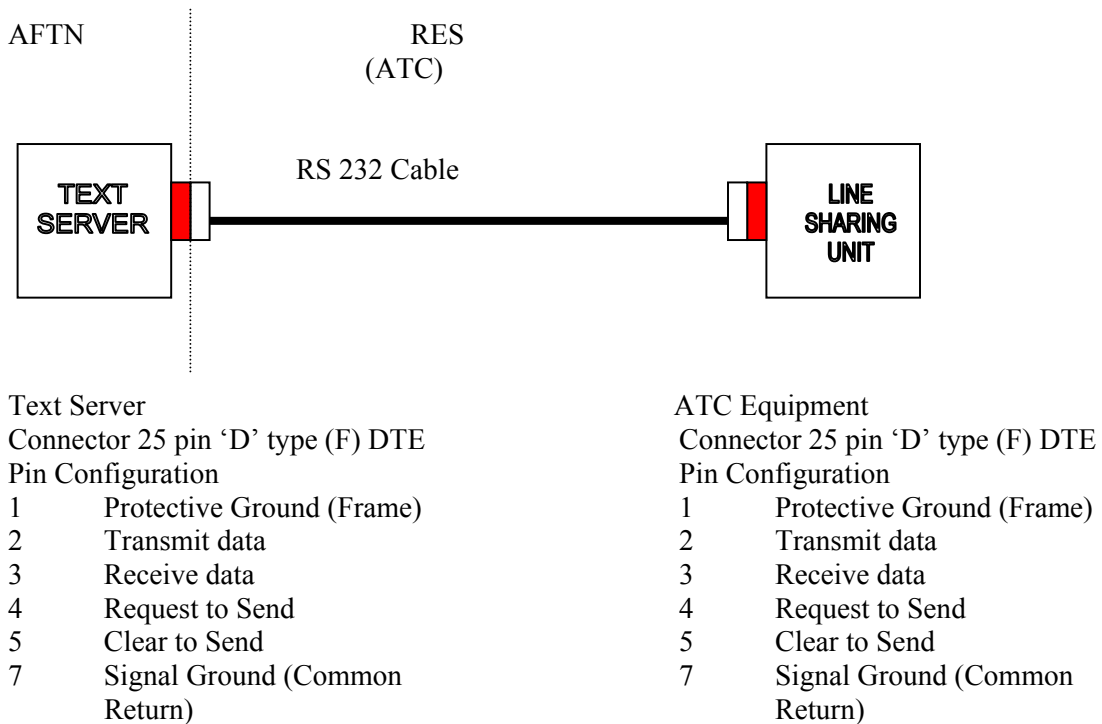
Type:	Serial - asynchronous
Description:	FULL DUPLEX
Data Type:	AFTN messages
Format:	ICAO
Message Identity:	AFTN Messages
Message Definition:	Refer to ICAO Annex 10 Wind Data ICAO_Meteorological Data
Data Rate:	2.4 kbps
Electrical Characteristics:	RS 232c V24/V28
Physical Connection:	'D' type 25 pin at input to AIS Processors

3.34.3 Special Features

A line sharing unit is employed at the input to the AIS servers to allow for un-interrupted connection should one of the AIS fail and a switch over occurs.

3.34.5 Interface Connection

The following diagram defines the interface connection point for the AFTN serial interface. See also Figure 3.1-4 for details of the connections to the FDP and AIS processors.



3.35 Time Server to ATCS Interface (Time Synchronization Message)

3.35.1 General

The Time server sent Time synchronization Messages to the ATCS dual LAN, using nntp service in the RDP to synchronize all the workstations. This will provide the System Time.

3.35.2 Interface Definition

Type:	LAN
Description	Ethernet
Data Type:	Time synchronization Message
Format:	TCP/IP, Internal LAN Message structure
Message Identity:	ATCS TimeSynchronization
Message Definition:	LAN Message Time synchronization
Source Mail Box:	(TBD)
Source IP Address:	(TBD)
Destination Mail Box:	(TBD)
Destination IP Address:	(TBD)
Data Rate:	100 Mbps
Electrical Characteristics:	ISO3309 and ISO7776
Physical Connection:	RJ45

3.35.3 Special Features

A time synchronization message will be generated at regular intervals (every 10 seconds) to ensure that the ATCS has the same time, which is synchronized to the GPS Universal Time Coordinated (UTC). The message will be sent to a unique node address in the ATCS using a Mail box number scheme.

3.35.4 Interface Protocol

The data provided by the Time server is formatted into a Message data block. Order of transmission is LSB sent first.

Figure 3.1-1 Typical Radar Data Interface – dual links from each radar (A+B)

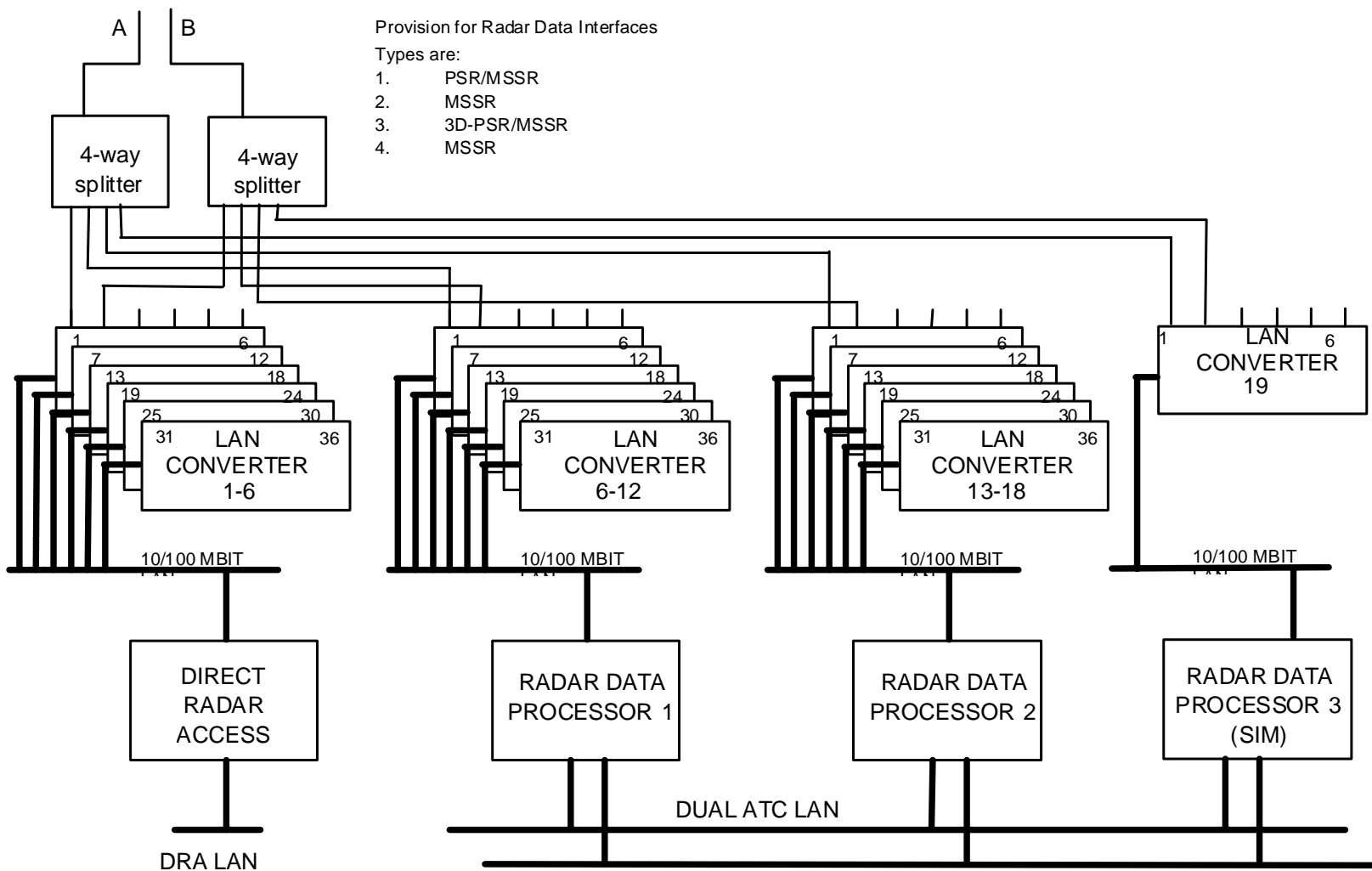


Figure 3.1-2 Typical Interface to the AGP for Future ADS Data Reception

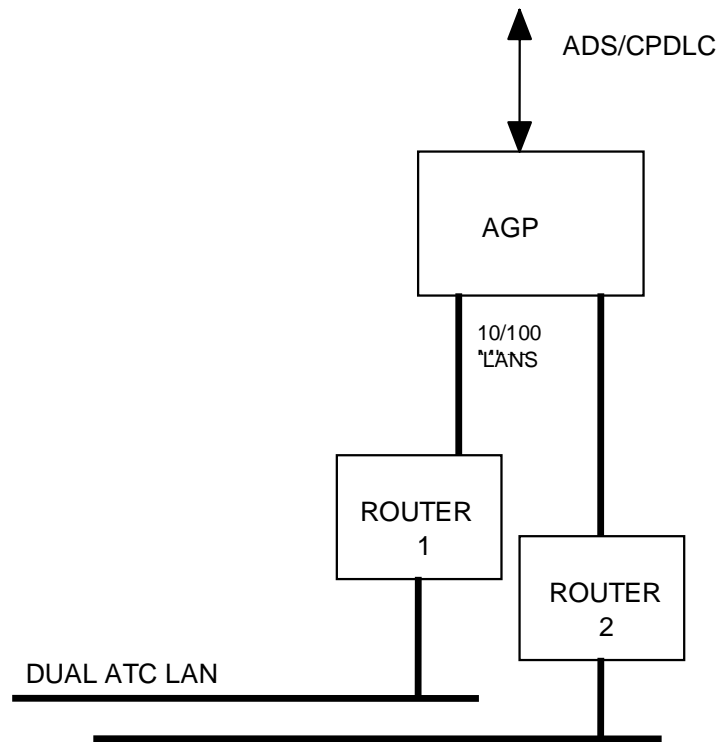


Figure 3.1-3 Typical ATCS Configuration

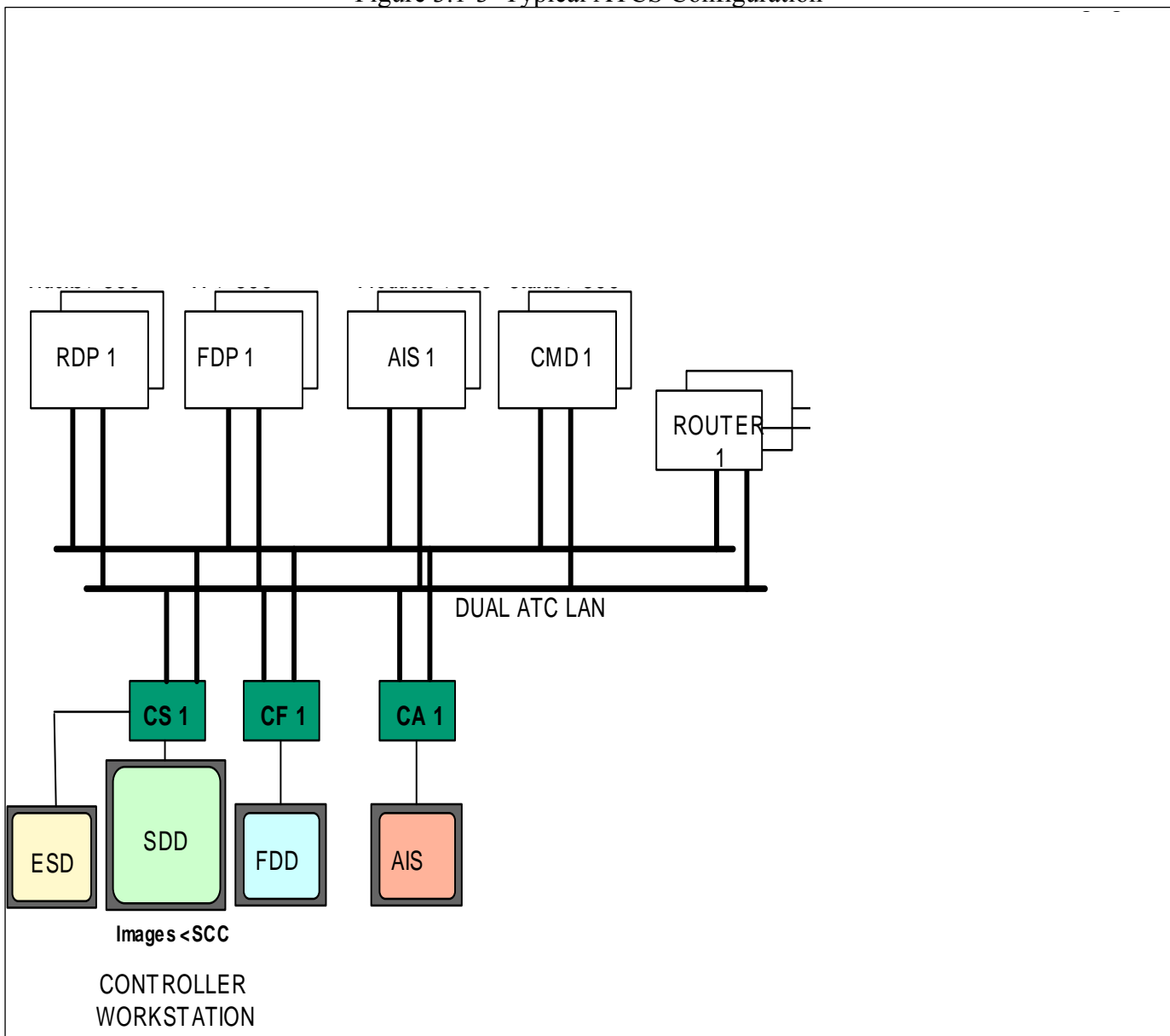
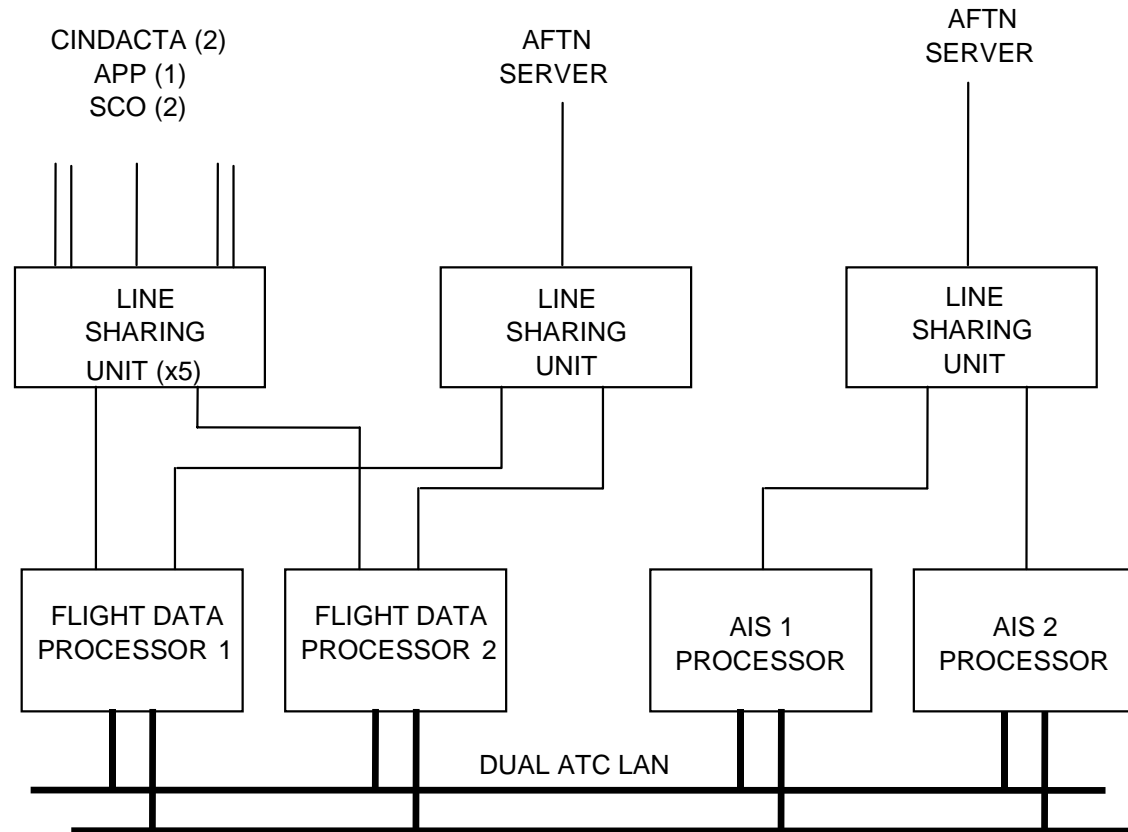


Figure 3.1-4 Interface to ATC Centers and AFTN for Flight data exchange



4.0 Recommended interfaces

The recommend interfaces are:

_ Surveillance: as defined in the Item 3.25 – Intercenter ASTERIX Radar Data category 62 and 63.

_ Flight Plan: as defined in the item 3.31 – AIDC Messages over ATN.

5.0 Notes

5.1 Glossary

This section contains a list of abbreviation used in this document.

AFTN	Aeronautical Fixed Telecommunications Network
AGDLIC	Air/Ground Data Link Interface Controller
AIS	Aeronautical Information Services
AMS	Alenia Marconi Systems
AMSS	Automatic Message Switch System
APP	Approach Control
ASTERIX	All purpose structure Eurocontrol radar information exchange
ATC	Air Traffic Control
ATCS	Air Traffic Control System
CFE	Customer Furnished Equipment
CINDACTA	Centro Integrado de Defesa Aerea e Controle de Trafego Aereo
DCE	Data Circuit-Terminating Equipment
DTE	Data Terminal Equipment
EMA	Altitude Weather Station
EMS	Surface Meteorological Station
FCS	Frame Check Sequence
FDDI	Fibre (optic) Distributed Data Interface
FDP	Flight Data Processor
FIR	Flight Information Region
FP	Flight Plan
GPS	Global Positioning Satellite
HDLC	High-level data link control
HF	High Frequency
HTTP	Hyper-text Transfer Protocol
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
IDD	Interface Design Document
IRS	Interface Requirements Specification
LAB	Laboratory
LAN	Local Area Network
M&C	Monitor and Control
MSSR	Monopulse Secondary Surveillance Radar
NOTAM	Notice to Airmen
OUE	User Organization Equipment
PSR	Primary Surveillance Radar

RDP	Radar Data Processor
RDSS	Radio Determination Sub-system
RDU	Radar Distribution Unit
RES	Raytheon Electronic Systems
RF	Radio Frequency (normally rf)
RM	Regional Monitoring
RPL	Repetitive Flight Plan
RS	Remote Sensing
SCD	Brazilian low Earth orbiting satellite
SCO	Operations Sub-center
SICD	System Interface Control Document
SIVAM	System for the Vigilance of the Amazon
STV	Data Treatment and Visualization Center
TBD	To be determined
TCP/IP	Transmission Control Protocol/Internet Protocol
TEL	Telecommunications
TIROS	Television and infra-red observation satellite
UDP	User Datagram Protocol
UTC	Universal Time Coordinated
VCCS	Voice Communications Control System
WAN	Wide Area Network
WMO	World Meteorological Organization

APPENDIX B

**CAR/SAM AUTOMATED ACC INTERCONNECTION
PLAN**

PREFACE

This document defines the Plan for Automated ACC Interconnection of the CAR/SAM region. This document is subject to change based on continuing review by ICAO Offices and the States members.

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1. PURPOSE

1.1 Identification

This document presents the operational concept, objectives and strategies for the Interconnection of Automated Air Traffic Control Centers of the CAR/SAM Regions, and establishes the related Implementation Plan.

1.2 Overview

Air Traffic Control Centers of the CAR/SAM Regions have been faced with difficulties on proper air traffic coordination, that has been appointed as a major contributing factor to air traffic incidents, which could be significantly reduced through the Interconnection of the Automated Air Traffic Control Systems. The interconnection is based on an implementation strategy that counts on the REDDIG and MEVA II VSAT networks as the primary means for all required data communication. Whilst considering the interconnection of ACCs with automated systems as the main objective, alternate solutions to improve air traffic coordination with and between non-automated Centers are also dealt with. Detailed information on all relevant aspects of the interconnection is contained in the following sections of this document.

1.2.1 Introduction

The interconnection of the Automated Air Traffic Control Centers will allow the implementation of automated air traffic coordination for the transfer of control responsibilities between adjacent Area Control Centers of the CAR/SAM Regions, thus reducing the risks of aeronautical incidents due to eventually improper coordination activities, whilst also improving the planning phases for an efficient control of the flights coming or leaving from the corresponding Flight Information Regions (FIR). In order to accomplish the interconnection, the regional office of ICAO at Lima established the following agenda of activities, within the scope of Project RLA98/003:

- Missions to States, for Data Gathering: Activity performed during 2007, by a team of experts provided by DECEA and ICAO/LIMA, with the purpose of assessing the current situation of the automated air traffic control systems installed in the Area Control Centers of CAR/SAM States. On site technical visits were accomplished in Peru, Ecuador, Venezuela, Colombia, Panama, COCESNA, Chile, Uruguay, Argentina and Brazil.

- Elaboration of the Interface Control Document (SICD): based on the data collected during the visits, the team prepared a document of interfaces that contains all the related data and a description of the existing interfaces of the many systems available at the ACCs of CAR/SAM States, therefore, providing an overview of the current situation and providing the subsidies for adopting the necessary measures to interconnect those systems.
- Interconnection Plan: based on the information consolidated in the SICD and taking into consideration the peculiarities of each State's ACCs, an interconnection plan is being proposed, which is the aim of this document. Thus, the present document represents the summary of the work done by the team of experts and outlines the objectives, concepts, strategy and actions deemed necessary for the accomplishment of the operational requirements associated with the interconnection of automated ATC Facilities.

In order to assess the complexity and technical feasibility of a system interconnection between adjacent ATC centers, a team of technical experts provided by a SAM Air Navigation Services Provider (ANSP), duly coordinated by ICAO-Lima, performed interconnection tests between the automated systems of Manaus-ACC (FIR Amazonica), in Brazil and Maiquetía-ACC (FIR Maiquetía) in Venezuela, with excellent results and thus validating the proof-of-concept activity.

1.3 Context Diagram

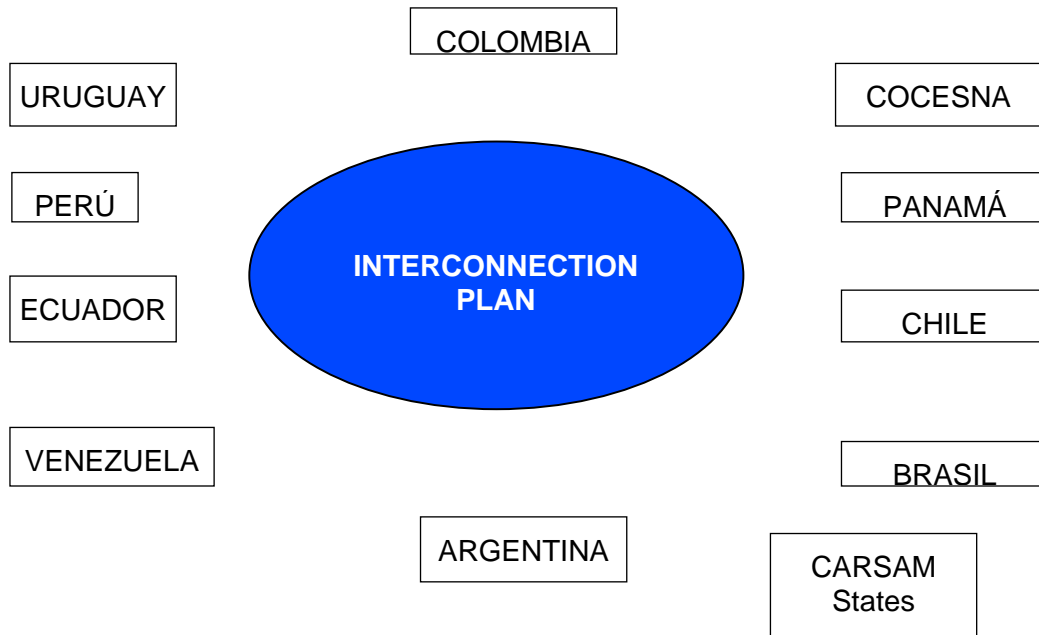
This interconnection plan is applicable in the context of the automated ATC Facilities, namely ACCs, of CAR/SAM States, with characteristics as follows:

The data flows will be established between adjacent ACCs, subject to formal operational agreements. Data will encompass:

- Flight plan data (up-dated); and
- Surveillance (Radar) data.

The data flow will occur in both directions.

FIGURE 1.3-1 CARSAM CONTEXT (WITH THE VISITED STATES)



1.4 Organization of the Document

This document presents the operational concept, objectives and strategies for the Interconnection of Automated Air Traffic Control Centers of the CAR/SAM Regions, and establishes the related Implementation Plan, according to the operational requirements presented by users. It also describes how the System will be used and its relationship with other existing systems.

This document is divided in the following chapters:

- Section 1 Purpose: introduction and overview of the system.
- Section 2 Reference documents: list of the applicable documents relevant to this document.
- Section 3 System or Current situation: describes the system or the current procedure that the user requires to be changed.
- Section 4 Justifies the nature of the changes: justifications for a new or a modified system and any restrictions to the current system.
- Section 5 Concepts of the new or the modified system: describes the system being proposed.
- Section 6 Operational Setting: describes one or more operational settings in the new or modified system.

- Section 7 Summary of the Impacts: impacts on the organization arising from the implantation of the new or the modified system.
- Section 8 Analysis of the proposed system: analysis of the advantages and disadvantages of the proposed system.
- Section 9 Notes: abbreviations and definitions used in this document.

2. DOCUMENTS OF REFERENCE

STANDARDS

OLDI	Standard Document for On-Line Data Interchange (EUROCONTROL).
Preliminary CARSAM SICD	Preliminary System Interface Control Document for the Interconnection of ACC Centers of the CARSAM Region
SICD RADNET	System Interface Control Document for the EUROCONTROL RADNET
DOC 9705	Manual of Technical Provisions for the Aeronautical Telecommunication Network (ATN)
DOC 4444-PANS/ATM	AIR TRAFFIC MANAGEMENT
Annex 10 – Vol III	Aeronautical Telecommunications
ASIA/PACIFIC ICD FOR AIDC	ASIA/PACIFIC INTERFACE CONTROL DOCUMENT FOR ATS INTERFACILITY DATA COMMUNICATIONS

3. CURRENT SITUATION

3.1 Statements, Objectives and Scope

The interconnection of automated systems of Air Traffic Control Facilities of the CAR/SAM regions has the objective of establishing the automated transmission of flight plan data and surveillance data of the flights that are transitioning from one FIR to the adjacent FIR, as a way of improving the air traffic control coordination process and transfer of control of flights between affected Air Traffic Control Centers. The system's interconnection will be dependant upon the application of specific procedures and filtering criteria, that will allow the control of the process of the distribution of the information to accredited users only.

The Interconnection Plan is subject to further detailing in the operational agreements, to be established between the interested ATC Facilities.

3.2 Policies and Operational Restrictions

3.2.1 Organization

The ICAO SAM Regional Office (Lima) will coordinate the implementation of the plan with the States involved, publishing criteria and policies for the shared use of the information on flights, of strictly civil nature.

The implementation of the Plan demands the signing of operational agreements between the States interested in sharing the information.

Those agreements will give due considerations to all the relevant technical and operational aspects, with clear statement of the responsibilities and duties of each part, as well as the designation of the respective managers and points of contact.

Each participating State may define that portions of its FIR where surveillance and flight plan data are to be shared, observing, however, that the common areas of interest are large enough to allow the timely completion of air traffic coordination for all flights concerned, as established by ICAO Standards.

A specific Managing Committee will be created with a mandate of supervising the provisions and implementation of this Plan, coordinated by ICAO-Lima and having representatives of the participating States as members.

All the suggestions to enhance the Plan or to clarify operational questions shall be submitted to the consideration of ICAO-Lima.

3.2.2 Information Security

The usage of information made available according to this Plan shall remain restricted to applications of the civil air traffic control systems. For that, each participating State shall implement all reasonable measures in order to guarantee the integrity and confidentiality of information. Also, release of the information to third parties shall not be allowed without prior authorization of the Managing Committee, in written.

In order to assure the level of security for the information, the Management Committee may conduct periodical site visits, being in a position of denying the continuity of the interconnection service if there is a clear and serious risk of data corruption or misuse.

3.3 Current Scenario

At the time of elaboration of this document, many States and/or ANSPs own a national net of fixed radars and get a synthesis of the information received from those sensors which, complemented by flight plan information, constitutes basic data used for air traffic control. In addition to these data, other information from adjacent ATC Units may be fed into the automated systems, in order to provide a wider picture of the air traffic under their responsibility.

The transfer of responsibility of control of flights between adjacent Centers is initiated via transmission of data from the flight plans through AFTN messages and is finally accomplished through oral bilateral communications of the air traffic controllers on duty. This manual, non-automated process, has been identified as a root-cause of several operational mishaps.

The missions to States of the ICAO Experts for data gathering purpose on the current ATC systems installed throughout the region, resulted in the elaboration of a document of external interfaces (SICD), which presents the description of the internal characteristics of ATC systems installed in the CAR/SAM regions.

The SICD provides an easy overview of different systems installed at ATC Facilities in the Region, developed and installed by different suppliers, with each system having its own architecture and reflecting a certain technological development stage. Therefore, some systems already are prepared to allow for the use of advanced technologies, such as ADS/CDPLC, whilst others still rely upon the use of basic features.

The visits to States confirmed that the system most widely installed in the region is AIRCON 2000, provided by INDRA. A total of five Area Control Centers already rely on this system, however, there are different versions of the mentioned system, with some different functionalities.

Radar coverage in the different FIR is quite diverse, the case being that some of them have full coverage at upper airspace levels, whilst in others only a very limited radar coverage is provided.

Another aspect that has been observed is the great difference on how dependent certain States are of the supplier of the solution. Some ANSPs depend totally on the supplier to implement even very simple changes to the system, whilst others succeeded in having a technical team highly capable and up-to-date, that is capable of performing configuration changes as needed and specify new functionalities to optimize the provision of air navigations services.

Throughout the region, only one effective case of radar data sharing has been implemented, between Argentina and Uruguay, with some others being under consideration and at different stages of the corresponding bilateral agreements. However, there are no implementations or concrete plans that deal with the coordination of crossborder flights in an automated way between air traffic control centers.

Although the existing systems of most ATC Centers present the basic feature that would allow coordinating flight plans through the OLDI protocol, this function is not in use yet, mainly due difficulties shown by the local technicians to configure the system accordingly, as well as the apparent differences of implementations of the protocol by the systems providers. In one case, a tentative establishment of flight plan coordination between two adjacent ACCs using OLDI went unsuccessful, probably due the differences of implementation of the protocol by competing providers.

Some ATC Systems make use of coordination messages (CDN, LAM, ACP) as specified in ICAO Document 4444-PANS/ATM for flight plan coordination between adjacent ACCs, this being the specific case of Brazil (where plans of eventually using OLDI for the same purpose and upgrading to AIDC are in place).

Also, Venezuela too has the capacity to coordinate through ICAO Document 4444-PANS/ATM Messages, and, although it is not been used operationally, this feature has been subject to feasibility demonstration during the interconnection tests conducted between Amazon-FIR and Maiquetía-FIR, that were realized in the scope of RLA/98/003.

Overall, only Chile makes operational use of an OLDI protocol implementation, in order to accomplish automated air traffic coordination between its ACC and national Approach Control Centers.

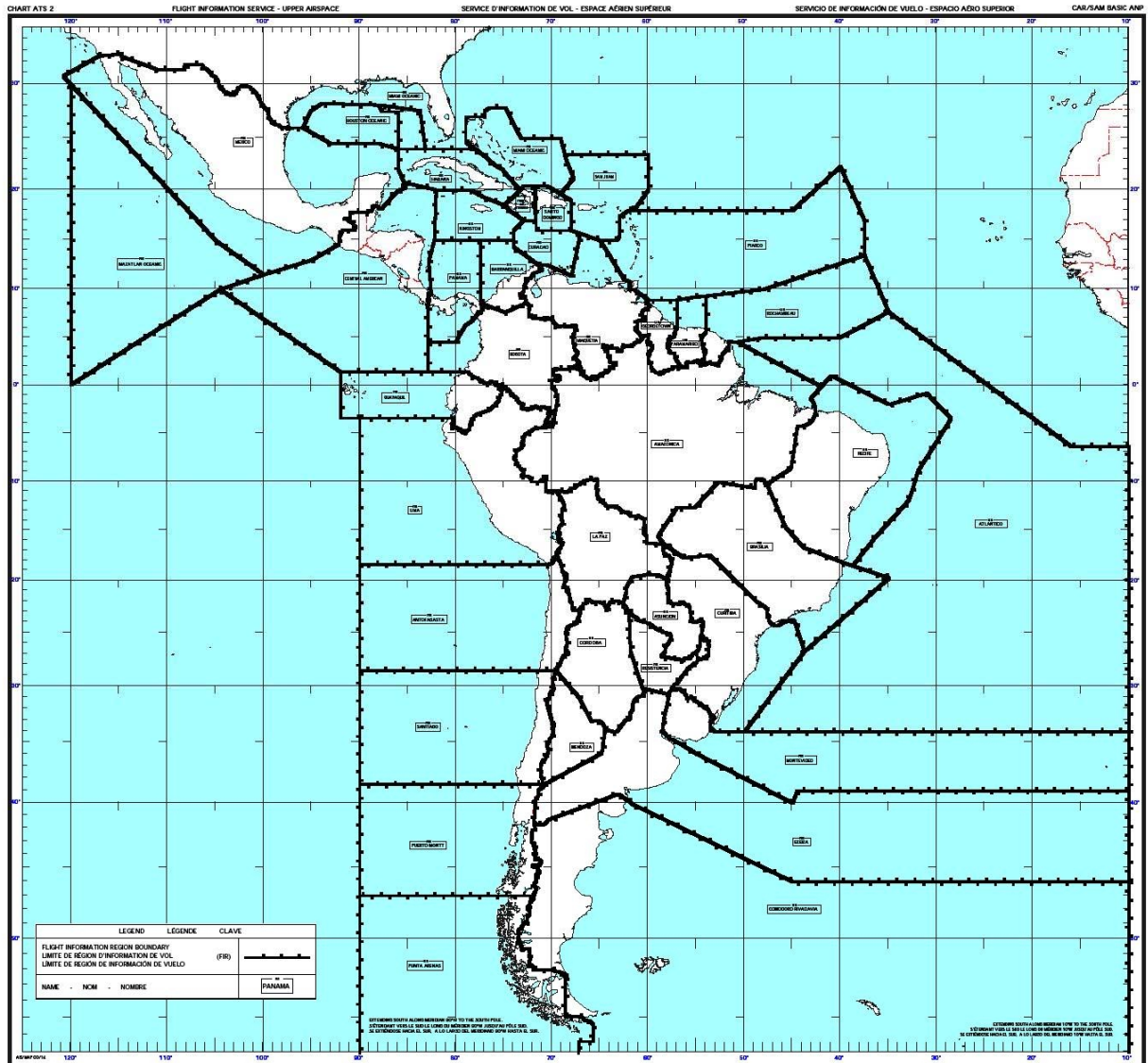
3.4 Organizations and Interested Users

The initial clients of the current Plan are the Air Navigation Service Providers of States or Organizations of the CAR/SAM regions that have, or are in the process of acquiring automated systems of air traffic control and, in the interest of better service provision for the end user, should take all reasonable action in order to share relevant surveillance and flight data information of operational interest.

3.5 Supporting Strategy

The implementation of the Automated ATC Systems Interconnection Plan counts on an active coordination role of ICAO, besides a strategy of fostering the support of the end users of the current system to speed up the interconnection implementation activities.

FIGURE 4-2 CAR/SAM ACC AREAS OF RESPONSIBILITY



The coordination of the air traffic, whilst being a relatively simple activity when done by organizations such as a TWR and APP installed at the same place, may become more complex when it involves organizations located far from each other or even in different States. In those cases, the success of the coordination depends totally on the communication means, on the resources for the exchange of information and the strict compliance of the standardized procedures for the completion of the task.

Not a long time ago, in the CAR/SAM region serious deficiencies were observed in all above mentioned aspects, especially the availability of the communication means. Furthermore, the total dependence on oral communications between air traffic controllers brought to evidence difficulties in understandings, because in certain cases the air traffic controllers' proficiency in the use of the common language has been below a level that would be considered as adequate.

The implementation of the REDDIG solved the communication deficiency, but the introduction of the Reduced Vertical Separation Minima (RVSM), the increase of the air traffic at international routes and air transport market characteristics that concentrate flights and generate peak loadings at certain hours, brought along new operational requirements and demand new, automated and integrated, solutions for improved air traffic control coordination. Any case, the need for a reduction in verbal coordination between adjacent control positions and ATC units has been consistently identified by ICAO and many ANSPs, worldwide.

Inefficiencies in the coordination process have been appointed as contributing to air traffic incidents and aircraft accidents and, therefore, a provision of ATS Safety Management calls for the *“automation systems {to} generate and display flight plan, control and coordination data in a timely, accurate and easily recognizable manner and in accordance with Human Factors principles”*.

4.1 “NON AUTOMATED” AIR TRAFFIC COORDINATION

The coordination and transfer of control of a flight between successive ATC units and control sectors is normally effected by a dialogue comprising the following stages:

- a) notification of the flight in order to prepare for coordination, as necessary;
- b) coordination of conditions of transfer of control by the transferring ATC unit;
- c) coordination, if necessary, and acceptance of conditions of transfer of control by the accepting ATC unit; and
- d) the transfer of control to the accepting ATC unit or control sector.

Although there are ICAO provisions and internal rules in each State for the use of standard expressions to be used in this process, it is known that situations vary a lot and the standard expressions, as well as letters of agreement, may not be enough to treat properly every case. Furthermore, although even the AFTN may be used for the exchange of coordination messages (CDN, LAM, ACP), what really happens is that the process is bound to the limitations of the human oral communication through telephone, and not always in the language that is the native idiom of the air traffic controllers involved.

There is an additional difficulty, arising from the increased workload that air traffic controllers have recently been faced with in the Region due to a growing demand of aircraft movements, a situation at which the other typical activities of tactical air traffic control may “compete” with the demands arising from the coordination process, consequently, making it more compelling to automate this process in order to alleviate the work load. Obviously, the flight plan and control information has to be transmitted in sufficient time to permit reception and analysis of the data by the receiving unit and necessary coordination between the units concerned.

Finally, recent information on Large Height Deviations (LHD) that were made public by the CARSAMMA (NE03/AP/ATM/13), indicate that the TLS for the RVSM operations at the CAR/SAM regions may not be maintained. For this reason, short term actions are urgently required in order to revert the unacceptable situation of more risks than those admitted by the TLS assessment. Among the main measures to be taken, the one to improve the air traffic coordination through interconnection of the ATC automated centers has been identified as a major initiative of capital interest.

4.2 “AUTOMATED” AIR TRAFFIC COORDINATION

The interconnection of the automated ATC centers, with the purpose of improving the air traffic coordination, needs an automatic interchange of the data from the surveillance subsystem and data from the flight plan processing subsystem, as set forth in the reference SICD.

ICAO provisions clearly recommend that “*States should, on the basis of regional air navigation agreements, provide for the automated exchange of coordination data relevant to aircraft being provided with ATS surveillance services, and establish automated coordination procedures*” (PANS/ATM, 8.1.6).

In the same line, at the regional level it has been stated at several occasions that the “*Progressive implementation of ATS interfacility data communications (AIDC)*” will enhance the safety of the airspace and would reduce category “M” error. Code M stands for Error in ATC-unit to ATC-unit transition messages, and account for the largest cause of LHDs since the monitoring system went into operation.

Based on the availability of surveillance systems coverage at areas of common interest of different FIRs, the following scenarios for automated data interchange can be identified:

- 1) Only surveillance data interchange;
- 2) Only flight plan data interchange; and
- 3) Both surveillance data interchange and flight plan data interchange.

4.2.1 Scenario 1 - Only surveillance data interchange

This case is limited to the situations where surveillance system (radar, ADS) coverage is available at the limits of adjacent FIRs and where, for some reason, there is no sharing and integration of radar data in the respective control centers.

Regarding this case, ICAO recommends that “*States should, to the extent possible, facilitate the sharing of information derived from ATS surveillance systems in order to extend and improve surveillance coverage in adjacent control areas*” (PANS/ATM, 8.1.5).

The recommended solution for surveillance data interchange is to share radar data, which should be implemented according the pertinent decisions of GREPECAS.

4.2.2 Scenario 2 - Only flight plan data interchange

This case covers the situations where there is NO coverage of the surveillance system (radar, ADS) at the limits of adjacent FIRs. Therefore, the data interchange is limited to the flight plan data, as updated by the correspondent flight plan processing system.

The automated exchange of updated flight plan data between adjacent ATC Centers has been classified of utmost importance for the optimization of air traffic coordination.

4.2.3 Scenario 3 - Both surveillance data interchange and flight plan data interchange

This is the situation where there is coverage of the surveillance system (radar, ADS) at the limits of adjacent FIRs and the interchange of flight plan data could also be obtained through the interconnection of the automated systems.

5. CONCEPTS FOR AUTOMATED ATC SYSTEMS INTERCONNECTION

5.1 Interconnection Levels

Based on the technical information gathered at Control Centers of the CAR/SAM region, as consolidated in the reference SICD, several levels of System Interconnection can be established, in regard of the coordination and exchange of flight plan data as well as exchange of surveillance data at areas of common interest.

The established interconnection levels are deemed to serve as planning factors for the definition of the implementation strategies, since they characterize and categorize the current stage and readiness of each ATC Center for such interconnection.

5.2 Flight Plan Data Exchange

The following table shows the Flight Plan Interconnection Levels identified:

Flight Plan Data Interconnection Level	Communication Protocol	State/ATC Center	Notes
1	AIDC	Argentina (Ezeiza, Cordoba)	System contemplated, but not used yet.
2	OLDI	Argentina, Chile, Colombia, Ecuador, Panamá, Uruguay, and CENAMER	System contemplated, but not used, with the exception of Chile.
3	ICAO Doc 4444 Coordination	Brazil, Venezuela	Implemented in the ACCs of Brazil for coordination between Internal Air Traffic Control Centers.
4	ICAO Doc 4444 (Manual Messages)		

TABELA 5.2-1 FLIGHT PLAN INTERCONNECTION LEVEL

5.2.1 AIDC Application

The passing of data on individual flights, over telephone, as part of the co-ordination process has always been a major support task at ATC units, particularly at Area Control Centers (ACC). Therefore, the operational use of direct connections between Flight Data Processing Systems (FDPS) at ACCs for the purpose of replacing such verbal "estimates", referred to as On-Line Data Interchange (OLDI), began within Europe in the early nineteen eighties.

ATS interfacility data communication (AIDC), as defined by ICAO, stands for automated data exchange between air traffic services units, particularly in regard to coordination and transfer of flights.

AIDC is an ATN application that is used by two air traffic service units to enable the exchange of ATS information for active flights related to flight notification, flight coordination, transfer of control, surveillance data and free (i.e. unstructured) text data.

AIDC application functions are applicable to normal-priority flight safety messages, encompassing the following:

- flight notification;
- flight coordination;
- transfer of control;
- transfer of communications;
- transfer of surveillance data; and
- transfer of general data.

The technical provisions for the AIDC application are defined in ICAO Doc 9705, Sub-volume III. An example of regional AIDC implementation may be found in the Asia/Pacific AIDC ICD, as referenced in this document.

It should to be noted that provisions on the AIDC application are currently also contained in ICAO Doc 4444, according to which AIDC messages, include:

- notification messages;
- coordination messages;
- transfer of control messages;
- general information messages; and
- application management messages.

When the transfer of control involves exchange of data, the proposal for transfer shall include information derived from an ATS surveillance system, if appropriate.

5.2.2 OLDI Protocol

The passing of data on individual flights, over telephone, as part of the co-ordination process has always been a major support task at ATC units, particularly at Area Control Centers (ACC). Therefore, the operational use of direct connections between Flight Data Processing Systems (FDPS) at ACCs for the purpose of replacing such verbal "estimates", referred to as On-Line Data Interchange (OLDI), began within Europe in the early nineteen eighties.

Through the use of OLDI, an ATC system may become able to:

- receive OLDI messages;
- process them automatically in accordance with this Standard;
- output flight data in accordance with the message received, and display required warnings in case of inconsistency in the data received;
- generate and transmit acknowledgement messages automatically at the application level.

Reliability on every OLDI link shall be at least 99.86 % (equivalent to a downtime of not more than 12 hours per year based on 24-hour availability). Additional information on the OLDI Protocol, including message categories, contents, classification and transaction times, may be found in the reference documentation.

5.2.3 ICAO Doc 4444-PANS/ATM Coordination Messages

ICAO Doc 4444-PANS/ATM contains provisions for coordination messages, that are authorized for transmission via the aeronautical fixed service (including the aeronautical telecommunication network (ATN) and the aeronautical fixed telecommunication network (AFTN), direct-speech circuits or digital data interchange between ATS units, and direct teletypewriter and computer-computer circuits), or via the aeronautical mobile service, as applicable.

Coordination messages (priority FF), include:

- current flight plan messages (CPL);
- estimate messages (EST);
- coordination messages (CDN);
- acceptance messages (ACP); and

- logical acknowledgement messages (LAM).

The method of message exchange shall also be dependent upon the availability of adequate communications channels, the function to be performed, the types of data to be exchanged and the processing facilities at the centres concerned.

Basic flight plan data necessary for air traffic control purposes shall be furnished to the first en-route control centre at least 30 minutes in advance of the flight, and to each successive centre at least 20 minutes before the aircraft enters that centre's area of jurisdiction, in order for it to prepare for the transfer of control. The second en-route centre and each successive centre shall be provided with current data, including updated basic flight plan data, contained in a current flight plan message or in an estimate message supplementing already available updated basic flight plan data.

5.3 Surveillance Data Exchange

The following table shows the Surveillance Interconnection Levels identified:

Surveillance Data Interconnection Level	Communication Protocol	Notes
1	Intercenter ASTERIX cat 62,63	Ecuador
2	Proprietary Intercenter ICD	Brazil, Venezuela
3	ASTERIX ICD Radar	
4	Proprietary ICD	Uruguay, Argentina
5	No shared Data	

TABELA 5.3-1 SURVEILLANCE DATA INTERCONNECTION LEVEL

Examples of current interconnection:

- Data Transmission between Uruguay and Argentina, thorough Aircat 500 protocol;

- Essay of Interconnection Brasil – Venezuela using Flight Plan Coordination Level 3 and Surveillance Data Interconnection Level 2 (ACC Interconnection Trials - 2006)

5.3.1 ASTERIX Protocol

ASTERIX has been designed as a flexible way of encoding surveillance related information to be exchanged between users. It is characterised by the grouping of information in data categories and the flexible generation of messages in order to save bandwidth in the transmission.

For the various applications within the surveillance domain, individual data categories are defined. This allows the designer of a system to implement exactly what is needed, not more and not less. The software to be implemented can be tailored exactly to the function of the respective system. Should at any stage additional functionality be required, the necessary interface can easily be added by integrating the ASTERIX category defined for the specific application.

The same flexibility applies to the generation of the ASTERIX messages itself. Subdividing the whole information into individual data-items, a message can be composed according to the information available. Items carrying no information are simply left out when creating the message. The FSPEC, a sort of "Table of Contents" for each ASTERIX message precedes the data items, indicating unambiguously to the receiving system, which data items are present and which are not. This allows the processing to be adapted to the real message contents. There is no need anymore to transmit useless bits and bytes or to skip unwanted information in a message.

The sequence of items in the message has been defined in the co-called "User Application Profile" UAP. The application domain of ASTERIX has constantly expanded, and ASTERIX has now been adopted world-wide as the standard format for exchanging data from primary, secondary, monopulse, Mode S and weather radars, and also for carrying multiradar data, data-link, SMGCS, control & monitoring, etc.

5.3.1.1 Relevant ASTERIX Categories

To implement the ASTERIX data format in a structured way, the set of documentation has been subdivided into **Parts**, each of which grouping the data for a specific application and purpose. Each ASTERIX Part contains one or more **Data Categories**. The information contained in these categories is dedicated to a specific area of application and defines which data in which format is to be transmitted between the users of these applications.

Each category consist of a **Catalogue of Data Items**, with the Data Item being the smallest unit of standardised information. This categorisation serves multiple purposes:

- it is easy to identify the application;
- The dispatching of the data to the appropriate task within the receiving system is facilitated;

- only the category for applications implemented in the user system have to be implemented.

Up to **256 Data Categories** can be defined and their usage is as follows:

- Data Categories **000 to 127** for standard civil and military applications;
- Data Categories **128 to 240** reserved for special military applications;
- Data Categories **241 to 255** used for both civil and military non-standard applications.
- The categories relevant for the interconnection of automated systems are as follows:
 - ASTERIX Cat 001 - Monoradar Data Target Reports, from a Radar Surveillance System to an SDPS (plots and tracks from PSRs, SSRs, MSSRs, excluding Mode S and ground surveillance)
 - ASTERIX Cat 002 – Monoradar Service Messages (status, North marker, sector crossing messages)
 - ASTERIX Cat 008 – Monoradar Derived Weather Information
 - ASTERIX Cat 034 – Next version of Category 002 (PSR Radar, SSR Radar, M-SSR Radar and Mode-S Station)
 - ASTERIX Cat 048 – Next version of Category 001 (PSR Radar, SSR Radar, M-SSR Radar and Mode-S Station)
 - ASTERIX Cat 062 – System Track Data (Surveillance Data processing System (SDPS))
 - ASTERIX Cat 063 – Sensor Status Messages (Surveillance Data processing System (SDPS))
 - ASTERIX Cat 253 – Remote Station Monitoring and Control Information (Used by RMCDE/RMCDS)
 - ASTERIX implementations also incorporate a User Application Profile (UAP), i. e., a mechanism whereby the correspondence between Data Items and Data Fields shall be standardized for each application making use of the ASTERIX message structure. Besides, there is a special feature, called Special Purpose field, allowing a user subgroup to exchange a variable length field which shall be transparent to non-interested users.

5.3.2 Proprietary Radar Data Protocols

Until the 1980s and previously the existence of ASTERIX, every National Administration developed its own format for delivering radar data to Air Traffic Control Centres. This is a situation that still persists

in some surveillance Facilities, but it makes exchange of radar data across borders a more complicated issue. The proprietary radar data protocols still in use in the CAR/SAM regions are listed in the reference SICD.

5.4 Requirements

The interconnection of automated ATC Centers shall be in compliance with the following requirements:

- Allow the transference of flight plans between adjacent ATC Centers in an automated manner, in addition to the manual coordination over telephone;
- Allow the sharing of surveillance data (mostly radar) at areas of common interest.

5.5 Solutions

The analysis of the current state of readiness for interconnection of ATC Centers in the region shows different technological stages at each State or ACC, which guides the implementation strategy for the adoption of interconnections alternatives, with their associated costs and benefits.

Of course, the ideal solution would be the accomplishment of interconnection of all ATC Centers in the Region, making use of advanced technologies and standardized communication protocols, but also demanding major investments by most States and/or ANSPs, and that might constitute a critical factor for successful implementation.

Therefore, the alternate possibility of considering implementation of the interconnection of ATC Centers by stages, with short, medium and long term objectives, has been developed and is being proposed in this Plan.

Nevertheless, at the time of bilateral agreement negotiations, institutional aspects of sharing surveillance information should be considered, in order to cope with unique specifications of different Centers.

A basic part of the implementation strategy is the specification of the REDDIG as the primary means for all required data communication.

Based on these aspects, the following interconnection possibilities were considered:

5.5.1 Bilateral Interconnection (Center to Center)

This is done when a common protocol is established to exchange de data of flight plans and radars between two neighbor States, with the necessary adjustments to integrate those data in each system.

This way has the advantage of establishing short period actions and using the existing technologies common to each neighbor State. With this, it is possible to use the existing technical knowledge and resources saving money and means.

The adoption of this option should follow the steps:

- Establish a transition area where the vigilance data will be shared;
- Agreement about the necessary interfaces, establishing, hence, the communication protocols for exchange of information;
- Configuration of the Flight and Radar Plan connections, with adjustments in each system, which might involve:
 - Physical configuration of the lines;
 - Logical configuration of the lines through files of configurations and generations of data base;
 - Occasional alteration of the software in order to include protocol differences or functionalities;
 - Occasional use of protocol converters and interconnection equipments;
- Configuration of the means of data communication, preferably through REDDIG;
- Hiring of a firm or system provider to do the modifications;
- Establishing of a Work Schedule to do coordinated actions;
- Making of a book of procedures for the tests of the connections;
- Tests;
- Establishing of a formal procedure of Interconnection Confirmation;
- Follow-up on the operation of the air traffic coordination under the aspects of availability, integrity, trustworthy with monitoring of the data communication traffic;

- Data gathering for the statistics of Air Traffic and the establishment of performance indicators to evaluate the cost-benefit of the interconnection.

Ex: Brasil – Venezuela (ACC Maiquetía – ACC Amazonico) Interconnection Trials

5.5.2 Multilateral Interconnection Solution

As a benchmark, the Project Team analyzed the European solution for surveillance data integration by means of the “RADNET” (Radar Data Network), a European initiative that provides a network specifically to facilitate extensive surveillance data sharing. In this network, all data (radar and ADS-B) from different sites/locations in several European States are received at the specific interface of each sensor, converted to standard ASTERIX format and shared according to a geographical filtration based on each State interests.

The basic equipment is the RMCDE (Radar Message Conversion and Distribution Equipment), which normally is first applied to give support to national programs of modernization. Later on, the equipment also provides for a given State to connect with adjacent States’ Facilities to exchange surveillance data of common interest and, at advanced stages, the same physical equipment allows for integration to a radar data net that is flexible and of a wide-spanning range.

It allows that any kind of radar data be used by any kind of user anywhere. That is why many States chose, in the past, the RMCDE as the base element for its national infra-structure of radar communication.

As it was demonstrated successfully by the European RADNET, the RMCDE allows the construction of national nets or multinational communication. The ATC Centers will not have to be connected separately to all the sensors, but may obtain total coverage through radar, independently of its geographical location or the location of the radar stations.

The RMCDE allows the use of old sensors with new equipments that process radar and vice-versa. This guarantees a security to the investment and helps States or centers to separate the modernizations of the radar stations from the modernizations of the RDP, allowing a smooth transition step by step to this new technology.

In general, the following steps are necessary:

- Recognition Mission to find out about the implanted solution in the EUROCONTROL context, to know the options used, limitations and performance restrictions, as well as requirements for the implementation;
- Contact with the suppliers, giving priority to the usage of COTS equipments and software;

- Creation of a Work Plan that involves all the necessary activities and definition of responsibilities among the States that are part of the enterprise, including:
 - Acquisition activities;
 - Costs survey;
 - Creation of a schedule for payment in infra-structure investment;
 - Survey of the estimated traffic and necessary adaptation for the current REDDIG net to accommodate the new data flow;
 - Definition of the protocols that are going to be used at the beginning, as well as provision for the usage other vigilance data such as ADS-B;
 - Establish each State activity for the integration of the information on their respective system;
 - Establish a proof-of-concept project for the validation of the concept and future expansion.

5.5.3 Interim Alternate Solution for Sharing of Surveillance Data

On the case of States that borders Brazil, there is a possibility of establishing stand-alone clients to use the radar data of the border region, using the SISTRASAG system, which is in its final stages of development.

The SISTRASAG is a system that aims to allow Brazil to distribute selectively the synthesis of the national radar to the Clients that need to use the data for their operational planning.

It is going to be implanted a redundant Server-Distributor, with the ability to connect itself to at least thirty-two first level Clients.

The communications will be limited to the functions implanted in the system itself, which are necessary for the request, confirmation and distribution of the information between Server-Distributor and the Clients.

The system should be implemented in order to allow interactions Server/Client through the following ways:

- INTERNET;
- Local Net;
- Dialing Line or Dedicated Line;

Each client will pay for the telecommunications allocated to their needs.

The SISTRASAG System Synchronism is implemented through a time reference of the system installed in Brasília.

However, each client will be responsible for adjusting its own clock (computer clock) within the limits that will not hinder the data interpretation given.

5.5.3.1 Organizational Impacts

The effective implantation of the SISTRASAG will result in a series of impacts, both immediate and future, described as follow:

The distribution of the radar synthesis through the SISTRASAG will allow the Organizations to use those information when planning their operational activities.

The system will allow ATC organizations that need to have some knowledge of the air situation in general, to do so in a simple manner and safely.

Impacts during the SISTRASAG Implementation:

- It will be necessary to fit the SISTRASAG to attend the requirements for the necessary performance to coordinate the air traffic.

The figure 5.5.4-1, that follows, presents a diagram of the SISTRASAG.

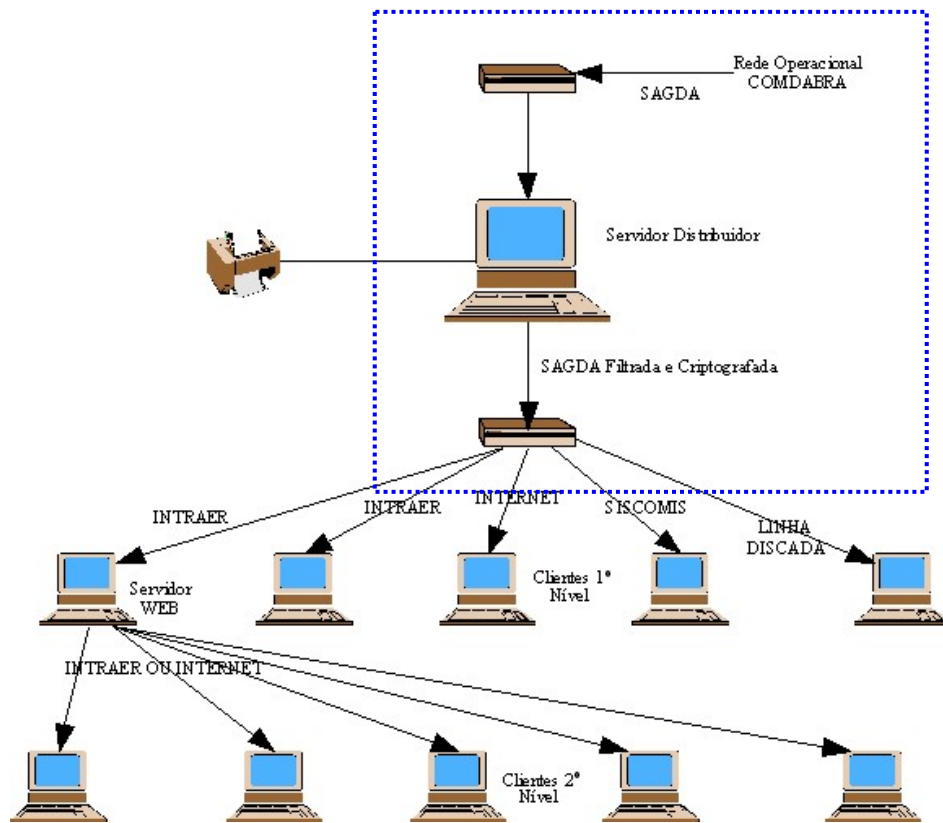


FIGURE 5.5.4-1 – SISTRASAG DIAGRAM

The Figure 5.5.4-2 presents a detailed diagram of the connection between Server-Distributor and Clients Level 1 (that represents, on the Figure 5.5.4-1, above the contents of the broken line area).

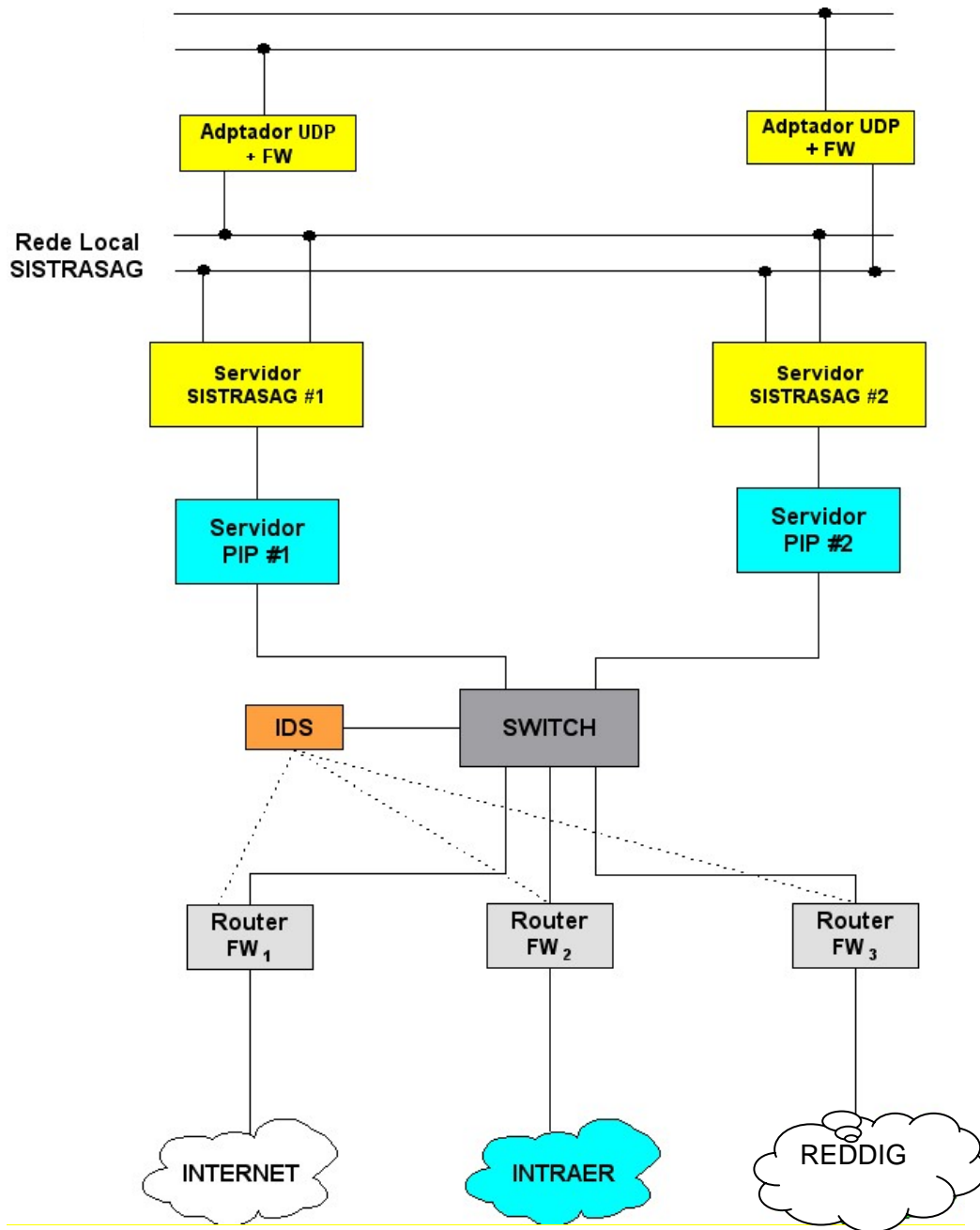


FIGURE 5.5.4-2 – SERVER/LEVEL 1 CLIENT CONNECTION DIAGRAM

On the above figure, it is possible to note the implementation of protection walls (“firewalls”) and intrusion monitoring (IDS – “Intrusion Detection System”) so as to insure net safety.

5.5.3.2 Hardware

The SISTRASAG configuration will happen according to the description presented on the document of Technical Specification of Basic Hardware and Software of the SISTRASAG. The following table transcribes the configuration table of the document:

TABLE 5.5.3.2-1 - TYPICAL HARDWARE COMPOSITION FOR THE CLIENT

Position	Quantity	Hardware configuration
Client Level 1 Desktop	1*	HP dx2250 Microtower - AMD Athlon 64 3800+ Dual Core 2.0GHz Processor; 1 GB RAM PC2-5300 DDR - 667 MHZ (2x512MB); 80 GB SATA SMART III 7200 HDD; 48x/32x CD-RW/DVD-ROM Combo Drive; Integrated ATIX300 Radeon Graphics; Realtek 8100c 10/100 LAN controller; HP PS/2 standard Keyboard; HP USB optical scroll mouse.
Client Level 1 Laptop	1*	Laptop DELL Latitude D620 - Intel Core 2 Duo T5500 1.66GHz Processor; 2M L2 Cache; 14.1 inch wide Screen WXGA LCD Panel; 1.0GB DDR2-533 SDRAM; 80GB 5400rpm Hard Drive; 24x CD-RW/DVD; Intel Integrated Graphics Media Accelerator 950; Dell Wireless 1390 802.11g Mini Card; 56K v92 Internal Modem; 10/100/1000 Gigabit Ethernet Network Adapter; Serial Port; 4 USB Ports 6 Cell Primary Battery; 65W A/C Adapter.

5.5.3.3 Software

The software will be supplied with the basic visualization functions, operating on LINUX platform.

5.5.3.4 Installation of the SISTRASAG System

The hardware and software installation is documented in the SISTRASAG Manual of Installation.

5.5.3.5 SISTRASAG Servers

The Server-Distributor of the SISTRASAG system will be implanted in Brasília – DF.

5.6 Solution Allocation for the Interconnection of the ACC Centers

The Interconnection Levels were allocated using the following convention:

A – Current Level of Interconnection

S – Possibility of Surveillance Radar Data Sharing using SISTRASAG

P – Possibility of Interconnection using the current Air Traffic Control System

P* - Possibility of interconnection using the Air Traffic Control System that is being installed

The following tables show the solution that might be used for each ACC and their Adjacent ACC in a specific State:

STATE: ARGENTINA										
ACC	ACC ADJ	FLIGHT PLAN				SURVEILLANCE				
		INTERCONNECTION				INTERCONNECTION				
		LEVELS				LEVELS				
		1	2	3	4	1	2	3	4	5
CORDOBA INSTAL.	ASUNCION				A					A
	LA PAZ				A					A
	EZEIZA	P*	P*		A	P*		P*		A
	MENDOZA				A					A
	RESISTENCIA				A					A
RESISTENCIA (NON-AUTO)	ASUNCION				A					A
	CORDOBA				A					A
	CURITIBA				A					A
	MENDOZA				A					A
	MONTEVIDEO				A					A
EZEIZA	RIVADAVIA				A					A
	MENDOZA				A					A
	SANTIAGO		P*		A			P*		A
	CORDOBA	P*	P*		A	P*		P*		A

STATE: ARGENTINA										
ACC	ACC ADJ	FLIGHT PLAN				SURVEILLANCE				
		INTERCONNECTION				INTERCONNECTION				
		LEVELS				LEVELS				
		1	2	3	4	1	2	3	4	5
	RESISTENCIA				A					A
	JOHANNESBURG				A					A
	MONTEVIDEO		P*		A	P*			A	
MENDOZA (NON AUTO)	EZEIZA				A					A
	SANTIAGO				A					A
	CORDOBA				A					A
RIVADAVIA (NON-AUTO)	EZEIZA				A					A
	SANTIAGO				A					A

TABLE 5.6-1 INTERCONNECTION LEVELS FOR ARGENTINA

STATE: BRASIL										
ACC	ACC ADJ	FLIGHT PLAN				SURVEILLANCE				
		INTERCONNECTION LEVELS				INTERCONNECTION LEVELS				
		1	2	3	4	1	2	3	4	5
AMAZÔNICO	BRASÍLIA			A				A		
	BOGOTÁ				A			P		A
	GEORGETOWN				A				S	A
	LA PAZ				A				S	A
	LIMA				A				S	A
	MAIQUETIA			P	A		P			A
	PARAMARIBO				A				S	A
	RECIFE			A				A		
	ROCHAMBEAU				A				S	A
	ATLÂNTICO				A					A
BRASÍLIA	AMAZÔNICO			A				A		
	CURITIBA			A				A		
	LA PAZ				A				S	A
	RECIFE			A				A		
	ATLÂNTICO				A					A
CURITIBA	ASUNCION				A				S	A
	BRASÍLIA			A				A		
	LA PAZ				A				S	A
	MONTEVIDEO				A			P		A
	RESISTÊNCIA				A				S	A
	ATLÂNTICO				A					A

STATE: BRASIL										
ACC	ACC ADJ	FLIGHT PLAN				SURVEILLANCE				
		INTERCONNECTION LEVELS				INTERCONNECTION LEVELS				
		1	2	3	4	1	2	3	4	5
RECIFE	AMAZÔNICO			A				A		
	BRASÍLIA			A				A		
	ATLÂNTICO				A					A
ATLÂNTICO (NON-AUTO)	AMAZÔNICO				A					A
	BRASÍLIA				A					A
	CURITIBA				A					A
	DAKAR				A					A
	JOHANNESBURG				A					A
	LUANDA				A					A
	MONTEVIDEO				A					A
	RECIFE				A					A
	ROCHAMBEAU				A					A

TABLE 5.6-2 INTERCONNECTION LEVELS FOR BRAZIL

STATE: BOLIVIA										
ACC	ACC ADJ	FLIGHT PLAN				SURVEILLANCE				
		NÍVEIS DE IMPLEMENTAÇÃO				NÍVEIS DE IMPLEMENTAÇÃO				
		1	2	3	4	1	2	3	4	5
LA PAZ (NON-AUTO)	AMAZÔNICO				A				S	A
	ASUNCION				A					A
	BRASÍLIA				A				S	A
	CURITIBA				A				S	A
	CORDOBA				A					A
	LIMA				A					A
	SANTIAGO				A					A

TABLE 5.6-3 INTERCONNECTION LEVELS FOR BOLIVIA

STATE: CHILE										
ACC	ACC ADJ	FLIGHT PLAN				SURVEILLANCE				
		INTERCONNECTION LEVELS				INTERCONNECTION LEVELS				
		1	2	3	4	1	2	3	4	5
SANTIAGO	CORDOBA		P		A			P		A
	LIMA				A					A
	LA PAZ				A					A
	MENDOZA				A					A
	RIVADAVIA				A					A

TABLE 5.6-4 INTERCONNECTION LEVELS FOR CHILE

STATE: COLOMBIA										
ACC	ACC ADJ	FLIGHT PLAN				SURVEILLANCE				
		NÍVEIS DE IMPLEMENTAÇÃO				NÍVEIS DE IMPLEMENTAÇÃO				
		1	2	3	4	1	2	3	4	5
BOGOTÁ	AMAZÔNICO				A			P	S	A
	GUAYAQUIL		P		A			P		A
	LIMA				A					A
	MAIQUETIA				A			P		A
	PANAMÁ		P		A			P		A
	BARRANQUILLA		P		A			P		A
BARRANQUILLA	MAIQUETIA				A			P		A
	PANAMÁ		P		A			P		A
	BOGOTÁ		P		A			P		A
	KINGSTON				A					A
	CURAÇAO				A					A

TABLE 5.6-5 INTERCONNECTION LEVELS FOR COLOMBIA

STATE: ECUADOR										
ACC	ACC ADJ	FLIGHT PLAN				SURVEILLANCE				
		INTERCONNECTION LEVELS				INTERCONNECTION LEVELS				
		1	2	3	4	1	2	3	4	5
GUAYAQUIL	BOGOTA		P		A	P		P		A
	LIMA				A					A
	CENAMER				A					A

TABLE 5.6-6 INTERCONNECTION LEVELS FOR ECUADOR

STATE: FRENCH GUYANA										
ACC	ACC ADJ	FLIGHT PLAN				SURVEILLANCE				
		INTERCONNECTION LEVELS				INTERCONNECTION LEVELS				
		1	2	3	4	1	2	3	4	5
ROCHAMBEAU	AMAZÔNICO				A				S	A
	PARAMARIBO				A					A
	PIARCO				A					A
	ATLANTICO				A					A

TABLE 5.6-7 INTERCONNECTION LEVELS FOR FRENCH GUYANA

STATE: GUYANA										
ACC	ACC ADJ	FLIGHT PLAN				SURVEILLANCE				
		NÍVEIS DE IMPLEMENTAÇÃO				NÍVEIS DE IMPLEMENTAÇÃO				
		1	2	3	4	1	2	3	4	5
GEORGETOWN	AMAZONICO				A				S	A
	PIARCO				A					A
	MAIQUETIA				A					A
	PARAMARIBO				A					A

TABLE 5.6-7 INTERCONNECTION LEVELS FOR GUYANA

STATE: PANAMA										
ACC	ACC ADJ	FLIGHT PLAN				SURVEILLANCE				
		INTERCONNECTION LEVELS				INTERCONNECTION LEVELS				
		1		3	4	1	2	3	4	5
PANAMA	BOGOTA		P		A			P		A
	BARRANQUILLA		P		A			P		A
	CENAMER		P		A			P		A

TABLE 5.6-8 INTERCONNECTION LEVELS FOR PANAMA

STATE: PARAGUAY										
ACC	ACC ADJ	FLIGHT PLAN				SURVEILLANCE				
		INTERCONNECTION LEVELS				INTERCONNECTION LEVELS				
		1	2	3	4	1	2	3	4	5
ASUNCION (NON-AUTO)	CURITIBA				A				S	A
	LA PAZ				A					A
	RESISTÊNCIA				A					A

TABLE 5.6-9 INTERCONNECTION LEVELS FOR PARAGUAY

STATE: PERU										
ACC	ACC ADJ	FLIGHT PLAN				SURVEILLANCE				
		INTERCONNECTION LEVELS				INTERCONNECTION LEVELS				
		1	2	3	4	1	2	3	4	5
LIMA	AMAZONICO				A				S	A
	BOGOTÁ				A				P	A
	CHILE				A					A
	GUAYAQUIL				A					A
	LA PAZ				A					A

TABLE 5.6-10 INTERCONNECTION LEVELS FOR PERU

STATE: SURINAME										
ACC	ACC ADJ	FLIGHT PLAN				SURVEILLANCE				
		INTERCONNECTION LEVELS				INTERCONNECTION LEVELS				
		1	2	3	4	1	2	3	4	5
PARAMARIBO	AMAZÔNICO				A				S	A
	GEORGETOWN				A					A
	PIARCO				A					A
	ROCHAMBEAU				A					A

TABLE 5.6-11 INTERCONNECTION LEVELS FOR SURINAME

STATE: URUGUAY										
ACC	ACC ADJ	FLIGHT PLAN				SURVEILLANCE				
		INTERCONNECTION LEVELS				INTERCONNECTION LEVELS				
		1	2	3	4	1	2	3	4	5
MONTEVIDEO	CURITIBA				A				S	A
	EZEIZA		P		A	P*		P	A	
	RESISTENCIA				A					A
	ATLANTICO				A					A
	JOHANNESBURG				A					A

TABLE 5.6-13 INTERCONNECTION LEVELS FOR URUGUAY

STATE: VENEZUELA										
ACC	ACC ADJ	FLIGHT PLAN				SURVEILLANCE				
		INTERCONNECTION LEVELS				INTERCONNECTION LEVELS				
		1	2	3	4	1	2	3	4	5
MAIQUETIA	AMAZONICO			P	A		P			A
	BOGOTA		P		A			P		A
	BARRANQUILLA				A			P		A
	PIARCO				A			P		A
	ROCHAMBEAU				A					A

TABLE 5.6-12 INTERCONNECTION LEVELS FOR VENEZUELA

INTERNATIONAL ORGANIZATION: COCESNA										
ACC	ACC ADJ	FLIGHT PLAN				SURVEILLANCE				
		INTERCONNECTION LEVELS				INTERCONNECTION LEVELS				
		1	2	3	4	1	2	3	4	5
CENAMER	GUAIAQUIL				A					A
	KINGSTON				A					A
	LA HABANA				A					A
	MERIDA				A					A
	PANAMA		P		A					A
	MEXICO				A					A

TABLE 5.6-14 INTERCONNECTION LEVELS FOR COCESNA

Legenda:

A – Current Level of Interconnection

S – Possibility of Surveillance Radar Data Sharing using SISTRASAG

P – Possibility of Interconnection using the current Air Traffic Control System

P* - Possibility of interconnection using the Air Traffic Control System that is being installed

6. SUMMARY OF IMPACTS

The implementation of the Interconnection of Automated ATC Systems in the CAR/SAM Regions may have an impact on a variety of related systems, organizations, procedures, and people, as stated in the following items of this section.

6.1 Impacts on Communications Systems

The impacts caused in the architecture and topology of the Telecommunications Digital Architecture, necessary to a global ATM in Region CAR/SAM, are linked to the speed of implementation and the traffic generated by these new services, such as: AMHS, AIDC, ADS / CPDLC, among others. This will eventually demand the upgrade to the ATN network using the protocol IPV6. (Refer to Appendix A for details)

6.2 Impacts on Surveillance Systems

No significant impacts on the existing surveillance systems and facilities are foreseen as a consequence of the interconnection Project.

6.3 Impacts on Automated ATC Systems

The impacts of the interconnection on automated ATC Systems will largely be dependent on which one of the implementation options is chosen. The integration of additional surveillance data from different sources will be of none or minor impact, but the sharing of flight plan data may constitute a more significant factor to the existing systems. For example, the common interconnection, based on the use of OLDI, implies that each system's parameters be assessed in order to ensure timely, automatic initiation of OLDI messages. Also, the system's capability to manually initiate the transmission of a coordination message prior to the calculated transmission time should be provided.

The Human-Machine Interface (HMI) may also be subject to certain impacts, including, inter alia, that the system shall be able to:

- display the operational contents of OLDI messages and relevant warnings related to received messages for immediate attention;
- route co-ordination and transfer message warnings to the operational positions responsible for the co-ordination of the flights concerned.

The system will have to be checked and, eventually, configured so that the HMI indicates when the transmission of an OLDI message is in progress or has been successfully transmitted as appropriate. A warning or notification to the appropriate ATC or technical position shall be generated automatically if no acknowledgement has been received within the parameter time following a transmission of a coordination or transfer message.

The HMI at ATC positions using OLDI should provide a warning if a pertinent OLDI facility is not available.

6.4 Impacts on non-automated ATC Units

No impacts on the existing non-automated ATC Units in the Region are foreseen as a consequence of the interconnection Project. Even the proposed interim solution for sharing of surveillance data, based on SISTRASAG, will only facilitate the coordination process, without significant changes to established procedures and current practices.

6.5 Impacts on the ANSP Workforce

Air Traffic Control Officers, Supervisors, and Technicians will be required to show knowledge and proficiency at the use of the new system functionalities, as installed, including specific contingency procedures.

6.6 Impacts on Operational Regulations and Agreements

Each new OLDI facility, including a new facility on an existing link, shall be subject to an evaluation period to verify the data integrity, accuracy, performance, compatibility with ATC procedures and overall safety prior to its operational implementation.

Independently of any activities performed by ICAO in the context of the interconnectin project, the date of the operational introduction, implying completion of the evaluation period, has to be formally agreed between any two ATC units concerned.

The failure of automated coordination shall be presented clearly to the controller responsible for coordinating the flight at the transferring unit. This controller shall then facilitate the required coordination using prescribed alternative methods, as stated, for example, in the correspondent letter of agreement.

7. ANALYSIS OF THE PROPOSED SYSTEM

7.1 Summary of benefits of surveillance data sharing options

Advantages of each possible solution or alternative for surveillance data sharing are presented in this chapter. Further, it should be observed that the benefits listed are not mutually exclusive and may be cumulative, depending on the context and the selected implementation options.

7.1.1 Advantages of the Bilateral Solution for surveillance data sharing

The bilateral solution for surveillance data sharing, on the basis of direct agreements between interested parties may, in certain cases, be implemented at very short notice, particularly where the systems have been provided by the same supplier, or technical compatibility is assured by the use of common protocols.

7.1.2 Advantages of the Multilateral Solution for surveillance data sharing

The multilateral solution for surveillance data sharing on the basis of RADNET-alike architecture, presents a set of operational advantages, including:

- COTS Products, minimizing the implementation effort to develop interfaces;
- Reduced implementation risks, as the specifications and interfaces are defined by the EUROCONTROL;
- Can be used at a national level, with early benefits for the national control centers, and evolution for future integration with adjacent ATC Centers;
- Prepared to incorporate new surveillance technologies, such as ADS-B.

7.1.3 Advantages of the Interim Solution with SISTRASAG

The interim solution of surveillance data sharing on the basis of the SISTRASAG presents a set of operational advantages, including:

- Possibility of being used by all ATC Centers adjacent to the Brazilian FIRs , even if they are currently not equipped with automated systems;
- Possibility of ready, almost immediate implementation;
- Uses data transmission through IP (compatible with REDDIG);
- Client software works with PC platform based on Linux;

- Allows cost-benefit evaluation of cross-border surveillance data sharing, in advance of decision taking on investing in more complex systems, such as RADNET-alike solution.

7.2 Summary of Disadvantages/Limitations

The solutions for interconnection of systems, as stated before, also present some disadvantages and limitations, inherent to each of the implementation options.

7.2.1 Limitations of the Bilateral Solution

The bilateral solution for surveillance data sharing, on the basis of direct agreements between interested parties may also present some limitations, including:

- The common interface could be very specific and limited for the bilateral integration, only;
- Need of a consensus for the interfaces in case of different suppliers, eventually requiring protocol conversion;
- The implementation timing for each pair of ATC Centers will certainly be different.

7.2.2 Limitations of the Multilateral Solution

The multilateral solution for surveillance data sharing on the basis of RADNET-alike architecture, also presents a set of inherent limitations, including:

- Needs consensus and overall agreement of all or most of the CAR/SAM States for its complete implementation;
- Early Costs estimates indicate an amount of investment that requires a complete CBA (Cost-Benefit Analysis);
- In being a more complex solution, it demands a longer period of implementation and, therefore, may only be accomplished at the medium or long term.

7.2.3 Limitations of the Interim Solution with SISTRASAG

The interim solution of surveillance data sharing on the basis of the SISTRASAG also presents some limitations, including:

- Integration limited to ATC Units located adjacent to Brazilian ACCs;
- Solution involves only radar information sharing.

7.3 Advantages and Limitations of Flight Plan Data Sharing Options

Advantages of each possible solution or alternative for Flight Plan data sharing are presented in this chapter.

7.3.1 Advantages

The AIDC is a ICAO recommended solution for interconnection.

Most of the systems are OLDI capable.

7.3.2 Limitations

The Doc 4444 using CDN, LAM, ACP messages is a limited solution, since there is coordination situations that are not completely automated.

The OLDI protocol is not ATN compatible.

The AIDC is a recommended solution for interconnection, but most of the States have not implemented yet.

7.4 Implementation Option - Recommended

Based on the analysis of the advantages and limitations of each possible solution or alternative for Flight Plan Data sharing, as well as for Surveillance Data sharing, and with due consideration that:

- The sharing of relevant data on flight plans between adjacent ATC units is urgently required in order to facilitate the air traffic coordination process and thus reduce one major contributing factor to air traffic incidents;
- The bilateral solutions for Flight Plan and/or Surveillance Data Sharing may not be implemented in a timely manner and, under certain conditions, are not the most convenient way of accomplishment of the interconnection;
- The multilateral solution for Flight Plan and/or Surveillance Data Sharing may prove itself of difficult implementation without a centralized project coordination;
- The eventually required support of Systems Providers to configure the systems or implement minor changes or upgrades may be more effectively negotiated collectively, rather than by individual ANSPs;
- The experience gained with multinational implementations, e.g. REDDIG, accomplished under the provisions of a specific Project coordinated by the ICAO SAM Regional Office;

and, therefore, it is highly recommended that the interconnection of the automated ATC Centers in the CAR/SAM Region is accomplished via a specific Project, in a similar way to the former REDDIG Project.

7.4.1 ICAO Automated ATC Systems Interconnection Project

The set up of the proposed ICAO Automated ATC Systems Interconnection Project is seen as a SAM Region initiative and, therefore, it will have to be submitted to the decision of the Directors – Civil Aviation Authorities. Besides, there is a clear operational requirement of close coordination with the adjacent ATC Facilities of the CAR Region on this subject, which indicates that the project should also be taken to the consideration of GREPECAS, specifically, the ATM/CNS Sub-group.

Eventually, the establishment of such a project might also be considered via an already existing mechanism, e.g., including the interconnection project as a new objective of RLA/06/901.

7.4.1.1 Project Objectives

Implementation of the Interconnection of Automated ATC Systems in the SAM Region, using standard protocols and based on the existing capabilities of the REDDIG.

7.4.1.2 Project Outline

The Project for Interconnection of Automated ATC Systems in the SAM Region, under the overall coordination of the ICAO SAM Regional Office, shall provide for the accomplishment of all pertinent activities, including:

- Operational Requirements Revision;
- Technical description;
- Technical cooperation activities, including support on operational agreements development;
- On-site Installation activities;
- Site Acceptance
- Documentation;
- Follow-on activities.

7.4.1.3 Project Activities

A preliminary, comprehensive list of Project Activities has been defined and is presented in Appendix “B” of this document, which also contains the estimated duration of each listed activity.

8. NOTES

8.1 Acronyms

ACC	Area Control Center
AIDC	ATS Interfacility Data Communications
ANSP	Air Navigation Service Provider
APP	Approach Control Center
ATC	Air Traffic Control
ASTERIX	All-purpose Structured Eurocontrol Surveillance Information Data Exchange
CINDACTA	Centro Integrado de Defesa Aérea e Controle de Tráfego Aéreo
COCESNA	Corporación Centroamericana de Servicios de Navegación Aérea
COTS	Commercial Off The Shelf
ATC	Air Traffic Control
EUROCONTROL	European Organization for the Safety of Air Navigation
HW	Hardware
IDS	<i>Intrusion Detection System</i> (Sistema de Detecção de Intrusão)
IHM	Interface Homem-Máquina
 OCD	Operational Concepts Description
OLDI	On line data Interchange
RADNET	Radar Network
REDDIG	“Red Digital”
RJ	Rio de Janeiro
RMCDE	Radar Message Conversion and Distribution Equipment
SICD	Descrição de Interfaces Externas (<i>System Interface Control Document</i>).
SISTRASAG	Sistema de Transmissão da Situação Aérea Geral
SSS	System/Subsystem Specification
TLS	Target Level of Safety
UAP	User Application Profile

8.2 Glossary

AIDC application	An ATN application dedicated to exchanges between ATS units (ATSUs) of air traffic control (ATC) information in support of flight notification, flight coordination, transfer of control, transfer of communication, transfer of surveillance data and transfer of general data.
Client Level 1	Organization or authority with connection to the national security, properly accredited and registered in the SISTRASAG to receive information for the visualization.
ATS surveillance system	An ATS surveillance system will normally consist of a number of integrated elements, including sensor(s), data transmission links, data-processing systems and situation displays.
Co-ordination (of air traffic)	The process, executed between ATC units with adjoining areas of responsibility, of formally advising each other of the planned passage of flights across the boundary, in order to ensure flight safety through consistency of intended actions.
Co-ordination Phase	In respect of a given flight, the phase during which the transferring and receiving ATC units agree the conditions (e.g. flight level, boundary point) under which a flight will pass from the control of one to the other (EUROCONTROL).
Co-ordination Message	A generic term referring to a message used for accomplishing ATC co-ordination, including the CDN.
Flight Plan	Specified information provided to air traffic service units, relative to an intended flight or portion of flight of an aircraft. In addition, information derived from the flight plan of a specific flight held within an FDPS (EUROCONTROL).

Appendix A – Communication Network

A.1) The Architecture for Digital Communications, which is necessary for the integration of automation systems of the Regions CAR / SAM, proposed in this document will be divided in the following segments of telecommunications networks:

a) Access Network: Also known as the last mile, is responsible for taking information from radar data and flight plan data, from its sources to the Radar Data Processor (RDP) and the Flight Plan Data Processor (FDP), located in the ATCS.

b) Local Network (LAN) are usually dual. The interconnection between the ATCS LANs with the communications LAN is made through a router. The router provides the necessary isolation of ATCS, radar data and flight plan.

c) Network Long Distance - WAN (Backbone) :The exchange of messages (radar and flight plan) between two adjacent centers, will be through channels of communication point to point. These digital links might be type E1 links radio and/or communications systems via geostationary satellites of the type VSAT, with multiple access technology such as: FDMA PAMA SCPC or TDMA DAMA. The types of communication protocols might be Frame Relay (FR), X-25 and IP, using the physical interface such as RS232C and V-35, with the transmission rate ranging from 2400 bps to 19200 bps.

A.2) Based on the previous concepts, you can set the following requirements of communication for ATM Automation and Integration of the Regions CAR / SAM:

- Communications between adjacent facilities ATS should be through the Aeronautical Communications Network (ATN), as DOC 9694 Part VI, item 1.2.
- The ATN, for ATM Automation, will be implemented using IPS-capable routers "dual stack", which allows the use of IPv4 and IPv6 networks. These routers IPS should be scaled to operate as we ATN network of the future IPS Regional. Thus the SICD of Automation ATM would, together with the AMHS, encouraging the establishment of the Regional ATN.

A.3) The ATN routers (IPV4/IPV6) will be interconnected through VSAT networks existing Regional: REDDIG SAM in the Region and the Region II MEVA CAR.

- Each node of REDDIG and MEVA II should receive a router ATN / IPS, in order to compose a network with regional presence in all states of the Regions CAR / SAM.
- Access of routers to networks REDDIG and MEVA II should use the link protocol Frame Relay.

- Each node of the network of communication should be composed of routers in 1 +1 configuration, to ensure the continuity of service.
- The Frame Relay network routers should be set to achieve the FIR adjacent using a single hop satellite.
- The routers of limits of Regions (Brazil, Argentina, Chile, Peru, Venezuela, COCESNA, among others) should have additional capabilities to support features of BIS and should compose the main backbone Regional.
- A draft of the Plan of Transition AMHS, developed in ATN-TF, considers the existence of a "backbone" in the main Regions CAR / SAM and recommends it to be considered part of the "backbone", the States must meet all the following criteria: have at least a connection to another Region ICAO;
 - • Having have at least two connections within the Region;
 - • Having high-speed circuits that are able to handle large volume of traffic, including alternative to routing of messages;
 - • Having a AMHS and a Gateway AMHS / AFTN, and
 - • Having 24H support
- The architecture of the network ATN / IPS should be based on the model proposed ACP, as shown below:

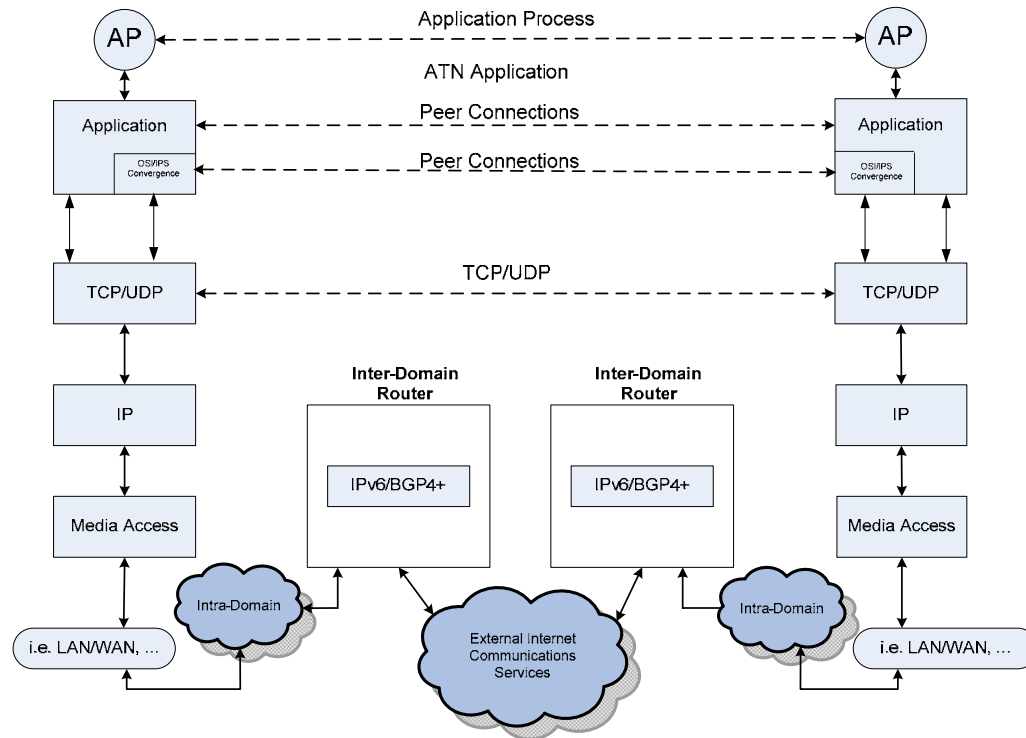













FIGURE A-1 - IPS ARCHITECTURE IN THE ATN

- The service external communication (External Internet Communications Services) should be provided, the level of link Frame Relay, the REDDIG and MEVA II respectively for the Regions and SAM CAR.
- The ATN routers / IPS could have additional ports to facilitate future alternative connections that could take advantage of the Internet in the future.

Considering it has been a gradual evolution in the implementation of systems / services CNS / ATM, in the Regions CAR / SAM. There are more details to be defined, including information from physical character (site of the installation of routers, type of routers, interconnections internal to the State [intra-domain], etc. ..) and information that are logical (Band of the channels between routers, addressing IP, protocol routing, network management, safety mechanism, etc..). That, of course, will be treated in forums ICAO AMHS / ATN / AIDC, among others.

**CAR/SAM AUTOMATED ACC INTERCONNECTION PLAN SCHEDULE/
CRONOGRAMA DEL PLAN DE INTERCONEXION DE SISTEMAS AUTOMATIZADOS EN ACC EN LAS REGIONES CAR/SAM**

CNS/COMM/6 WP/11 - NE/11

ID		Nome da tarefa	Duration	Start	Finish
1		CAR/SAM Interconnection Plan	1425 days	Mon 21/04/08	Fri 04/10/13
2		Plan Approval	160 days	Mon 21/04/08	Fri 28/11/08
3		Plan Presentation in the 1ª GT CNS/ATM SAM-ATM/CNS/IG 1 Meeting	5 days	Mon 21/04/08	Fri 25/04/08
4		Plan Presentation ATM/CNS/SG/6	5 days	Mon 30/06/08	Fri 04/07/08
5		Plan presentation in the GREPECAS Meeting	5 days	Mon 13/10/08	Fri 17/10/08
6		CAR/SAM interconnection plan Approval	30 days	Mon 20/10/08	Fri 28/11/08
7		Project Managing Board Creation	90 days	Mon 01/12/08	Fri 03/04/09
8		Project Organization	22 days	Mon 06/04/09	Tue 05/05/09
9		Managing plan	22 days	Mon 06/04/09	Tue 05/05/09
10		Communication Plan	22 days	Mon 06/04/09	Tue 05/05/09
11		Human resources Plan	22 days	Mon 06/04/09	Tue 05/05/09
12		Cost Plan	22 days	Mon 06/04/09	Tue 05/05/09
13		Risk Assesment Plan	22 days	Mon 06/04/09	Tue 05/05/09
14		Escope Managing Plan	22 days	Mon 06/04/09	Tue 05/05/09
15		Quality plan	22 days	Mon 06/04/09	Tue 05/05/09
16		Procurement and Acquisition plan	22 days	Mon 06/04/09	Tue 05/05/09
17		Plan execution	1330 days	Mon 01/09/08	Fri 04/10/13
18		STARTUP MEETING	2 days	Mon 02/03/09	Tue 03/03/09
19		Coordination Meetings	940 days	Fri 04/09/09	Thu 11/04/13
20	 	1 Coordination Meeting	2 days	Fri 04/09/09	Mon 07/09/09
21		2 Coordination Meeting	2 days	Thu 11/03/10	Fri 12/03/10
22		3 Coordination Meeting	2 days	Wed 15/09/10	Thu 16/09/10
23		4 Coordination Meeting	2 days	Tue 22/03/11	Wed 23/03/11
24		5 Coordination Meeting	2 days	Mon 26/09/11	Tue 27/09/11
25		6 Coordination Meeting	2 days	Fri 30/03/12	Mon 02/04/12
26		7 Coordination Meeting	2 days	Thu 04/10/12	Fri 05/10/12
27		8 Coordination Meeting	2 days	Wed 10/04/13	Thu 11/04/13
28		Institutional/Legal Documents Creation	120 days	Mon 02/03/09	Fri 14/08/09
29		Responsability definition over Shared Resources	22 days	Mon 02/03/09	Tue 31/03/09
30		Operational Agreements Between States	60 days	Mon 02/03/09	Fri 22/05/09
31		Surveilance Area definition to be shared	90 days	Mon 02/03/09	Fri 03/07/09
32		Security Plan	120 days	Mon 02/03/09	Fri 14/08/09
33		Flight Plan Interconection Implementation	434 days	Mon 01/09/08	Thu 29/04/10

**CAR/SAM AUTOMATED ACC INTERCONNECTION PLAN SCHEDULE/
CRONOGRAMA DEL PLAN DE INTERCONEXION DE SISTEMAS AUTOMATIZADOS EN ACC EN LAS REGIONES CAR/SAM**

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ID	Nome da tarefa	Duration	Start	Finish
34	Flight Plan interconnection using OLDI	304 days	Mon 02/03/09	Thu 29/04/10
35	First Phase	198 days	Mon 02/03/09	Wed 02/12/09
36	EZEIZA-MONTEVIDEO	22 days	Mon 02/03/09	Tue 31/03/09
37	EZEIZA-CORDOBA	22 days	Wed 01/04/09	Thu 30/04/09
38	EZEIZA-SANTIAGO	22 days	Fri 01/05/09	Mon 01/06/09
39	BOGOTÁ-GUAYAQUIL	22 days	Tue 02/06/09	Wed 01/07/09
40	BOGOTÁ-PANAMÁ	22 days	Thu 02/07/09	Fri 31/07/09
41	BOGOTÁ-BARRANQUILHA	22 days	Mon 03/08/09	Tue 01/09/09
42	BARRANQUILHA-PANAMÁ	22 days	Wed 02/09/09	Thu 01/10/09
43	SANTIAGO-CORDOBA	22 days	Fri 02/10/09	Mon 02/11/09
44	PANAMÁ-CENAMER	22 days	Tue 03/11/09	Wed 02/12/09
45	Second Phase (With Brazil)	44 days	Mon 01/03/10	Thu 29/04/10
46	CURITIBA-URUGUAI	22 days	Mon 01/03/10	Tue 30/03/10
47	AMAZÔNICO-BOGOTÁ	22 days	Wed 31/03/10	Thu 29/04/10
48	Flight Plan interconnection using Doc 4444 (CDN, LAM,ACP)	60 days	Mon 01/09/08	Fri 21/11/08
49	MAIQUETIA - AMAZONICO Interconnection Comissioning	60 days	Mon 01/09/08	Fri 21/11/08
50	Flight Plan interconnection using AIDC	22 days	Mon 01/03/10	Tue 30/03/10
51	BRASIL-ARGENTINA	22 days	Mon 01/03/10	Tue 30/03/10
52	Surveillance Data interconnection Implementation	1330 days	Mon 01/09/08	Fri 04/10/13
53	Surveillance Data interconnection Implementation using Intercenter ASTERIX 62/63	304 days	Mon 02/03/09	Thu 29/04/10
54	EZEIZA-MONTEVIDEO	22 days	Mon 02/03/09	Tue 31/03/09
55	BRASIL- MONTEVIDEO	44 days	Mon 01/03/10	Thu 29/04/10
56	Surveillance Data interconnection Implementation with Proprietary ICD	60 days	Mon 01/09/08	Fri 21/11/08
57	AMAZONICO-MAIQUETIA	60 days	Mon 01/09/08	Fri 21/11/08
58	Surveillance Data interconnection Implementation using ASTERIX Radar ICD	352 days	Wed 01/07/09	Thu 04/11/10
59	EZEIZA-SANTIAGO	22 days	Wed 01/07/09	Thu 30/07/09
60	EZEIZA-CORDOBA	22 days	Fri 31/07/09	Mon 31/08/09
61	EZEIZA- MONTEVIDEO	22 days	Tue 01/09/09	Wed 30/09/09
62	AMAZÔNICO-BOGOTÁ	22 days	Thu 01/10/09	Fri 30/10/09
63	CURITIBA-MONTEVIDEO	22 days	Mon 02/11/09	Tue 01/12/09
64	SANTIAGO-CORDOBA	22 days	Wed 02/12/09	Thu 31/12/09
65	BOGOTÁ-GUAYAQUIL	22 days	Fri 01/01/10	Mon 01/02/10
66	BOGOTÁ-PANAMÁ	22 days	Fri 01/01/10	Mon 01/02/10

CAR/SAM AUTOMATED ACC INTERCONNECTION PLAN SCHEDULE/
 CRONOGRAMA DEL PLAN DE INTERCONEXION DE SISTEMAS AUTOMATIZADOS EN ACC EN LAS REGIONES CAR/SAM

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ID	Nome da tarefa	Duration	Start	Finish
67	BOGOTÁ-BARRANQUILHA	22 days	Tue 02/02/10	Wed 03/03/10
68	BOGOTÁ-MAIQUETIA	22 days	Thu 04/03/10	Fri 02/04/10
69	BOGOTÁ-LIMA	22 days	Mon 05/04/10	Tue 04/05/10
70	PANAMÁ-CENAMER	22 days	Wed 05/05/10	Thu 03/06/10
71	CORDOBA-EZEIZA	22 days	Fri 04/06/10	Mon 05/07/10
72	MAIQUETIA-BARRANQUILHA	22 days	Tue 06/07/10	Wed 04/08/10
73	BARRANQUILHA-PANAMÁ	22 days	Thu 05/08/10	Fri 03/09/10
74	BARRANQUILLA-MAIQUETIA	22 days	Mon 06/09/10	Tue 05/10/10
75	MAIQUETIA-PIARCO	22 days	Wed 06/10/10	Thu 04/11/10
76	Surveillance Data interconnection Implementation using RADNET for the CAR/SAM Region	440 days	Tue 01/03/11	Mon 05/11/12
77	Specification	44 days	Tue 01/03/11	Fri 29/04/11
78	Acquisition	132 days	Mon 02/05/11	Tue 01/11/11
79	Installation	264 days	Wed 02/11/11	Mon 05/11/12
80	Telecommunication infrastructure Coordination	1200 days	Mon 02/03/09	Fri 04/10/13
81	Surveillance Data interconnection Implementation using SISTRASAG	100 days	Mon 02/03/09	Fri 17/07/09
82	BRASIL	30 days	Mon 02/03/09	Fri 10/04/09
83	LIMA	10 days	Mon 13/04/09	Fri 24/04/09
84	LA PAZ	10 days	Mon 27/04/09	Fri 08/05/09
85	ASSUNCION	10 days	Mon 11/05/09	Fri 22/05/09
86	GEORGETOWN	10 days	Mon 25/05/09	Fri 05/06/09
87	PARAMARIBO	10 days	Mon 08/06/09	Fri 19/06/09
88	ROCHAMBEAU	10 days	Mon 22/06/09	Fri 03/07/09
89	RESISTENCIA	10 days	Mon 06/07/09	Fri 17/07/09